

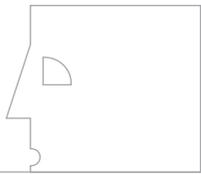
Research Report 2003–2004



The Max Planck Institute for Human Development, founded in 1963, is a multidisciplinary research establishment dedicated to the study of human development and education. Its inquiries are broadly defined, but concentrate on the evolutionary, social, historical, and institutional contexts of human development, as well as examining it from life-span and life-course perspectives. The disciplines of education, psychology, and sociology reflect the current directors' backgrounds, but the Institute's scholarly spectrum is enriched by the work of colleagues from such fields as mathematics, economics, computer science, evolutionary biology, and the humanities.

The Institute for Human Development is one of about 80 research facilities financed by the Max Planck Society for the Advancement of Science (Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V.), the core support for which is provided by the Federal Republic of Germany and its 16 states.





Research Report 2003–2004



Impressum

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Design: Grafisches Atelier Rudolf J. Schmitt, Berlin

Realization: Jürgen Baumgarten, Dagmar Gülow, Renate Hoffmann,
Jürgen Rossbach, Erna Schiwietz, Peter Wittek
of the *Max Planck Institute for Human Development*

Printed 2005 by DruckVerlag Kettler GmbH, Bönen/Westfalen, Germany

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Contents



| | |
|---|-----|
| Introduction | 6 |
| Highlights | 12 |
| Cooperation with Universities | 20 |
| LIFE | 23 |
| Graduate Program | 27 |
| MaxnetAging | 30 |
| Center for Adaptive Behavior and Cognition | 32 |
| Center for Educational Research | 74 |
| Center for Lifespan Psychology | 152 |
| Center for Sociology and the Study of the Life Course | 214 |
| Independent Research Group | 276 |
| Service Units | 292 |
| Appendix | 300 |

Introduction





Introduction

The Max Planck Institute for Human Development is a multidisciplinary research establishment dedicated to the study of human development and education. Its inquiries are broadly defined, but concentrate on the evolutionary, social, historical, and institutional contexts of human development, as well as examining it from life-span and life-course perspectives. The disciplines of education, psychology, and sociology reflect the current directors' backgrounds, but the Institute's scholarly spectrum is enriched by the work of colleagues from such fields as cognitive neuroscience, mathematics, economics, computer science, evolutionary biology, and the humanities. The Institute is one of about 80 research facilities financed by the Max Planck Society for the Advancement of Science (Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V.), the core support for which is provided by the Federal Republic of Germany and its 16 states. The total permanent staff at the Institute is 113, including 37 researchers, supplemented by a varying number of predoctoral, postdoctoral, and affiliate researchers and visiting fellows.

Research Centers

Research into processes of human development is conducted primarily from the theoretical vantage points offered by models of lifespan psychology, bounded rationality and adaptive behavior, life-course sociology, and conceptions of social-historical change.

The Institute is organized into four research centers:

The **Center for Adaptive Behavior and Cognition** (Director: Gerd Gigerenzer) investigates human rationality, in particular decision-making and risk perception in an uncertain world. Current research focuses on (1) bounded rationality, that is, the simple heuristics—cognitive, emotional, and behavioral—that laypeople and experts use to make decisions under constraints of limited time and knowledge, (2) social intelligence in cooperation and competition and (3) risk understanding and uncertainty management in everyday life, including applications

in medicine, law, and education.

Each of these research areas emphasizes the evolutionary foundations of behavior and cognition, in particular their domain specificity and functional adaptiveness (pp. 32–73).

The **Center for Educational Research** (Director: Jürgen Baumert) examines learning and development from an institutional point of view. Educational settings such as schools offer a variety of developmental opportunities, but at the same time exclude others. The impact of such settings is investigated from three perspectives: (1) the long-term consequences of schools' opportunity structures on individual development in terms of cognitive competencies as well as motivational and social resources, (2) international comparison of the outcomes of schooling in the fields of reading comprehension, mathematics and science literacy, and cross-curricular competencies, and (3) improvement of learning and instruction in terms

of the cognitive activation of students, mainly in science and mathematics (pp. 74–151).

The **Center for Lifespan Psychology**

(Director: Paul B. Baltes/Ulman Lindenberger) is characterized by a lifespan perspective and a concern with the optimization of human potential. The studies of children, adolescents, adults, and the elderly concentrate primarily on the development of cognition, memory, sensorimotor functions, intelligence, motivation, personality, and self-hood, as well as on prominent contextual factors of life-long socialization, such as interpersonal action coordination and co-development. In each of these areas, plasticity of human behavior and successful development, including their societal and neural causes and effects, play an important role in the conceptual and methodological design of the studies. Theory, methodology and history of developmental psychology define an additional area of interest. The most important change during the period 2003–04 was Ulman Lindenberger's appointment as Director of the Center for Lifespan Development and successor to Paul Baltes (July 2004). The Center's new research profile, balancing continuity and innovation, is outlined in this Report (see pp. 152–213).

In the **Center for Sociology and the Study of the Life Course**

(Director: Karl Ulrich Mayer), empirical research is oriented toward the analysis of social structure and institutions in a multilevel, historical and comparative perspective. Currently, this research is organized around four major foci: (1) Education, Training, and Employment;

(2) Life Courses in the Transformation of Former Socialist Countries; (3) Welfare State, Life Courses, and Social Inequalities; and (4) Life-Course Research and Analysis: Theory, Methods, and Synthesis. The research centers on the degree of interdependence among the processes of family formation, educational careers, and occupational trajectories in the life histories of members of various birth cohorts that differ in their historical situation as well as in their sociopolitical contexts (e.g., former East vs. West Germany). The methodology of sociostructural analysis and the analysis of dynamic processes provide additional foci of activity (pp. 214–275).

An important collaborative effort that involves all four Centers at the Institute as well as universities in Berlin and the United States is the **International Max Planck Research School "The Life Course: Evolutionary and Ontogenetic Dynamics (LIFE)"** co-chaired by Paul B. Baltes, Jacquelynne S. Eccles/University of Michigan, and John R. Nesselrode/University of Virginia. This interdisciplinary graduate program brings together doctoral students from the United States and Germany, but also from many other countries (see pp. 23–26).

Another international project that is organized by the Max Planck Society but housed at the Institute is the **International Max Planck Research Network on Aging (MaxnetAging)** which is directed by Paul B. Baltes (Jacqui Smith, Deputy Director). The general focus is on research, theory, and method of the behavioral and social science of aging. Specific objectives include the development of

new interdisciplinary research initiatives and providing a forum for promoting the careers of young scientists interested in the study of aging. The institutional collaboration involves several Max Planck Institutes, the Karolinska Institute, Stockholm, and the University of Virginia (see pp. 30–31). Hosting the new research network is a chance to further strengthen the Institute's international relations.

Governance of the Institute

The Institute is governed by a Board of Directors, currently consisting of the five members of the Institute who are Fellows (Wissenschaftliche Mitglieder) of the Max Planck Society (Paul B. Baltes, Jürgen Baumert, Gerd Gigerenzer, Ulman Lindenberger, Karl Ulrich Mayer). The Board is augmented by one member from the Institute's research staff (Petra Stanat) and the head of administration (Nina Körner). On a rotational basis, one of the Directors is elected by the Board to serve as Managing Director, usually for a period of two years. Several in-house committees composed of representatives elected by the entire scientific staff or by appointment advise the Board of Directors on matters of scientific research and policy. One of the major institute-wide committees is the Scientific Staff Committee (Mitarbeiterausschuss) which is elected by all scientists.

The **International Board of Scientific Advisers** offers an important source of external review and advice to both the Directors and the scientific staff on matters of research at the Institute. Members are selected from an international circle of distinguished researchers and appointed by the President of the Max Planck Society to four-year terms. They meet biannually to discuss completed, ongoing, and future research projects at the Institute. A list of the current members can be found on the frontmatter of this report.

Organization of the Annual Report

This research report is organized in the following manner:

- The presentation of each research center begins with an introductory overview summarizing its program.
- The introduction is followed by descriptions of the center's research areas and selected projects along with a list of scientific publications.
- The supportive activities of the service units—library and computing services—are described in a special section at the end of the report (pp. 292–299).
- The appendix provides information on the research colloquia held at the Institute, the visiting scholars, and the cooperation of the Institute's scientific staff with projects outside the Institute. It also includes an index of the scientific staff and their research interests (pp. 300–319).

Berlin, April 2005

For the Board of Directors:
Jürgen Baumert

Highlights



Honors and Awards

Paul B. Baltes 2004 Prize for Lifetime Achievement, German Psychological Association

Jürgen Baumert Order of Merit, Federal Republic of Germany

Jürgen Baumert Arthur Burkhardt Prize of the Arthur Burkhardt Foundation

Jürgen Baumert Member, Deutsche Akademie der Naturforscher Leopoldina

Jürgen Baumert Honorary Doctor, Martin Luther University Halle-Wittenberg

Felix Büchel 2003 Emerald Literati Club Highly Commended Award

Felix Büchel Adjunct Professor of Economics, Technical University of Berlin

Wolfgang Edelstein Order of Merit, Federal Republic of Germany

Gerd Gigerenzer 2004 Batten Fellow, Darden Business School, University of Virginia, Charlottesville

Gerd Gigerenzer 2004 "Professor der Universitätsgesellschaft," University of Munich

Gerd Gigerenzer 2003 *Reckoning with Risk* shortlisted for the Aventis Prize for Science Books

Konstantinos Katsikopoulos 2003 New Investigator Award, Brunswik Society

Ute Kunzmann & Antje Stange Best Poster Prize, German Psychological Association, Section for Developmental Psychology

Ulman Lindenberger Honorary Professor of Psychology, Free University of Berlin

Ulman Lindenberger Honorary Professor of Psychology, Humboldt University Berlin

Ulman Lindenberger Honorary Professor of Psychology, Saarland University

Ulman Lindenberger Member, Wilhelm Wundt Society

Karl Ulrich Mayer Member, American Academy of Arts and Sciences

Karl Ulrich Mayer Fellow, American Association for the Advancement of Science

Frances McGinnity Best Junior Publication 2001-2003 based on SOEP data, German Institute for Economic Research, Berlin

Jörg Rieskamp 2004 New Investigator Award, Brunswik Society

Jacqui Smith Fellow, American Psychological Association

Jacqui Smith Member, Academia Europaea, Section for Behavioral Sciences

Jacqui Smith Honorary Professor of Psychology, Free University of Berlin

Jacqui Smith New South Wales Return Award for Expatriate Researchers

Elsbeth Stern Honorary Professor of Psychology, Technical University of Berlin

Elsbeth Stern & Fritz Staub EARLI award for an outstanding publication in: Journal of Educational Psychology

Henrik Saalbach & Elsbeth Stern Chinese Psychological Society award for an outstanding journal article in: Psychonomic Bulletin & Review

Heike Trappe Fellow, Radcliffe Institute for Advanced Study, Cambridge, MA

Students Awards

Will Bennis William E. Henry Memorial Award (for the best dissertation in the Committee on Human Development at the University of Chicago)

Natalie Ebner Student Travel Award 2004 and Graduate Student Poster Award 2004 of the Society of Personality and Social Psychology

Natalie Ebner APA Student Award of Division 20, Adult Development and Aging

Anja Felbrich Junior Researcher Award, German Psychological Association, Section for Educational Psychology

Marita Jacob Otto Hahn Medal of the Max Planck Society

Nele McElvany 2003 Best Poster Award, Junior Researchers of EARLI

Christina Limbird Junior Researcher Award, German Psychological Association, Section for Educational Psychology

Florian Schmiedek Gustav A. Lienert Prize for young scientists of the German Psychological Association

Ulrich Trautwein Otto Hahn Medal of the Max Planck Society

Ulrich Trautwein Junior Researcher Award, German Psychological Association, Section for Educational Psychology

Andreas Wilke 2004 Linda Mealey Young Investigator Award, International Society for Human Ethology

Where Have Our Researchers Gone? New Positions 2003–2004

Research Scientists

Alexandra M. Freund 2005, University of Zurich, Full Professor of Psychology

Anne Goedicke 2003, University of Duisburg, Assistant Professor

Ralph Hertwig 2003, University of Basel, Associate Professor

Steffen Hillmert 2003, University of Bamberg, Assistant Professor

Ulrich Hoffrage 2004, University of Lausanne, Business School (Ecole des Hautes Etudes Commerciales, HEC), Full Professor

Ralf-Thomas Krampe 2004, University of Leuven, Full Professor

Ute Kunzmann 2004, International University Bremen, Jacobs Center, Junior Professor

Stefanie Kurzenhäuser 2004, University of Basel, Dept. of Psychology, Assistant Professor

Laura Martignon 2003, Ludwigsburg Teachers College, Professor of Mathematics and Mathematical Education

Frances McGinnity 2004, Economic and Social Research Institute, Dublin, Research Scientist

Antje Mertens 2005, Berlin School of Economics, Professor of Economics

Matthias Pollmann-Schult 2004, University of Bielefeld, Assistant Professor

Maïke Reimer 2005, Bavarian State Institute for Research in Higher Education, Munich, Research Scientist

Holger Seibert 2005, Institute for Labor Market and Employment Research, Berlin-Brandenburg, Research Scientist

Tania Singer 2003, Wellcome Dept. of Imaging Neuroscience, London

Heike Solga 2005, University of Göttingen, Dept. of Sociology, Full Professor

Rainer Watermann 2005, University of Göttingen, Dept. of Educational Sciences, Full Professor

Postdoctoral Research Fellows

Barbara Fasolo 2004, Operational Research Lecturer, London School of Economics and Political Sciences

Konrad Halupka 2003, University of Wrocław, Assistant Professor

Juan Rafael Morillas 2003, CentrA: Fundación Centro de Estudios Andaluces, Granada

Markus Raab 2003, University of Flensburg, Junior Professor

Torsten Reimer 2003, University of Basel, Associate Professor

Alessandra Rusconi 2004, University of Bremen, EMPAS, Assistant Professor

Sandra Wagner 2004, Federal Ministry of Education and Science, Berlin, Educational Research, Reporting and Standards

Annika Wallin 2004, University of Lund, Lecturer
Lixia Yang 2003, University of Toronto, Postdoctoral Fellow

Predocctoral Research Fellows

Ping-Huang Chang 2004, National Taiwan Normal University, Postdoctoral Researcher

Anke Demmrich 2003, University of Jena Children's Hospital

Thomas Dudey 2004, IT consultant, itelligence AG

Anja Felbrich 2004, Humboldt University Berlin, Assistant Professor

Yaniv Hanoch 2004, UCLA, Dept. of Public Health, Postdoctoral Fellow

Anke Höhne 2005, University of Halle-Wittenberg, Assistant Professor

Marita Jacob 2003, Institute for Labor Market and Employment Research (IAB), Nuremberg, Research Scientist

Rocio Garcia-Retamero Imedio 2004, University of Granada, Predocctoral Research Grant

Antje Stange 2004, Georgia Institute of Technology, Atlanta

Regina Wolf 2003, Vocational Training Academy, Plauen

Conferences Organized by Institute Researchers

Research in Teaching and Learning From a Neuroscience Perspective

(MPI for Human Development on behalf of the Federal Ministry of Education and Science)
November 2004
(Organizer: Elsbeth Stern)

Jacobs Foundation Conference on Educational Influences

(MPI for Human Development & King's College London)
October 2004
(Coorganizers: Jürgen Baumert, Petra Stanat, Barbara Maughan, & Michael Rutter; Coordinator: Susannah Goss)

The Causes and Consequences of Low Education in Contemporary Europe

(MPI for Human Development & European Consortium for Sociological Research/EURESCO)
September 2004
(Coorganizers: Paul M. de Graaf, Heike Solga, & Marlis Buchmann)

Brain–Behavior Dynamics Across the Lifespan: Methods and Concepts

(MPI for Human Development)
September 2004
(Coorganizers: Ulman Lindenberger & Shu-Chen Li; Coordinator: Conor Toomey)

Summer Institute on Bounded Rationality in Psychology and Economics

(MPI for Human Development & MPI for Research into Economic Systems, Jena)
August 2004
(Directors: Gerd Gigerenzer & Werner Güth; Coordinator: Guido Biele)

Summer School: Advanced Statistical Methods in Educational and Developmental Research

(MPI for Human Development & German Research Foundation (DFG), Priority Program on the Quality of School (BIQUA))
July 2004
(Coorganizers: Jürgen Baumert & Rainer Watermann)

Self-Concept, Motivation and Identity: Where to from here? Third International Biennial SELF Research Conference

(MPI for Human Development & SELF Research Centre, University of Western Sydney)
July 2004
(Coorganizers: Jürgen Baumert, Herbert W. Marsh, Ulrich Trautwein, & Garry E. Richards; Coordinator: Susannah Goss)

Dahlem Conference "Heuristics and the Law"

(MPI for Human Development & MPI for Research on Collective Goods)
April 2004
(Directors: Gerd Gigerenzer & Christoph Engel)

PISA 2000 Conference "Instruction in Mathematics and the Sciences"

(MPI for Human Development, IPN Kiel, & University of Oldenburg)
March 2004
(Coorganizers: Gundel Schümer, Jürgen Rost, & Michael Neubrand; Coordinator: Andrea Derichs)

International Max Planck Research School
The Life Course: Evolutionary and Ontogenetic Dynamics (LIFE)

LIFE Fall Academy 2004, October
(MPI for Human Development, University of Michigan, & University of Virginia)
(Directors: Paul B. Baltes, Jacquelynne S. Eccles, & John Nesselrode; Coordinator: Julia Delius)

LIFE Spring Academy 2004, May
(University of Michigan & MPI for Human Development)
(Directors: Jacquelynne S. Eccles & Paul B. Baltes; Coordinators: Janice Templeton & Julia Delius)

LIFE Fall Academy 2003, October
(MPI for Human Development & University of Michigan)
(Directors: Paul B. Baltes & Jacquelynne S. Eccles; Coordinator: Julia Delius)

LIFE Spring Academy 2003, May
(University of Michigan & MPI for Human Development)
(Directors: Jacquelynne S. Eccles & Paul B. Baltes; Coordinators: Janice Templeton & Julia Delius)

Graduate Program
"Neuropsychiatry and Psychology of Aging"

Dissertation Workshop
(MPI for Human Development & Free University of Berlin)
October 2003
(Directors: Paul B. Baltes & Isabella Heuser; Coordinator: Jacqui Smith)

Summer Institute on Bounded Rationality in Psychology and Economics

Special Focus: Bounded Rationality and the Law
(MPI for Human Development, University of Nottingham, & Universitat Pompeu Fabra)
August 2003
(Directors: Gerd Gigerenzer, Chris Starmer, & Robin Hogarth; Coordinator: Anja Dieckmann)

Brain, Mind, and Culture: From Interactionism to Biocultural Co-Constructivism

(MPI for Human Development)
August 2003
(Coorganizers: Paul B. Baltes, Patricia Reuter-Lorenz, & Frank Rösler; Coordinator: Julia Delius)

PISA 2000 Conference "Enhancing Reading Competence"

(MPI for Human Development & University of Bielefeld)
June 2003
(Coorganizers: Petra Stanat & Cordula Artelt; Coordinator: Andrea Derichs)



Teaching and Academic Degrees

The Institute has always considered its cooperation with universities as very important, especially by participating in teaching activities. Researchers from our Institute teach courses at three universities in Berlin and at the University of Potsdam as well as at many other universities in Germany and abroad.

In the years 2003–2004, more than 100 courses were taught by scientific staff members—directors, research scientists, postdoctoral as well as pre-doctoral fellows—of the Institute.

In addition, Institute members were supported in completing their academic degrees in cooperation with the universities in Berlin and elsewhere. In the years 2003–2004, 3 habilitations and 22 doctoral dissertations were completed by scientific staff members of the Institute.

All degrees are listed in the Appendix.



Exhibition in the Institute's entrance hall. Painting by Peter Lindberg.

International Max Planck Research School

The Life Course: Evolutionary and Ontogenetic Dynamics (LIFE)

Max Planck Institute for
Human Development
Humboldt University
Free University



Charlottesville
University of
Virginia
Ann Arbor
University of
Michigan

This graduate program on the Life Course (LIFE) is part of the Max Planck Society's framework of International Max Planck Research Schools. It was established in 2002 as a collaboration between the Max Planck Institute for Human Development, Berlin, the Humboldt University in Berlin, the Free University of Berlin, and the University of Michigan, Ann Arbor, USA. The University of Virginia, Charlottesville, USA, joined in October 2004.

The goal of the Research School is advanced research training in the study of human behavior and institutional systems over evolutionary and ontogenetic (life cycle) time. LIFE takes an integrative and interdisciplinary approach to understanding human development in a changing world, connecting evolutionary, ontogenetic, historical, and institutional perspectives.

The target group of the Research School are post-diploma or post-master's graduate students who intend to pursue a doctorate in one of the relevant disciplines (biology, psychology, sociology, anthropology, educational science). As a collaborative Research School, LIFE offers students a unique education experience: Discipline-based training in the study of the life course/life cycle that is enriched by interdisciplinary and international perspectives. The training program involves seminars at the participating institutions,

a series of Fall and Spring Academies, and collaborative supervision of research training. It also includes opportunities for research abroad at a cooperating institution. Three fellows from Berlin and two from Ann Arbor have made use of this since 2003, and further exchanges among the three locations are being planned.

The strong interlocking components are two annual week-long academies in which fellows and faculty from each university participate. During the reporting year of 2004, two such academies took place. The average number of participants including faculty was about 50. The LIFE Spring Academy 2004 was held in May at the University of Michigan. It had a primary focus on methodology and was followed by a 5-day workshop on structural equation modeling taught by John J. McArdle and others from the University of Virginia. The LIFE Fall

Co-chairs

Paul B. Baltes
(MPI for Human
Development),
Jacquelynne S.
Eccles (University
of Michigan), &
John R.
Nesselrode (Uni-
versity of Virginia)

Coordinator

Julia Delius (MPI
for Human Devel-
opment) & Janice
Templeton (Univer-
sity of Michigan)

www.imprs-life.mpg.de

In total, 36 faculty (Berlin: 13; Ann Arbor: 16; Charlottesville: 7), 5 associate faculty, 35 full fellows and 12 associate (external) fellows (Berlin: 18 full, 12 external fellows; Ann Arbor: 12 full; Charlottesville: 5 full) are currently involved.

Fellows from Europe, the Americas, and Asia joined the program on the following annual schedule:

- 2002: 18 (Berlin: 14; Ann Arbor: 4) – 2 have submitted their dissertations and successfully completed the LIFE program in 2004
- 2003: 12 (Berlin: 7; Ann Arbor: 5)
- 2004: 19 (Berlin: 10; Ann Arbor: 4; Charlottesville: 5)

Academy 2004 took place at the Hotel Döllnsee-Schorfheide in October. Participants included LIFE Fellows from Ann Arbor, Charlottesville, and Berlin, along with Guest Fellows from the Chinese Academy of Sciences in Beijing and the State University of Campinas, Brazil. The teaching faculty consisted of 31 faculty members (8 from Ann Arbor, 15 from Berlin, and 5 from Charlottesville as well as 3 guests from other institutions). The next Acade-

my is scheduled to take place at the University of Virginia in May 2005. In addition, each participating university offers special courses reflecting the special profile of its graduate programs and selects a subset of fellows for the added specialization provided by LIFE. The Berlin approach is to offer weekly seminars at the MPI for Human Development taught throughout the academic year by a varying team of faculty from the three Berlin institutions.

Topics of the Berlin LIFE seminar included:

- *The Biology of Life History*, Peter Hammerstein (HU) & guests
- *Contexts and Dynamics of Behavior and Cognition in the Life Course*, Ralf Krampe (MPI), Shu-Chen Li (MPI), Peter Todd (MPI), & guests
- *The Life Course: Structures and Institutions*, Martin Kohli (FU), Felix Büchel (MPI), Heike Solga (MPI), & guests
- *Developmental Methodology*, Ulman Lindenberger (MPI-FU-HU) & guests
- *Norms and Development: Interdisciplinary Approaches*, Monika Keller (MPI), Masanori Takezawa (MPI), & Gerd Gigerenzer (MPI-FU)

LIFE Fall Academy 2004



MPI for Human Development

Paul B. Baltes, Psychology & Gerontology
Jürgen Baumert, Educational Science
Gerd Gigerenzer, Psychology
Ulman Lindenberger, Psychology
Karl Ulrich Mayer, Sociology

Free University of Berlin

Martin Kohli, Sociology (currently European University Institute, Florence)
Hans Merzens, Educational Science
Ralf Schwarzer, Psychology

Humboldt University Berlin

Jens B. Asendorpf, Psychology
Peter Frensch, Psychology
Peter Hammerstein, Biology
Gerd Kempermann, Neuroscience
Rainer H. Lehmann, Educational Science

Faculty Associates

Alexandra M. Freund, Psychology, University of Zürich (formerly Northwestern University)
Shu-Chen Li, Psychology, MPI for Human Development
Heike Solga, Sociology, University of Leipzig (formerly MPI for Human Development)
Peter Todd, Psychology, MPI for Human Development
Oliver Wilhelm, Psychology, Humboldt University Berlin

University of Michigan

Toni C. Antonucci, Psychology
Kai S. Cortina, Psychology & Education
Jacquelynne S. Eccles, Psychology & Education
Richard Gonzalez, Psychology
James S. Jackson, Social Psychology
Daniel Keating, Psychology
Bobbi S. Low, Evolutionary & Behavioral Ecology
Randolph M. Nesse, Psychology & Psychiatry
Richard Nisbett, Psychology
Patricia Reuter-Lorenz, Cognitive Psychology & Neuroscience
Arnold Sameroff, Psychology
John Schulenberg, Psychology
Twila Tardif, Psychology
Henry M. Wellman, Psychology

University of Virginia

(initiated in 2004)

Judy DeLoache, Developmental Psychology
David L. Hill, Psychobiology
John J. McArdle, Quantitative & Developmental Psychology
John R. Nesselroade, Quantitative & Developmental Psychology
Timothy Salthouse, Cognitive Psychology
Eric Turkheimer, Quantitative & Clinical Psychology
Timothy D. Wilson, Social Psychology

**Professorial
Faculty
2004/2005**



**LIFE Doctoral
Fellows
2004/2005**

**Max Planck Institute for Human
Development**
Guido Biele, Psychology
Yvonne Brehmer, Psychology
Michaela Gummerum (External LIFE
Fellow), Psychology
Stefanie Gundert (External LIFE
Fellow), Sociology
Bettina von Helversen, Psychology
Oliver Huxhold, Psychology
Dana Kotter (External LIFE Fellow),
Psychology
Rui Mata, Psychology
Andrea G. Müller, Educational
Science
Gabriel Nagy (External LIFE Fellow),
Educational Science
Thorsten Pachur (External LIFE
Fellow), Psychology
Lisa Pfahl, Sociology
Christina Röcke, Psychology
Sabine Schäfer (External LIFE
Fellow), Psychology
Yee Lee Shing, Psychology
Yi-Miau Tsai, Educational Science
Markus Werkle-Bergner (External
LIFE Fellow), Psychology
Andreas Wilke, Psychology

Free University of Berlin
Rainer Heuer (External LIFE Fellow),
Sociology
Helen Krumme, Sociology
Poldi Kuhl (External LIFE Fellow),
Educational Science
Christina Karlyn Limbird, Educational
Science
Jutta Wittig, Psychology

Humboldt University Berlin
Tobias Bothe, Psychology
Jaap J. A. Denissen, Psychology
Robert Gaschler (External LIFE
Fellow), Psychology
Nicole Hess, Biological Anthropology
Judith Lehnart (External LIFE Fellow),
Psychology
Lars Penke (External LIFE Fellow),
Psychology
Dennis Rüniger, Psychology

University of Michigan
Sean Duffy, Psychology
Sarah Dunphy-Lelii, Psychology
Katherine Leigh Fiori, Psychology
Jung-Hwa Ha, Sociology
Justin Jager, Psychology
Cristine Legare, Psychology
Besangie Sellars, Psychology
Jessica Garrett, Educational Science
Emily Messersmith, Psychology
Pablo A. Nepomnaschy, Anthropology
Georges Potworowski, Psychology
Nicole Zarrett, Psychology

University of Virginia
Jesse C. Graham, Psychology
Vanessa LoBue, Psychology
Jamie Mangold, Psychology
Nilam Ram, Psychology
Karen Siedlecki, Psychology

LIFE Alumni

Natalie C. Ebner, External LIFE Fellow (2002–2004) at the MPI for Human
Development, now postdoctoral fellow at the MPI
Rebecca L. Utz, PhD, LIFE Fellow (2002–2004) at the University of Michigan,
now Assistant Professor, Department of Sociology, University of Utah

The Graduate Program (Graduiertenkolleg) on the Neuropsychiatry and Psychology of Aging



Neuropsychiatry and
Psychology of Aging

www.fu-berlin.de/age

Members of the Center for Lifespan Psychology involved include:

Paul B. Baltes (Co-chair until October, 2004)

Jacqui Smith (Scientific Coordinator and Member of the Steering Committee until October, 2004)

Together with predoctoral fellows in the Center (2003–2004):

Natalie C. Ebner

Denis Gerstorf

Daniel Grün

Susanne Scheibe

Antje Stange

This special program for doctoral training in psychological and psychiatric gerontology located at the Free University of Berlin was established in October 1998 by the late Margret M. Baltes and Hanfried Helmchen with funding from the German Research Council (DFG). The program was co-chaired by Hanfried Helmchen (Psychiatry) and Paul B. Baltes (Psychology, Max Planck Institute for Human Development) from March 1999 to March 2001. In April 2001, Isabella Heuser (Psychiatry) took over the chair after the retirement of Helmchen. After October 2004, and as a function of the career transition of Paul B. Baltes, the Institute no longer plays a key role in this program. However, several doctoral students located in the Center for Lifespan Psychology continue in the program until 2005. This DFG Graduiertenkolleg is funded until 2007, and now has a primary medical-biological focus.

During the six years of our intensive involvement (October 1998 to October 2004), this graduate training program represented an important cross-discipline collaboration to foster the careers of junior researchers. Five research groups were involved in the program: Free University of Berlin (Psychology, Ralf Schwarzer), University Medical School Benjamin Franklin (Psychiatry, Isabella Heuser, Friedel Reischies) and ENT (Hans Scherer), the Max Delbrück Center for Molecular Medicine (Berlin-Buch: Gerd Kemperman) and the Neurological Clinic of the Charité, Humboldt University Berlin (Arno Villringer), the Max Planck Institute for Human Development, Center for Lifespan Psychology (Baltes, Smith). Together, these groups sought to integrate medical, psychiatric, and psychological research on aging and very old age. The graduate program involved regular seminars, workshops, and Fall academies in which international researchers and doctoral fellows from other programs participated.

In the period 1998 to 2004, a total of 11 doctoral fellows based in the Center for Lifespan Psychology have worked together with 18 fellows located in the other institutions (medicine and psychology) to further their studies in gerontology. By the end of 2004, 18 dissertations were successfully completed in the program, including 11 by fellows from the Center for Lifespan Psychology or supervised by Center researchers (see below for the list of disserta-

tions submitted in the period of this report, 2003–2004). Many members of the program received national and international prizes for their doctoral research and were successful in obtaining postdoctoral fellowships to further their studies. Several in the initial cohort have now established their own research groups both in Germany and overseas (e.g., England, USA).

Dissertations Completed

Bondar, A. (2003). *Balance and cognition: Resource allocation and its control in young and older adults*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2003/48. From 2003 to 2004, postdoctoral fellow, MPI for Human Development.

Ebner, N. C. (submitted 2004). *Striving for gains and preventing losses: Multi-method evidence on the differences in personal goal orientation in early and late adulthood*. Doctoral thesis, Free University of Berlin. From 2004, postdoctoral fellow at the MPI for Human Development.

Gerstorff, D. (2004). *Heterogeneity and differential development in old age: A systemic-wholistic approach*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2004/342. From 2004, postdoctoral fellow at the MPI for Human Development.

Hoppmann, C. (2004). *Interpersonal contributions to the pursuit of work- and family-related goals in middle adulthood*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2005/24.

From 2004, research fellow at the University of Fribourg.

Jopp, D. (2003). *Erfolgreiches Altern: Zum funktionalen Zusammenspiel von personalen Ressourcen und adaptiven Strategien des Lebensmanagements*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2003/50. In 2003, research fellow, DZFA; from 2004: DFG-research fellow at Georgia Institute of Technology, Atlanta.

Lißmann, I. (2003). *Intraindividuelle Veränderungen von Extraversion und Neurotizismus im hohen Alter: Die Bedeutung sensorischer Beeinträchtigung*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2004/117. (Thesis supervisors at the Free University of Berlin: Jacqui Smith & Paul B. Baltes).

From December 2002, research fellow at the University of Marburg.

Rapp, M. (2003). *Dual-task performance in memory and balance: The role of aging and Alzheimer's disease*. Doctoral thesis, Free University of Berlin. Available online: www.diss.fu-berlin.de/2003/188. From 2003, research fellow at the Department of Psychiatry, Mount Sinai School of Medicine, New York.

Scheibe, S. (submitted 2004). *Longing ("Sehnsucht") as a new lifespan concept: A developmental conceptualization and its measurement in adulthood*. Free University of Berlin. From 2004, postdoctoral fellow at the MPI for Human Development.

MaxnetAging



MAX-PLANCK-GESELLSCHAFT

Max Planck International Research Network on Aging



Based on deliberations in the Max Planck Presidential Committee on Aging, the Max Planck International Research Network on Aging was established in the Fall of 2004. The initial time window for this Network is five years (2005–2009). During this period, the substantive task of the Network is to focus on the behavioral and social sciences of aging, broadly defined, with topical emphases on research about aging reflected in such fields as cognitive and social neuroscience, demography, psychology, law, history of science, cultural studies, sociology, economics, and the humanities. The primary goals are to:

- (1) Signal and initiate the long-range commitment of the Max Planck Society to the topic of individual and societal aging
- (2) Open new lines of inquiry into the behavioral- and social science-study of aging
- (3) Foster cross-disciplinary discussion about aging
- (4) Provide a platform for international research collaboration
- (5) Attract excellent young scholars to the field of gerontology

MaxnetAging is conceived both as a forum in which communication and cooperation in the study of aging is nurtured within the Human Sciences Section of the Max Planck Society and as a platform for international collaboration. Institutional partnerships have been established with the University of Virginia and the Karolinska Institute, Stockholm.

Semiannual meetings on topics of human aging, ranging across the full spectrum of the behavioral and social sciences and the humanities, provide the primary basis for fostering cross-disciplinary discussion and collaboration. Funds are available to seed new research initiatives and special seminars.

The Network consists of a core permanent group of Senior and Junior Fellows. In addition, Network Affiliates and Observers are invited to specific activities to ensure the infusion of new ideas and emphases. The main Network office is located at the Max Planck Institute for Human Development in Berlin. Jacqui Smith is the Deputy Director.

Director:
Paul B. Baltes

Collaboration:
Human Sciences
Section of the Max
Planck Society,
Karolinska Insti-
tute, Stockholm,
University of
Virginia





**Center for
Adaptive Behavior
and Cognition**

Contents

| | |
|---|----|
| Introductory Overview | 35 |
| Bounded Rationality | 37 |
| Ecological Rationality | 45 |
| Social Rationality | 56 |
| Evolutionary Psychology | 60 |
| Methods, Metaphors, and Theory Construction | 63 |
| Publications 2003–2004 | 68 |

Scientific Staff 2003–2004

Uwe Czienskowski, Anja Dieckmann, **Gerd Gigerenzer**, Ralph Hertwig (as of 2003: University of Basel), Ulrich Hoffrage (as of 2004: University of Lausanne), John M. C. Hutchinson, Konstantinos Katsikopoulos, Monika Keller, Jörg Rieskamp, Lael Schooler, Peter M. Todd

Postdoctoral Research Fellows

Will Bennis, Henry J. Brighton, Barbara Fasolo (as of 2004: London School of Economics), Stephanie Kurzenhäuser (as of 2004: University of Basel), Shenghua Luan, Magnus Persson, Markus Raab (as of 2003: University of Flensburg), Torsten Reimer (as of 2003: University of Basel), Julia Schooler, Masanori Takezawa, Annika Wallin (as of 2004: University of Lund)

Predocctoral Research Fellows

Guido Biele (LIFE), Thomas Dudgey (as of 2004: itelligence AG), Wolfgang Gaißmaier, Michaela Gummerum (LIFE), Yaniv Hanoch (as of 2004: University of California at Los Angeles), Bettina von Helversen (LIFE), Timothy Johnson, Rui Mata (LIFE), Thorsten Pachur (LIFE), Benjamin Scheibehenne, Andreas Wilke (LIFE), Jutta Wittig (LIFE)

Introductory Overview

The Center for Adaptive Behavior and Cognition (ABC) investigates reasoning and decision making under uncertainty at the levels of both individuals and social groups. The research group consists of psychologists, mathematicians, computer scientists, evolutionary biologists, economists, and researchers from other fields. With different methodological abilities—such as experimental methods, computer simulation, and mathematical analysis—they cooperate in solving the same problems.

The ABC program combines a strong theoretical focus with practical applications, that is, the research group both develops specific models and explores their applications. Those applications range from designing aids for web-based decisions to teaching statistical thinking and improving statistical reasoning—for instance, of expert witnesses in law courts—by particular representations of numerical information about risks.

The theoretical focus is on rationality and can be, albeit artificially, divided into three aspects: bounded, ecological, and social rationality.

Bounded Rationality

Models of bounded rationality attempt to answer the question of how people with limited time, knowledge, money, and other scarce resources make decisions. This program is an alternative to the dominant optimization paradigm in cognitive science, economics, and behavioral biology that poses the question of how Laplacean super-intelligences or near omniscient beings would behave. We study the proximal mechanisms of bounded rationality, that is, the adaptive heuristics that enable quick and frugal decisions under uncertainty. This collection of heuristics and their building blocks is what we call the adaptive toolbox.

Ecological Rationality

Models of ecological rationality describe the structure and representation of information in actual environments and their match with mental strategies, such as boundedly rational heuristics. To the degree

that such a match exists, heuristics need not trade accuracy for speed and frugality. The simultaneous focus on the mind and its environment, past and present, puts research on decision making under uncertainty into an evolutionary and ecological framework, a framework that is missing in most theories of reasoning, both descriptive and normative. In short, we study the adaptation of mental and social strategies to real-world environments rather than compare strategies to the laws of logic and probability theory.

Social Rationality

Social rationality is a variant of ecological rationality, one for which the environment is social rather than physical or technical. Models of social rationality describe the structure of social environments and their match with boundedly rational strategies people use. There is a variety of goals and heuristics unique to social environments. That is, in addition

Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things.

Isaac Newton

In this world nothing is certain but death and taxes.

Benjamin Franklin

tion to the goals that define ecological rationality—to make fast, frugal, and fairly accurate decisions—social rationality is concerned with goals, such as choosing an option that one can defend with argument or moral justification, or that can create a

consensus. To a much higher degree than for the purely cognitive focus of most research on bounded rationality, socially adaptive heuristics include emotions and social norms that can act as heuristic principles for decision making.

These three notions of rationality (according to which the present text is largely structured) converge on the same central issue: to understand human behavior and cognition as adaptations to specific environments, ecological and social, and to discover the heuristics that guide adaptive behavior. In a fourth section, we report on work that directly relates to evolutionary psychology, which, as a metatheoretical framework, lies behind the “adaptive” in our center’s name. The research reported in the last section relates to methodological, historical, and theoretical questions, in particular the influence of methodological preferences—such as linear models—on theories of cognition. Our reflections on methodologies constitute a source of ideas that is of central importance to modeling visions of rationality.

The ABC program is an invitation to take a journey into an exciting territory. The journey ventures into a land of rationality that is different to the familiar one we know from the many stories in cognitive science and economics—tales in which humans with unlimited time and knowledge live in a world where the sun of enlightenment shines down in beams of logic and probability. The new land of rationality we set out to explore is, in contrast, shrouded in a mist of uncertainty. People in this world have only limited time, knowledge, and computational capacities with which to make inferences about what happens in their world. The notions of bounded, ecological, and social rationality are our guides to understanding how humble humans survive without following the heavenly rules of rational choice theory.

Bounded Rationality

Humans and animals must make inferences about unknown features of their world under constraints of limited time, knowledge, and computational capacities. We do not conceive bounded rationality as optimization under constraints, nor do we think of bounded rationality as the study of how people fail to meet normative ideals. Rather, bounded rationality is the key to understanding how people make decisions without utilities and probabilities. Bounded rationality consists of simple step-by-step rules that function well under the constraints of limited search, knowledge, and time—whether an optimal procedure is available or not. Just as a mechanic will pull out specific wrenches, pliers, and spark-plug gap gauges to maintain an engine rather than just hit everything with a hammer, different domains of thought require different specialized tools. The notion of a toolbox full of unique single-function devices lacks the beauty of Leibniz’s dream of a single all-purpose inferential power tool. Instead, it evokes the abilities of a craftsman, who can provide serviceable solutions to almost any problem with just what is at hand.

The Adaptive Toolbox

This repertoire of specialized cognitive mechanisms, which include fast and frugal heuristics, were shaped by evolution, learning, and culture for specific domains of inference and reasoning. We call this collection of mechanisms the “adaptive toolbox.” We clarify the concept of an adaptive toolbox as follows:

- It refers to a specific group of rules or heuristics rather than to a general-purpose decision-making algorithm.
- These heuristics are fast, frugal, and computationally cheap rather than consistent, coherent, and general.
- These heuristics are adapted to particular environments, past or present, physical or social.
- The heuristics in the adaptive toolbox are orchestrated by some mechanism reflecting the importance of conflicting motivations and goals.

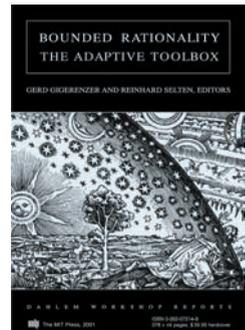
Fast and Frugal Heuristics

Fast and frugal heuristics generally consist of three building blocks: simple rules for guiding search for information (in memory or in the environment), for stopping search, and for decision making. They are effective when they can exploit the structures of information in the environment. That is, their rationality is a form of “ecological rationality” rather than one of consistency and coherence. We have continued to explore how fast and frugal heuristics mesh with diverse disciplines, such as biology, economics, and cognitive psychology, and have applied them in the areas of consumer behavior, medicine, and the law. For example, a review by Hutchinson and Gigerenzer (in press-b) compares ABC’s approach to biologists’ research into simple rules of thumb used by animals. A primary goal of the paper is to highlight what each school might learn from the other. For instance only a few papers

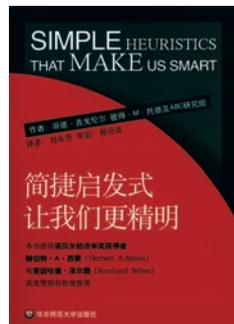
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in biology recognize that simple rules might outperform more complex ones, and biology lacks ABC's theoretical perspective on how the best method of combining information from several cues depends on the statistical structure of the environment. ABC might learn from biological examples of the order in which cues are inspected, which seems to depend not so much on validity, but on the cost of inspecting different cues and when each becomes apparent as the animal approaches. In the following, we will selectively report on some of the new findings and new areas of applications

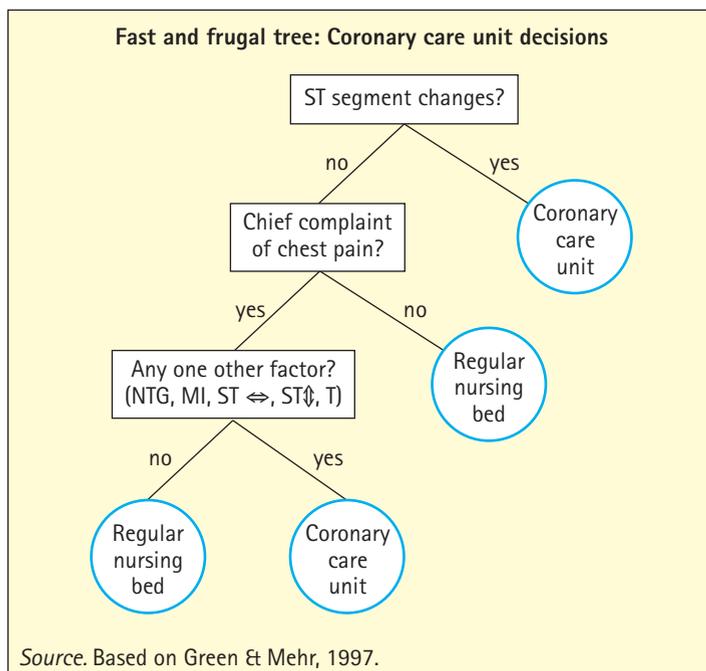
Fast and Frugal Trees

A man is rushed to the hospital with serious chest pains. The doctors suspect a myocardial infarction (heart attack) and need to make a quick decision: Should the patient be as-

signed to the coronary care unit or a regular nursing bed? In a Michigan hospital, doctors sent 90% of their patients to the coronary care unit. This defensive decision making led to a reduction in the quality of care because of overcrowding in the coronary care unit. An expert system and logistic regression did a better job of triage than the physicians, but the doctors did not take to these systems because they did not understand how they worked. To find a solution, researchers and the University of Michigan Hospital (Green & Mehr, 1997) used the building blocks of Take The Best to design the simple classification tree depicted in Figure 1.

The Green and Mehr (1997) tree is an example of a *fast and frugal tree*, a concept introduced by Martignon, Forster, Vitouch, and Takezawa (2003). These trees are simple sequential heuristics for assigning objects to one of two categories based on the values of a small number of binary cues. Even though they require little information, they still produce accurate classifications. In the heart disease example, the heuristic first asks whether the ST segment in the electrocardiogram is elevated or not. If it is, the patient is immediately classified as being at a high risk. If the ST segment is not elevated, the value of a second cue is inspected, and so on. The important point is that after each cue is looked up a classification can be made without consulting additional cues. Understanding why these simple trees perform so well and how they relate to other heuristics is currently an active area of research in the group. The simplicity of these trees

Figure 1. A fast and frugal tree for coronary care unit allocation.



produces pedagogical benefits as well. Fast and frugal trees can be drawn simply, making them easy for practitioners to see how they work. In another application, Dhami (2003) used fast and frugal trees to describe the process by which jurors in England make bail-or-jail decisions.

Coping With Too Much Choice

For many fast and frugal heuristics, including the trees described above, the number of alternatives in the choice set is fixed, and the focus is on how information about these alternatives is processed. We now turn to a set of studies where the focus is on situations in which there are many options to choose from.

Take the First

Research into decision making often uses tasks in which participants are presented with alternatives from which they must choose. Although tasks of this type may be useful in determining measures (e.g., preference) related to explicitly stated alternatives, they neglect an important aspect of many real-world decision-making environments, namely, the

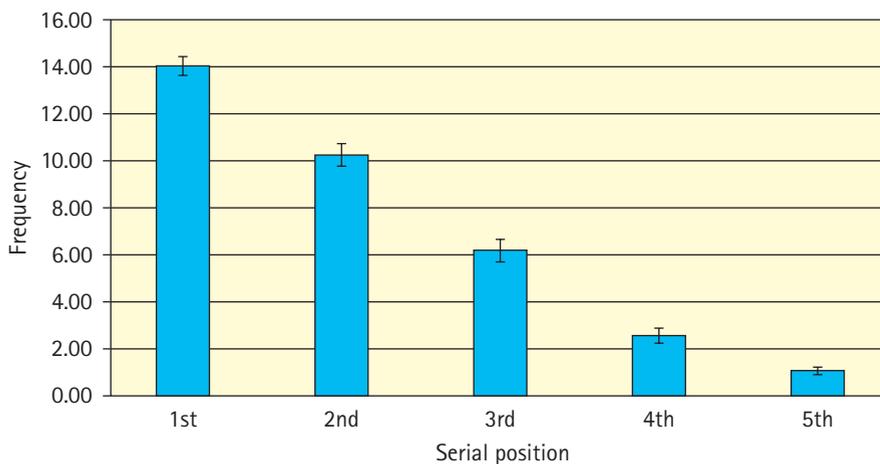
option-generation process. In handball, for instance, a player generates options under time pressure: pass the ball to the player on the left, the right, or take a shot. Do players make better decisions if they have more time to generate more options? Johnson and Raab (2003) placed experienced handball players in realistic situations that they might encounter during play and asked the athletes what they would do. Figure 2 shows that the quality of the options, as rated by experts, deteriorates with each successive option generated.

Decision-Facilitating Websites

The number of options is not only an issue in sports, but even more so for consumers: Most decisions nowadays present us with the "tyranny" of too much information and too much choice. One dramatic example is shopping online, where one is easily confronted with hundreds, if not thousands, of products characterized by dozens of attributes. To assist these difficult choices, a number of "decision-facilitating websites," such as www.activebuyersguide.com have

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Source. Johnson & Raab, 2003.

Figure 2. Frequency of "appropriate" decisions, as rated by experts, summed over participants and trials, for the generated options in each serial position, with standard-error bars. The result illustrates that a decision based on the first alternative that comes to mind is often better than one based on generating many alternatives.

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appeared on the Internet. Curiously, there appear to be two prevailing designs of decision-facilitating websites: those that facilitate fast and frugal decisions that do not require compensation between a bad and a good attribute (noncompensatory sites); and those that draw on the normative decision process of Multi-Attribute Utility Theory, and let good and bad attributes compensate for each other (compensatory sites).

First appearing in the US, decision-facilitating websites gradually migrated to Europe. Fasolo, Motta, and Misuraca (in press) review and compare decision-facilitating websites popular in the US and in Europe, focusing on Italy. The review highlights the greater popularity of noncompensatory sites because of their greater transparency and user-friendliness, compared to compensatory websites.

Fasolo, McClelland, and Lange (in press) ran experiments to compare consumers' perceptions and choices on compensatory and noncompensatory sites. They found that liking and quality of choices on the two sites depended on the structure of the choice environment. When choices presented trade-offs among conflicting attributes (i.e., where attributes were negatively correlated), the compensatory site was better liked, but choice was perceived as difficult. Vice-versa, when trade-offs were not present (attributes were positively correlated), the noncompensatory site was better liked and choice was perceived as easy.

This work highlighted the need to investigate compensatory multiattribute algorithms that could combine the advantages of the two website

designs: frugality and transparency, on the one hand, and ability to integrate conflicting attributes, on the other. Fasolo, McClelland, and Todd (in press) examine one such algorithm that could be implemented in future decision-facilitating websites. By means of simulations, they show that, in the presence of two constraints, consumers can make good choices despite neglecting most of the available product attributes. In particular, only one attribute is enough to select a good option—one within 90% of the highest value possible—as long as either the attributes are all positively correlated, or they are of unequal importance to the decision maker.

Biological Examples of Excessive Choice

Hutchinson (2005) reviewed evidence in animals of whether too much choice is ever aversive. The three key questions were whether animals prefer to visit sites where there is more choice, whether they are more likely to choose an item at such sites, and whether the items chosen at more diverse sites are better. For instance, a reanalysis of data on mating skew in leks (aggregations of males) of different sizes suggested that the probability of choosing one of the top $n\%$ of males might be highest at intermediate lek sizes.

Modeling the Hindsight Bias With Fast and Frugal Heuristics

Some years ago, the work on fast and frugal heuristics was extended to model a well-known phenomenon of memory research, the hindsight bias. Hindsight bias can occur when

people make a judgment or choice and are later asked to recall what their judgment had been. If, in the interim, they are told what the correct judgment should have been, their memory for their own judgment tends to become biased toward the new information. To explain this phenomenon, Hoffrage, Hertwig, and Gigerenzer (2000) developed the RAFT model (Reconstruction After Feedback with Take The Best). The core assumption of the model is that new information updates the knowledge base, which, in turn, will be used to reconstruct the initial response.

Recently, Hertwig, Fanselow, and Hoffrage (2003) put this model to a further test. Although typically considered to be a robust phenomenon, the hindsight bias is subject to moderating circumstances. A well-known meta-analysis of the phenomenon revealed that the more experience people have with the task under consideration, the smaller is the resulting hindsight bias. This observation is one benchmark against which the explanatory power of the process models of hindsight bias can be measured. Can the RAFT model account for this "expertise effect"? Yes. Specifically, using computer simulations of the RAFT model, Hertwig, Fanselow, and Hoffrage observed that the more comprehensive decision makers' prior knowledge is, the smaller is their hindsight bias. In addition, they made two counter-intuitive observations: First, the relation between prior knowledge and hindsight bias appears to be independent of how knowledge is processed. Second, even if prior knowledge is false, it can reduce hindsight

bias. This work was included in a special issue on the hindsight bias, which appeared 2003 in *Memory*, with Ulrich Hoffrage and Rüdiger Pohl as guest editors.

The Benefits of Cognitive Limits

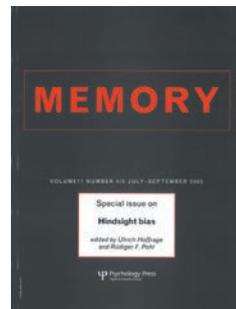
The premise that human information-processing capacity is limited is usually accompanied by another assumption, namely, that these limitations pose a liability: They constrain our cognitive potential. These limitations bar us from performing feats, such as reciting the *Iliad* from memory or, for many of us, remembering the three things we were to pick up at the store. Even more sinister, though, is that these cognitive limits are also suspected of being culpable for lapses of reasoning. The link between cognitive limitations and reasoning errors, more generally, and human irrationality can be found in such disparate research programs as Piaget's theory of the cognitive development of children, Johnson-Laird's mental model theory, and Kahneman and Tversky's heuristics-and-biases program. By bringing together ideas on cognitive limits from a variety of fields, Hertwig and Todd (2004) challenge the seemingly obligatory connection between cognitive limitations and human irrationality. While not doubting that limits can exact a price, they question their exclusively negative status. First, the thesis is put forth that decision-making strategies that take limitations into account need not be less accurate than strategies with little regard for those limitations; in fact, in psychologically important contexts, simple strategies can actually outperform "unbounded" strate-

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gies. Second, it is argued that limitations in processing capacity can actually enable rather than disable important adaptive functions. Third, it is suggested that some of the reasoning errors produced by the mind's cognitive limits fulfill important adaptive functions. Finally, the assumption is challenged that simple decision-making strategies have evolved in response to the cognitive limitations of the human mind. The reverse causality is suggested and the thesis is submitted that capacity constraints may, in fact, be a by-product of the evolution of simple strategies.

How Forgetting Aids Heuristic Inference

Forgetfulness is amongst our most troublesome cognitive limitations. Why don't we have the perfect recall of a computer memory chip? A few theorists have argued that forgetting should not be seen as a limitation, but as key to the proper working of human memory. Essentially, forgetting prevents outdated information from interfering with more recent information that is likely to be more relevant. Schooler and Hertwig (in press) propose that forgetting may, in addition, prove beneficial for inference heuristics that exploit mnemonic information, such as recognition and retrieval fluency. To explore the mechanisms that link loss of information and heuristic performance, they implemented the *recognition heuristic* (Goldstein & Gigerenzer, 2002) and the *fluency heuristic* (e.g., Jacoby & Dallas, 1981) in ACT-R (Anderson & Lebiere, 1998). The ACT-R research program strives to develop a coherent theory

of cognition, specified to such a degree that phenomena from perceptual search to the learning of algebra can be modeled within the same framework. In particular, ACT-R offers a plausible model of memory that is tuned to the statistical structure of environmental events. This model of memory was central to Schooler and Hertwig's (in press) implementation of the *recognition heuristic* and the *fluency heuristic*, both of which depend on phenomenological assessments of memory retrieval. The former operates on knowledge about whether a stimulus can be recognized, while the latter relies on an assessment of the fluency, the speed, with which a stimulus is processed. By grounding these memory-based heuristics in a cognitive architecture, they aimed to precisely define these heuristics and analyze whether and how loss of information—that is, forgetting—fosters their performance. Using computer simulations, the authors demonstrated that forgetting boosts the accuracy of the recognition heuristic (Goldstein & Gigerenzer, 2002), which relies on systematic failures of recognition to infer which of two objects scores higher on a criterion value. Similarly, simulations of the fluency heuristic, which arrives at the same inference on the basis of the speed with which the two objects are recognized, indicate that forgetting helps maintain the discriminability of recognition speeds. Thus, the ignorance that forgetting brings can, paradoxically, enhance inferences about real objects in the world.

How Emotions Aid Fast and Frugal Heuristics

Following Herbert Simon's claim that a complete explanatory account of human rationality must identify the significance of emotions for choice behavior, Muramatsu and Hanoch (in press) propose a strategy to study the significance of emotion in decision-making processes. They argue that emotions exert systematic influence on thinking and choice. They alter one's goal prioritization, determine the relative salience of aspects of a task, shape cost-benefit assessments, often tell us when to stop processing information, and render unthinkable many options for the decision maker.

Hanoch and Vitouch (2004) challenge the idea that high levels of emotional arousal are necessarily detrimental for performance, which is a common interpretation of the Yerkes-Dodson Law. In contrast to prevailing assumptions that having more information available is necessarily preferable to having less information, they show that the adaptive value of high emotional arousal stems precisely from its ability to restrict agents' attention. By this process agents are able to perform two vital functions: (i) focus their attention on the most urgent and vital information within the environment while overlooking peripheral information and (ii) mobilize the body to deal quickly with urgent problems.

Heuristics and the Law

Most lawyers would posit "heuristics and the law" to be a nonissue. In continental law, rules are generated by Parliament, and they are applied

by the executive or by the courts. All these formal institutions function under complex procedural rules that do not seem open for parsimonious context-specific decision rules. On closer inspection, however, one finds legislators responding to scandal, administrators taking one-reason decisions, and courts cutting through complex cases by relying on what they perceive to be their salient features. Research in psychology has identified situations in which *fast and frugal* heuristics can lead to more accurate decisions than more elaborate strategies that use more information, time, and resources. Can a less-is-more approach be applied to law as well? When are fewer rules better than more? Should legal rules be designed so that the authorities entrusted with their application need less information? How many tax laws does a society need?

These results can provide a new perspective and stimulation for two important programs. The *law and economics* movement offered rational choice theory as a descriptive account of human behavior and social or aggregate utility maximization as

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Dahlem Workshop on Heuristics and the Law

In June 2004, 40 scholars from law, psychology, economics, and related fields participated in a five-day Dahlem workshop to clarify the role of heuristics in the law. The workshop was organized by Christoph Engel, of the Max Planck Institute for Research on Collective Goods in Bonn, and Gerd Gigerenzer, and centered on four key questions: Are heuristics a problem or a solution? What is the role of heuristics in making law? What is the role of heuristics in court? How do heuristics mediate the impact of law on behavior?

As in all Dahlem workshops, the conference was not based on a series of talks. Rather, the editors asked 16 of the participants to write a paper on a specified topic, and these were distributed months before the workshop to all participants. The participants were then asked to comment on the papers whose topics they felt competent on, and these comments were also distributed before the workshop started. The five days of meetings were spent exclusively on intensive discussion and on writing the four group reports, addressing the four key questions. The revised chapters will be published by MIT Press.

a prescriptive goal for the design of legal rules. However, many scholars in the law and economics tradition became dissatisfied with a standard of individual utility maximization that sometimes ran dangerously close to being nonfalsifiable. This had particular salience in areas such as smoking or obesity, where large portions of the policy community simply refused to accept the idea that individual choices were *not* amounting to a problem, even for the individual choosers themselves. The second project, *behavioral law and economics*, has been heavily influenced by the conceptual frame-

work of the heuristics and biases program. This has been enormously fruitful research, but has been inclined to share the same half-empty-glass perspective displayed by the judgment and decision-making literature more generally. Behavioral law and economics scholars have tended to extrapolate from the heuristics and biases research without appreciating the way in which that research's aim of identifying "general-purpose heuristics" might not be well suited to the purpose of making domain-specific policy recommendations.

The ABC Research Group in 2004



Left to right, front row to back row: Monika Keller, Rocio Garcia Retamero, Gerd Gigerenzer, Henry Brighton, John Hutchinson; Michaela Gummerum, Tim Johnson, Benjamin Scheibehenne, Shenghua Luan; Lael Schooler, Bettina von Helversen, Anja Dieckmann, Masanori Takezawa; Ulrich Hoffrage, Nathan Berg, Jörg Rieskamp; Rui Mata, Will Bennis, Wolfgang Gaißmaier, Thorsten Pachur; Magnus Persson, Andreas Wilke, Jutta Wittig, Guido Biele, Peter Todd (not pictured: Uwe Czienskowski, Yaniv Hanoch, Konstantinos Katsikopoulos, Julia Schooler).

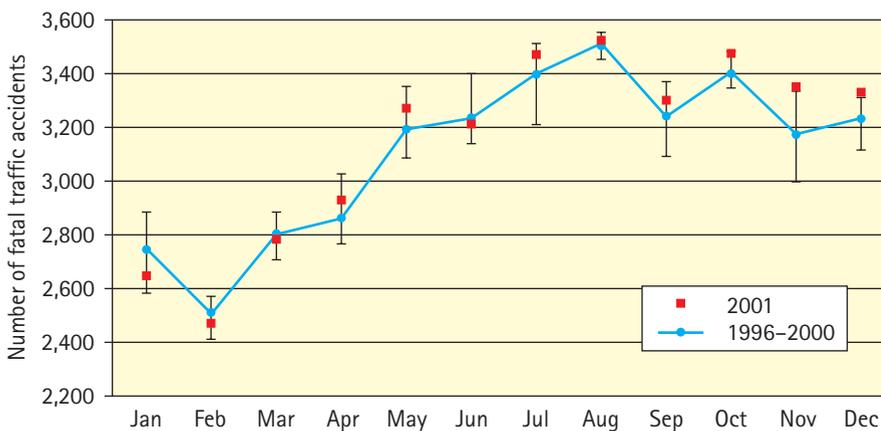
Ecological Rationality

Fast and frugal heuristics can perform as well, or better, than algorithms that involve complex computations. Even if humans had the mental computational power to use such complex algorithms, they would not gain much, if anything at all, by using them. The astonishingly high accuracy of these heuristics indicates their ecological rationality; fast and frugal heuristics exploit the statistical structure of the environment, and they are adapted to this structure. Our upcoming group book, the follow-up to *Simple Heuristics That Make Us Smart*, will focus on ecological rationality by exploring the ways that simple decision mechanisms fit with particular information structures in their environment. The book will cover heuristic building blocks and decision trees, social and nonsocial environments, as well as how people structure their own environments for easier cognition, and it will feature decision domains ranging from medical diagnosis to choosing a parking space. Navigating through the environment puts people into the business of making bets: Bets about the structure of the environment and about the risks they face. In this section, we highlight the costs that can be paid when people place bad bets about the risks of travel, and explore the processes that people use to assess risk.

The Risky Business of Avoiding Risks

Catastrophic events, such as the terrorist attack on September 11, 2001, in which many people are killed at one point in time, as opposed to situations where the same number of people are killed over a longer period, tend to generate great fear.

These high-consequence, but low-probability events are called *dread risks*. If Americans avoided the dread risk of flying after the terrorist attack and instead drove some of the miles not flown, one would expect an increase in traffic fatalities—a second toll of lives that has apparently gone unnoticed. But has this happened?



Source. Gigerenzer, 2004a.

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Figure 3. Number of fatal traffic accidents in the United States in 1996 through 2000 versus 2001. The blue line represents the means for the years 1996 through 2000, the vertical black bars indicate the highest and lowest values for those years, and the red squares indicate the values for 2001. Note the increase of fatal traffic accidents in the three months following September 11. During these three months an estimated 350 Americans lost their lives on the road, presumably in the attempt to avoid the risk of flying.

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After September 11, millions of Americans stopped, or reduced, their air travel. According to the Air Transport Association, the national revenue passenger miles decreased in October, November, and December 2001 by 20%, 17%, and 12%, respectively. Reports of increased vehicle miles from the American Office of Highway Policy Information suggest that a number of these Americans instead chose to drive: Compared with 2000, monthly miles driven were on average 0.9% higher before September 2001, but 2.9% higher in the three months following. In the last three months of the year, the largest traffic increase occurred on rural interstate highways (5.3%), which is consistent with the hypothesis that there was an increase in long-distance travel by car. As Figure 3 shows, the number of fatal crashes from January through August 2001 closely followed the numbers for the five preceding years, whereas from October through December 2001, it consistently rose at or above the upper range of the previous years. A more detailed analysis (Gigerenzer, 2004a) estimated that 350 people lost their lives by trying to avoid the risk of flying in the three months following September 2001. This number is higher than the total number of passengers and crew killed on the four fatal planes. Preventing terrorist attacks is difficult, but avoiding the second, psychologically caused toll of lives is possible, and should become a focus of security policy. The pictures of the planes striking the twin towers—shown again and again on TV—appealed to emotion and increased fear. In contrast, few citizens were

exposed to the fact that driving a car for 12 miles is as risky as one non-stop flight (even after September 11). Thus, if one arrives safely at the airport with the car, the most dangerous part of the trip may already be past. To prevent a similar secondary toll of lives happening again in the future, the public should be better informed about psychological reactions to catastrophic events and the potential risk of avoiding risk.

Sample-Based Inferences About Risk

When trying to infer the frequency of occurrence of events in real-world environments, people cannot typically consult frequency tables that provide summary statistics. Instead, they need to make such inferences on the basis of limited information. Such information can come in two forms—either in terms of cues or in terms of samples of the event in question. Most heuristics in the adaptive toolbox embody cue-based inferences, but recently ABC has begun to consider models for sample-based inferences. Pachur, Rieskamp, and Hertwig (in press) developed and tested the social circle heuristic, a heuristic for judging which of two events (e.g., health risks) occurs more often in the population. The heuristic relies exclusively on the number of occurrences of the events in a person's social circle (i.e., self, friends, family, acquaintances), which are searched sequentially. As soon as enough occurrences of the events are recalled to discriminate between the frequencies of the events, search is stopped. The heuristic implies that frequency judgments are often made based on

very small samples. In computer simulations Pachur et al. demonstrated that the heuristic is ecologically rational: That is, in particular real-world environments, it makes as accurate judgments as models that rely on much larger samples.

To what extent do people use information about the frequency of events in their social networks to make inferences about the frequency of occurrence of health risks, such as cancer, tornados, motor vehicle accidents, or tuberculosis? To investigate what mechanisms people use when judging risk frequencies, Hertwig, Pachur, and Kurzenhäuser (in press) asked participants to pick out of two health risks the more frequent one in Germany, and to estimate the number of people who are annually affected by the risks. The authors specified predictions for four different candidate mechanisms to account for these judgments. Of the four candidates, two mechanisms accounted for people's judgments best. The first, similar in spirit to the social-circle heuristic, makes frequency judgments based on the number of cases in a person's social network (*availability-by-recall*); and the second, a mechanism that assumes that frequencies are monitored automatically and people's estimates accurately reflect actual frequencies (though slightly regressed toward the mean; *regressed-frequency*). The superior fit of these mechanisms thus suggest that people have a relatively good sensitivity to the frequencies of health risks. Sampling-based heuristics have difficulty picking up on extremely rare events. The consequences of obtaining probabilistic information by

sequential sampling rather than in a summary format was studied by Hertwig, Barron, Weber, & Erev (2004) in a context in which people are asked to decide between two lotteries (e.g., A: Get \$4 with probability .8, \$0 otherwise, or B: Get \$3 for sure). The most prominent descriptive theory of how people decide between such lotteries is the prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). This theory posits that, relative to the objective probabilities with which an outcome can be expected to occur, people make choices as if small-probability events receive more weight than they deserve and as if large-probability events receive less weight than they deserve. Hertwig et al. (2004) argued that—in contrast to the standard paradigm for studying decisions between gambles, in which people are provided with a symbolic, usually written descriptions about the probabilities of the outcomes of gambles (*decision by description*)—we rarely have complete knowledge of the possible outcomes of our actions and their probabilities. Instead, we rely on the experience that we have accumulated over time. Hertwig et al. referred to this kind of choice as a *decision from experience*. To find out whether people behave differently when deciding from experience opposed to deciding from description, Hertwig et al. (2004) created an experimental environment in which people had to learn the outcome probabilities associated with pairs of lotteries by sampling from either distribution as many times as they wished. After they stopped sampling, they were asked which lottery they

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wanted to play for real payoffs. As it turned out, compared to the choices of respondents who received written descriptions of each option, the choices by respondents who were allowed to sample the possible outcomes freely and repeatedly suggested that rare events had less impact than they deserved (given their objective probability)—the opposite of the predictions from the prospect theory.

To account for the dramatic difference between decisions from description and decisions from experience, Hertwig and colleagues cited two factors—small samples and a recency effect. First, the experience group tended to rely on small samples of outcomes, which meant that they either never encountered the rare event or encountered it less frequently than expected on the basis of its objective probability. Second, they paid more attention to recently experienced outcomes. In contrast, having read about the rare events, the description group tend to exaggerate their importance.

Individual Differences in Risk Taking

The topic of the next three sections is individual differences with respect to risk taking, and the development of measures to predict and to assess people's willingness to take risks.

How to Identify the Young Daredevils in Traffic

We start with the youngest age group that we studied: 5- to 6-year-olds. The risky activity under consideration is crossing the street in front of oncoming vehicles. Is each young pedestrian similarly at risk? To find

this out, Hoffrage, Weber, Hertwig, and Chase (2003) placed 44 children on the curb of a busy one-way street in Munich where there was no traffic light or crosswalk. They then asked them to indicate when they thought it was safe to cross the street. As expected, some children were more likely than others to say they could still cross the street when it was potentially dangerous to do so. Did children's willingness to take risks in the street correlate with their willingness to take risks in the laboratory?

The researchers played two games with the children, a gambling game and a computer game. In the gambling game, each child was presented with ten wooden boxes, nine of which contained coveted stickers; the tenth box contained a little devil. The children were told to choose and open the boxes one-by-one. If they chose the box with the devil, the game ended and they lost their stickers; but if they stopped the game before they found the devil's box, they were allowed to keep the stickers they had found. Children who stopped early were classified as risk avoiders, while those who pressed their luck were labeled risk



takers. In the computer game, the real-traffic scenario was simulated as closely as possible. Children were seated in front of a computer monitor that depicted—from an aerial view—a stream of oncoming vehicles, with gaps of varying size between them. With a key press, the children sent a pedestrian across the street. They were told that for every successful crossing they would receive a piece of candy, whereas for every accident they would lose three. The classification of risk takers versus risk avoiders was based on their accident rates in this task.

It turned out that those children who were risk takers in the gambling task made more crossing decisions, especially when the gaps between cars were of medium size—a time when it is often unclear whether a child could safely cross. Second, they tolerated shorter time intervals between initiation of the crossing decision and arrival of the next vehicle, and were more likely to cause a (hypothetical) accident. Third, they made decisions more quickly than risk avoiders. Finally, while boys were more likely than girls to make risky decisions, whether a child was a risk taker according to the gambling game was a far better predictor of their street-crossing behavior than gender. The computer game, in contrast, did not predict behavior in the real-traffic situation, which may be explained by the compensatory payoff structure: Candies lost with accidents could be compensated for with successful crossings. Finding the devil's box, however, was noncompensatory and led to loss of everything accumulated so far—as in the real-traffic situation.

Individual Differences in Risk Taking in Sports

Individual players differ in the degree to which they are willing take risky decisions. A popular view is that such risky decisions can be explained by differences in personality traits. Rather than simply identifying differences in risk-taking behavior between individuals, Raab and Johnson (2004) explored the mechanisms that may underlie such differences. A basketball task was used in which participants had four options displayed on a video screen that varied in the degree of associated risk. For example, shooting to the basket was considered a high-risk option, while passing to a play maker entails relatively little risk. Different versions of a computational model of decision making, Decision Field Theory, were compared to evaluate whether behavioral differences depend on such factors as the focus of attention, the initial preference for particular behaviors, or an approach-avoidance interpretation of the task. In basketball, risky shooting behavior can be best explained by differences in the initial preferences for risky and safe options.

Is Risk Taking a Domain-General Phenomenon?

How to adequately measure risk-taking propensity has long been debated among researchers in psychology, economics, and other fields reflecting the importance of the construct not only to researchers but also to policy making. Two of the main problems researchers have run into are that, first, people tend not to be as generally risk seeking (or avoiding) as is often assumed, but

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Gigerenzer, G., & **Hoffrage, U.** (1995). How to improve Bayesian reasoning without instruction: Frequency formats. *Psychological Review*, 102, 684–704.

rather show differential risk taking across domains (e.g., a mountain climber who buys fire insurance) and second, that some typical risk-taking measurements (e.g., assessing risk propensity via choices made between monetary gambles) do not extend well to other risk domains or to behavior outside of the laboratory. Recently, Weber, Blais, and Betz (2002) overcame these limitations by hypothesizing domain-related within-individual differences in attitudes toward risk and developed a new psychometric instrument to distinguish risk-taking attitude and behavior in different domains. Now, Johnson, Wilke, and Weber (2004) translated and validated the English version of this domain-specific risk-taking scale on more than 500 German participants. This German-language scale assesses tendencies to engage in risky behaviors as well as perceptions of risks and expected benefits from such behaviors in six distinct domains of risk taking: ethical, recreational, health, social, investing, and gambling. As in the English version, risk-taking as well as perceptions of risks and benefits were domain-specific, while perceived risk attitudes were more similar across domains, thus supporting the use of a risk-return framework for interpreting risk-taking propensity. The translation has enabled cross-cultural studies on domain-specific risk. For example, one study underway explores how risk taking in different domains is used as a possible cue in human mate choice.

Information Representation

We have pursued the issue of ecological rationality in yet another

way, namely, by studying the question of representation. Representational formats constitute environments for cognition. This research has practical relevance in many domains, such as diagnostic inference or risk assessment in legal cases, where the external representation of diagnostic information influences physicians', counselors', and lawyers' performances. Probabilities and percentages are representations of uncertainty that were devised only a few hundred years ago and still cause people problems today. For instance, consider the statement: "There is a 30% chance of rain tomorrow." To investigate what this means to people, Gigerenzer, Hertwig, van den Broek, Fasolo, and Katsikopoulos (in press) surveyed citizens living in five cities of five countries: New York, Amsterdam, Berlin, Milan, and Athens, where probabilities of rain were introduced in 1965, 1975, 1990, on the Internet only, and not yet, respectively. They approached pedestrians in public squares and asked them to indicate which of three alternatives is the most and the least appropriate interpretation of the statement "There is a 30% chance of rain tomorrow." The alternatives were (i) "It will rain tomorrow in 30% of the region," (ii) "It will rain tomorrow for 30% of the time," and (iii) "It will rain on 30% of the days like tomorrow." How does the public understand a quantitative probability of rain? Figure 4 shows that two thirds of the participants in New York chose "days" as the correct reference, about one quarter chose "time," and a few "region." In contrast, in none of the European cities

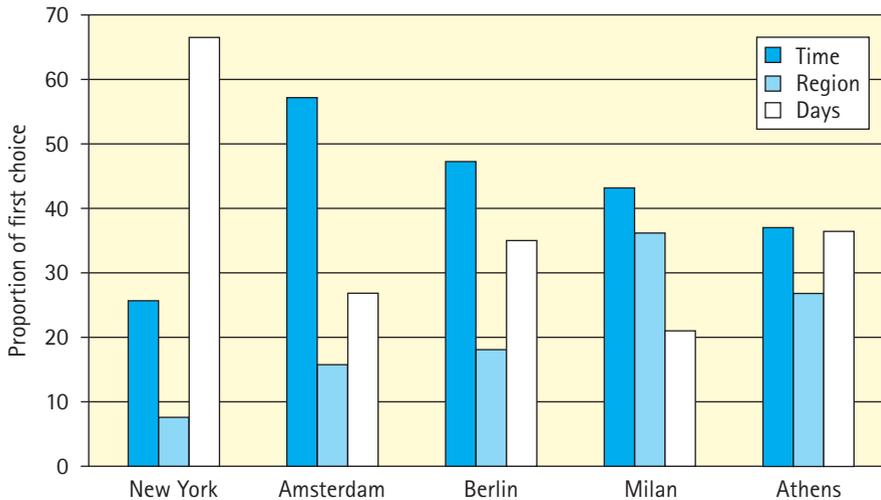


Figure 4. First Choice. People in New York ($n = 103$), Amsterdam ($n = 117$), Berlin ($n = 219$), Milan ($n = 203$), and Athens ($n = 108$) were asked what the statement "There is a 30% chance of rain tomorrow" refers to. The three alternatives were "It will rain tomorrow for 30% of the time," "in 30% of the region," and "on 30% of the days like tomorrow." Note that most Europeans misunderstood that the "30%" is intended to refer to the class of events of "days like tomorrow."

Source. Gigerenzer, Hertwig, van den Broek, Fasolo, & Katsikopoulos, in press.

did we find a majority for "days." The favored interpretation in Amsterdam, in Berlin, in Milan, and in Athens was "time."

Why does the public understand probabilities in such multiple ways? A forecast, such as "There is a 30% chance of rain tomorrow" conveys a single-event probability, which by definition leaves open the reference class (region, time, or days) to which it refers. For the National Weather Service, which defines the probability of precipitation "as the likelihood of occurrence (expressed as a percent) of a measurable amount of liquid precipitation ... during a specified period of time at any given point in the forecast region," a 30% chance of rain does not mean that it will rain tomorrow in 30% of the region or during 30% of the time. Rather, it means that it will rain in 30% of the days with similar weather constellations as tomorrow. The problem, however, is not simply the public's lack of understanding; it is the ambiguous communication of risk to the public. When meteorolo-

gists communicate risks in terms of single-event probabilities, they leave open what class of events this percentage refers to.

The ambiguity of a single-event probability in risk communication and the resulting possibility of miscommunication is not limited to probabilities of rain. The same problem occurs, for instance, when single-event probabilities are used by expert witnesses to explain DNA evidence in the court, and by medical organizations that publicize statements, such as "If a woman participates in mammography screening, she reduces her risk of dying from breast cancer by 25%," and women systematically misunderstand this percentage. Consider another medical scenario in which a physician needs to infer the probability that an asymptomatic man has colorectal cancer (C) after he received a positive hemocult test result (pos) in a routine screening. In terms of probabilities, the relevant information (concerning a population of men aged 50) is a base rate for colorectal

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cancer $p(C) = 0.3\%$, a sensitivity $p(\text{pos}|C) = 50\%$, and a false positive rate $p(\text{pos}|\bar{C}) = 3\%$. Whereas the Bayesian answer is 4.7%, typically most lay-people (and also doctors) estimate this probability at approximately 50% or higher. This result has been interpreted as the “base-rate neglect.”

To evaluate and understand the performance of the human mind, one needs to look at its environment and, in particular, at the external representation of the information. For most of the time during which the human mind evolved, information was encountered in the form of natural frequencies, that is, absolute frequencies as they result from ob-

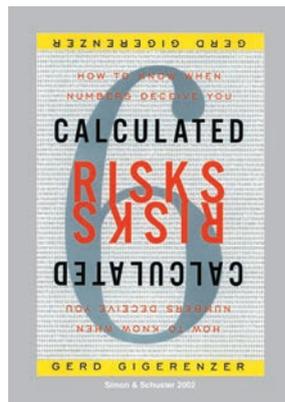
serving cases that have been representatively sampled from a population. The same information represented in terms of natural frequencies is: “Thirty out of every 10,000 people have colorectal cancer. Of these 30 people with colorectal cancer, 15 will have a positive hemocult test. Of the remaining 9,970 people without colorectal cancer, 300 will still have a positive hemocult test.” Natural frequencies simplify Bayesian computations and, as a consequence, help people gain insight into Bayesian reasoning. This was demonstrated both with lay-people (Gigerenzer & Hoffrage, 1995) and in different fields of professional decision making (Hoffrage,

Calculated Risks/Reckoning With Risk/Das Einmaleins der Skepsis

At the beginning of the 21st century, most children have learned to read and write, but many adults still do not know how to reason about uncertainties and risk. As this book repeatedly demonstrates, physicians or legal experts often do not understand the risks either. This problem has been called innumeracy, and this book offers a remedy.

The book provides experts and lay-people with mind tools for understanding risks and communicating these effectively to others. These tools are easy to learn, and can turn innumeracy into insight. They can help reduce the widespread uninformed consent in medical, legal, and everyday situations, from mammography screening to understanding the meaning of a DNA match in a legal trial.

The book, published by Penguin in the UK and Simon & Schuster in the US, was nominated in 2003 for the Aventis prize that recognizes science books targeted at a general readership. The German translation (*Das Einmaleins der Skepsis: Über den richtigen Umgang mit Zahlen und Risiken*) has been selected the Most Informative Book of the Year by *Bild der Wissenschaft*, a major German science magazine. Japanese and Italian translations have been published, and Chinese and Portuguese translations are underway.



Lindsey, Hertwig, & Gigerenzer, 2000). Moreover, Zhu and Gigerenzer (in press) found that even fourth, fifth, and sixth graders showed a better performance with natural frequency problems than adults with probability problems.

Representations of Risk Reduction

Natural frequencies are also beneficial for a related problem, namely, to understand the benefit of a therapy or of participation in a screening program. Consider again the statement that mammography screening reduces the risk of dying from breast cancer by 25%. Does that mean that from 100 women who participate in the screening, 25 lives will be saved? Although many people believe this to be the case, the conclusion is not justified. This percentage, in fact, means that from 1,000 women who do not participate in the screening, 4 will die from breast cancer within ten years, whereas from 1,000 women who participate, 3 will die. The difference between 3 and 4 is the 25% "relative risk reduction." Expressed as an "absolute risk reduction," however, this means that the absolute benefit is 1 in 1,000, that is, 0.1%. Cancer organizations and health departments typically inform women of the relative risk reduction, which gives a higher number—25% compared to 0.1%—and makes the benefit of screening appear larger than if it were represented in absolute risks. Kurzenhäuser (2003b) analyzed 27 brochures that informed women about mammography screening. The main result was that the relevant statistical information about risks and benefits are, for the most part, poorly explained. Even

when information is provided, it is frequently given in terms of vague verbal descriptions rather than in precise numbers. It should thus not come as a surprise that there is also confusion in the normal population about the meaning of numbers describing costs and benefits of medical interventions. Hoffrage (2003) conducted a survey among 50- to 60-year-old women that has revealed substantial deficits in understanding the difference between absolute and relative risks in the context of hormone replacement therapy.

Applications in Law

Judges also must make decisions based on probabilities. Does the representation of numerical information in natural frequencies foster Bayesian reasoning in court? Professionals and law students in Germany evaluated two criminal court case files involving rape and forensic evidence of a DNA match. Expert testimony reported the statistical information of DNA profiles and the rates of technical and human mishaps leading to false-positive results. This information was presented in two different formats, one stated as probabilities and the other as natural frequencies. When these statistics were expressed as probabilities, only 13% of the professionals and less than 1% of the law students correctly inferred the probability that the defendant was actually the source of the trace. But when the identical statistics were stated as natural frequencies, 68% and 44% of these same participants made the correct inference. Perhaps more significantly, the different ways of ex-

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pressing the same statistical information altered the verdicts in each case. When the information was presented as probabilities, 45% of the professionals and 55% of the students rendered a verdict of guilty, but only 32% and 33% did so when the same statistics were expressed

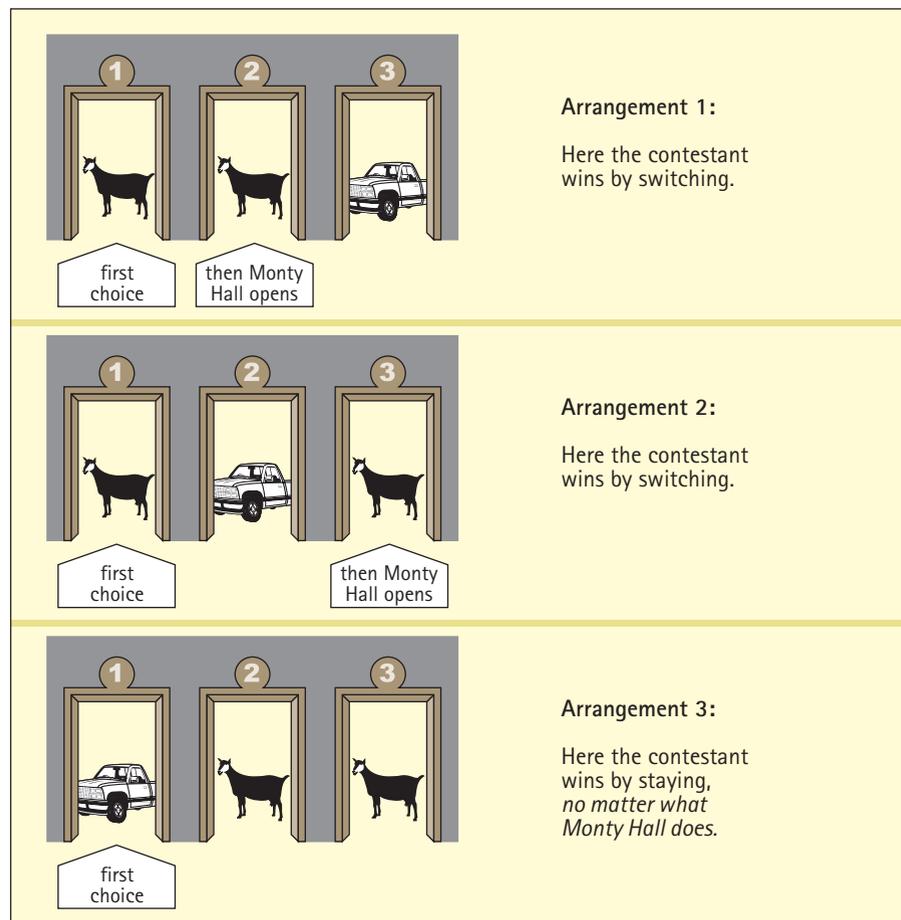
as natural frequencies (Lindsey, Hertwig, & Gigerenzer, 2003). When verdicts hinge on statistical evidence, understanding that evidence is crucial, and pursuing such simple methods of fostering statistical insight could contribute to that goal.

How to Solve the Monty Hall Problem

Base-rate neglect is an example of a so-called bias, typically revealed under conditions that differ from people’s natural environments. By representing (statistical) information in a way that better fits how we encounter information in the environ-

ment, reasoning becomes not only more accurate but also more consistent with statistical or probability norms, such as Bayes’ rule. Here is another example: Suppose you are on a game show and you are given the choice between three doors. Behind one door is a car; behind the others are goats. You pick, for exam-

Figure 5. Explanation of the solution to the Monty Hall problem: In two out of three possible car-goat arrangements the contestant would win by switching; therefore she should switch.



ple, door number 1, and the host, who knows what is behind the doors, opens a different door, for example, door number 3, to reveal a goat. He then asks you, "Do you want to switch to door number 2?" Is it to your advantage to switch your choice? What contestants should do in this situation (known as the Monty Hall problem or the three-door problem) sparked a heated public debate. Although it is to the advantage of the contestant to switch, until now, all experimental studies on the Monty Hall problem led to similar results: The vast majority of participants believes that switching and staying are equally good alternatives.

Piattelli-Palmarini singled out the Monty Hall problem as the most expressive example of the "cognitive illusions" or "mental tunnels" in which "even Nobel physicists sys-

tematically give the wrong answer, and (...) insist on it, and are ready to berate in print those who propose the right answer."

Krauss and Wang (2003) were able to shed light into this "mental tunnel" by formulating the problem in an ecologically appropriate manner: By asking "In how many of the possible arrangements would the contestant win by switching and in how many would she win by staying?" they allowed their participants to reason in a frequentist manner (see Figure 5). By implementing further manipulations into the problem's wording (e.g., a perspective change from the perspective of the contestant to the perspective of the game show host), they could bring a substantial portion of the participants to a full understanding of the brain-teasers' underlying mathematical structure.

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Social Rationality

Some of the most ambitious decisions faced by social species are those arising from an environment comprised of the decisions of conspecifics. Social environments are characterized by the speed with which they can change, and by the need to consider the decisions being made by others. These two features make social rationality an important and distinct form of ecological rationality.

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Understanding Relationships and Moral Norms in a Cross-Cultural Perspective

One focus of our research is on the development of the understanding of moral obligations and interpersonal responsibilities in a cross-cultural context from childhood into late adolescence. The developmental course of understanding in China and Western countries, in particular Iceland, reveals striking similarities in conceptions and the sequence of developmental levels both in general and situation-specific reasoning about close friendship and parent-child relationship. Children of different age groups focus on different defining properties of relationships, and seem to rely on a limited number of defining relationship structures (or cues), which lead to different behavioral responses, such as moral decisions and evaluations. In spite of the general similarities, culture modulates the specific meaning of obligations and responsibilities in close relationships (Keller & Gummerum, 2003). In the transition from early into late adolescence, understanding of close friendship in both societies reveals a developmental path from relationship intimacy to autonomy. However, young Chinese see the self and friendship embedded into society, while Icelandic adolescents focus on the psychological as-

pects of close friendship, for example, the friend as a therapist (Keller, 2004b).

Development of Moral Emotions in a Cross-Cultural Perspective

Moral emotions, such as guilt that are associated with the consequences of moral transgressions, are important cues for the motivational acceptance of moral norms. While older children attribute guilt to a moral violator, younger children have been defined as "happy victimizers" because in spite of moral knowledge, they attribute positive feelings to moral rule violators. However, this shift in attributions has not been found consistently. We tested in a cross-cultural study whether a self-other differentiation may be an explanation for these inconsistent findings. Six- and nine-year-old German and Portuguese children had to attribute emotions to a rule violator, both in the role of self and hypothetical other (Keller, Lourenço, Malti, & Saalbach, 2003). The findings revealed a developmental shift in both roles, but moral feelings were attributed much more frequently to self as violator than to the hypothetical other. Thus, a self-other differentiation only partly account for inconsistent results in the attribution of emotions to others. We are presently analyzing Chinese

data in which no emotional shift obtained for other. Thus, our research shows that not only different age groups but children from different cultures rely on different cues in the interpretation of the emotional consequences of moral transgressions. Two other studies have been performed to follow up on the phenomenon of moral emotions in different contexts. The first study interconnects deontic reasoning about contracts and contract violation with the attribution of emotions in a developmental perspective (Keller, Gummerum, Wang, & Lindsey, 2004). Already, young children from the age of 5 to 6 years on can understand contract violation from the two different perspectives of the contractors in parent-child and peer relationships. However, relationship cues influence the understanding of emotions of contract violators. In the symmetrical peer relationship, older children attributed moral feelings much more frequently than the younger children. In the asymmetrical parent-child relationship this linear increase was supported for the attribution of guilt feelings to the mother as contract violator. However, even the oldest children tended to attribute positive feelings to the child who is a violator. We concluded that moral feelings in the case of contract violation are specific to the type of relationship. Thus, we cannot conclude that there is one cheating detection device which helps identify contract violation in all kinds of relationships, but that this device has to be adapted to the domains of different relationships. This question is presently followed up in a further study control-

ling systematically for type of relationship and type of contract.

The Roles of Cognition and Emotion in Cooperation

The details of what cues and algorithms are involved in altruism, friendship, and general good will as well as the potential functions of emotional states in these algorithms, have been the subject of a good amount of speculation and research. For a recent Dahlem Conference volume, McElreath et al. (2003) reviewed the empirical evidence and theory about the cognitive nature of heuristics for cooperation, and the role of emotion and affect in regulating such behaviors. This literature has important implications for interpreting natural history (for animals ranging from bats to hermaphrodite fish), and for predicting the effects of institutional design on patterns of human cooperation.

Honor and the Regulation of Conflict

In many societies, people value their public standing or "honor," and other individuals recognize this standing as predictive of how others will behave when threatened or exploited. Such cultures of honor have existed in many places and times, seem to arise quickly, and have enduring properties. Yet the logic of honorable strategies is poorly understood. Social strategies of this type are impossible for individuals to decide upon rationally: When individuals pay attention to the behavior of others, the distributed effects of individual actions are very complex. A good amount of speculation and induction from historical and ethno-

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graphic cases exists, but deductive analysis of these arguments has been lacking. Thus, the function and value of the attitudes that generate cultures of honor are unclear. McElreath (in press) analyzed a formal model of conflict management strategies that track and value personal honor, to explore the material incentives and community structures that might lead to and maintain them. The analyses indicate that, unlike models of public standing for regulating cooperation, simple honor-attentive strategies perform well even when information about the standing of others is poor. The results may also explain the persistence of cultures of honor in situations where the material incentives that may have led to the values arising are no longer present.

Adaptive Foundations of an Egalitarian Social Norm

One of the important problems of social rationality is to explain how a social norm will emerge from the interactions among socially rational agents who adopt their behaviors and cognitions in response to current social environments. As an illustration, we focused on the emergence of an egalitarian distributive norm widely observed in primordial societies. It has been argued that communal sharing has emerged because it is a social device reducing uncertainty that is inherent in resource acquisition, but this cannot explain how the so-called free-rider problem is solved. Through a series of evolutionary computer simulations, it was shown that communal sharing norms can emerge, and are sustained when there is asynchro-

nous uncertainty on food acquisition (Kameda, Takezawa, & Hastie, 2003). We further extended the results, and hypothesized that this environment structure may work as a cue to induce a sharing behavior: When a resource acquisition is framed as uncertain, people may tend to share such a resource with the others. This hypothesis was confirmed in different cultures under different settings (vignette and laboratory experiments in Japan and the US; Kameda, Takezawa, Tindale, & Smith, 2001). In a new project by Keller, Takezawa, and Gummerum, the sharing of resources is studied with children in the context of cooperative games.

Recognition and Group Decision Making

Reimer and Katsikopoulos (2004) studied how recognition affects group decision making, by conducting a laboratory experiment in which three individuals discussed and inferred as a group which of two cities has a larger population. First, they asked whether members who use the recognition heuristic have more, less, or equal influence in the combination of individual inferences, compared to members who do not use the heuristic. Overall, the recognition heuristic was more accurate than other cues, and users of the heuristic were more influential. For example, consider the case where one individual is partially ignorant, recognizing only city A, while two individuals recognized both cities A and B; furthermore, both more knowledgeable members inferred that B was larger. The group decided that A was larger in 59% of the comparisons. The authors found less-is-more effects in

group decision making. For example, a group that recognized only 60% of the cities was correct on 83% of the comparisons, while a group that recognized 80% of the cities was correct on 75% of the comparisons.

Consistently, the data revealed that lower recognition rates were correlated with higher levels of accuracy. It was formally shown that less-is-more effects are predicted by a range of ways of aggregating individual inferences.

How does group decision making compare to individual decision making? This question has been extensively studied with the "hidden-profile" paradigm. Consider the following situation: Two candidates, *A* and *B*, apply for a position, and a four-member committee has to select one of them. Overall, most arguments are in favor of candidate *A*. However, no single group member is aware of this because information is distributed among the committee members in a biased way, such that each group

member has more arguments in favor of candidate *B*. Are groups able to detect the hidden profile, that is, are they able to detect that there are more arguments in favor of candidate *A* overall? Experimental evidence suggests that the answer is "no"—in the present example, most groups would decide for candidate *B*. According to the most prominent explanation for this so-called hidden-profile effect, groups fail to pool and integrate all available pieces of information. However, the question of how the information should be processed by the group has been rarely asked in this literature. In several of our own simulation studies, it turned out that a group version of Take The Best very effectively identifies concealed alternatives in the hidden-profile task, thereby demonstrating that the detection of a hidden profile does not necessarily require exhaustive information processing (Reimer & Hoffrage, in press).

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Evolutionary Psychology

Evolutionary psychology lies at the heart of many research projects undertaken by the ABC research group, providing a motivation for bounded rationality, supporting the significance of the environment in ecological rationality, and emphasizing the importance of the social interactions that lead to evolutionary change in social rationality. At the same time, evolutionary psychology is grounded in ecological rationality: It assumes that our minds were designed by natural selection to solve practical problems in an efficient and effective manner. While evolutionary psychology focuses specifically on ancestral environments and practical problems with fitness consequences, ecological rationality additionally encompasses decision making in present environments without privileging problems with fitness consequences. Recently, Hoffrage and Vitouch (2002) wrote a chapter on these and other issues in evolutionary psychology for a textbook on general psychology, which is notable for being one of the first accounts of this topic in such a German textbook (see also Hoffrage, in press-a).

As Todd, Hertwig, and Hoffrage (in press) argue in a new chapter upcoming in an important handbook of evolutionary psychology, a set of broad forces operating on multiple domains can also impact on the design of specific cognitive systems. They discuss how the costs of gathering information, and of using too much information, can be reduced by decision mechanisms that rely on as little information as possible—or even a lack of information—to come to their choices. They also explore how the pressures to use small amounts of appropriate information may have produced particular patterns of forgetting in long-term memory and particular limits of capacity in short-term memory. Finally, they show how selection for being able to think about past sets of events has given us humans reasoning mechanisms best able to handle information represented as samples or frequencies of experience rather than as probabilities—another recurring theme of the ABC group’s research.

Mate Choice

One of the most evolutionarily important decisions is mate choice. By definition, sexual reproduction entails combining one’s own genes with another individual’s genes to produce offspring. Through mate choice decisions made on the basis of perceived cues, individuals can influence the quality of the genes passed on to their offspring, and the quality of the parental care their offspring will receive (see van den Broek, & Todd, 2003, for an applica-

tion of this idea to the evolution of rhythmic songs as mate quality signals; Miranda, Kirby, & Todd, 2003, for related investigations). For many species, including humans, potential mates are not encountered simultaneously, but rather sequentially. When individuals find a potential mate, they must decide whether the prospect is good enough to have offspring with. This sequential search problem can be addressed through the use of simple satisficing heuristics, which establish a threshold as-

piration level that enables the straightforward judgment of the acceptability of a given potential mate. Simão and Todd (2003) have explored ways in which this aspiration level can be set, based on the experience of the individual searching for a mate, finding that simple threshold-adjustment mechanisms can outperform complex optimizing methods in this domain, as in others. The decision mechanisms that may have evolved to help us solve adaptive problems, such as mate choice, rely on the structure of the environment to make appropriate choices, and they will not work as well when the environment is different from what they expect (i.e., constantly being confronted with images of beautiful people through mass media may skew our mate preferences in ways that lead to poorer individual choices). In modern Western societies, deciding when to get married seems like a

highly personal and individual choice. We may feel that we are considering options and weighing possibilities that nobody else has ever had to think about in the same way. Furthermore, much research has pointed out the societal and economic constraints that impact on even these personal decisions. Indeed, when viewed from the aggregate level, the distribution of the ages at which people first get married shows surprising regularity across populations, following a right-skewed bell shape (see Figure 6, showing the similarly-shaped pattern across different countries and times, despite differences in overall marriage rates that affect the maximum height of the curve). Somehow, what people are doing in the mating game at the individual level seems to be following systematic rules that generate distinct patterns at the population level. But how? And how can we find out?

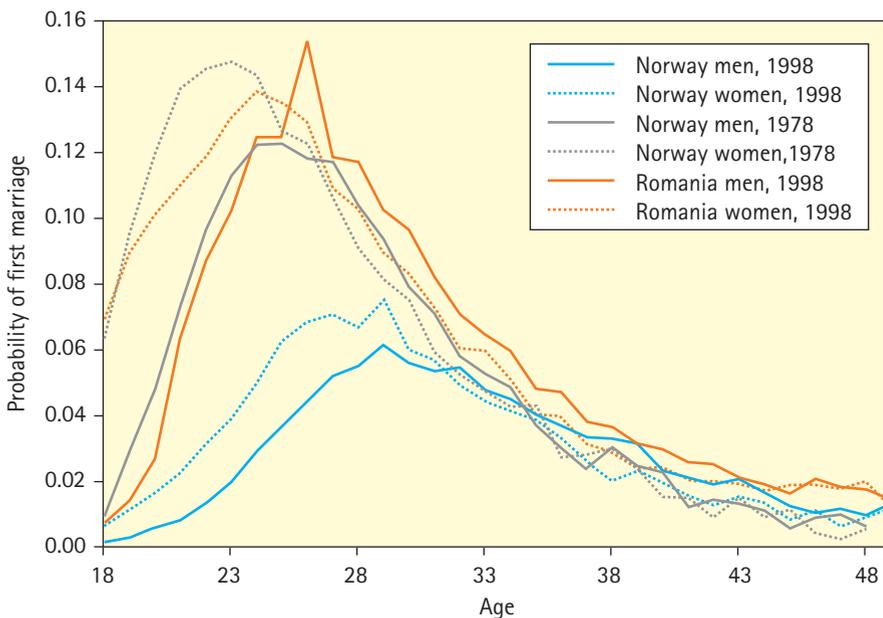


Figure 6. Hazard function for marriage (Number of first marriages of people who attain a given age x in a year by the number of still-unmarried individuals of age $x-1$ at the beginning of the year). These curves show a similar pattern across different countries and times, despite differences in overall marriage rates that affect the maximum height of the curve. Todd, Billari, & Simão (in press) demonstrate that curves like these can emerge when large numbers of simulated agents choose mates according to simple and psychologically plausible rules.

Source. Todd, Billari, & Simão, in press.

Todd, Billari, and Simão (in press) accounted for these patterns by developing agent-based models that simulate the aggregate behavior of individuals searching for marriage partners. In contrast to past models from demography and economics assuming fully rational agents with complete knowledge of the marriage market, their simulated agents use psychologically plausible simple heuristic search rules that adjust aspiration levels on the basis of a sequence of encounters with potential partners. They found that while these simple rules could indeed account for demographic-level outcomes in terms of aggregated individual behaviors, substantial individual variation had to be included in the models to account for the demographically observed age-at-marriage patterns.

This work shows that decision mechanisms not only exploit environment structure, they also initially help to create it: In this case, mate-choice mechanisms affect the population of available mates for others to choose from, which in turn can be seen in population-level measures of mating success, such as the age at which individuals mate. Studies such as this

close the loop from environment structure to evolved behavioral mechanisms, back to behaviorally influenced environment structure, further strengthening the connection that evolutionary psychology focuses on, between the mind and the world. Hutchinson and Halupka (2004) revisited the problem of sequential mate choice, introducing the realistic complication that in many species males occur in clumps. The paper first derived the optimal behavior in a simplified environment when there should be just two quality thresholds above which a male should be accepted, one when there are males left to inspect in the current patch and a lower one when inspecting new males requires moving to a patch. Optimal policies in more complex and realistic environments were derived, and their performance compared with that of the two-threshold policy and of other simple heuristics proposed in the literature. Usually the best heuristic was the simple two-threshold policy, suggesting that deriving heuristics from optima in simplified environments might sometimes be superior to more ad hoc approaches.

Methods, Metaphors, and Theory Construction

In spite of the fact that most scientists search for universal truths, scientific "truths" are contingent in important ways on the statistical and experimental tools used to discover and test them. From different starting points and based on different case studies, we converge on the same general issue in this project area, namely, the detection and understanding of the limitations and powers of scientists' tools.

Where Do Cognitive Theories Come From?

Scientific inquiry is often divided into two great domains, the context of discovery and the context of justification. Philosophers, logicians, and mathematicians claimed justification as a part of their territory and dismissed the context of discovery as none of their business, or even as "irrelevant to the logical analysis of scientific knowledge" (Popper, 1935/1959, p. 31). Discovery continues to exist in a mystical darkness where imagination and intuition reign, or so it is claimed. In earlier work, Gigerenzer (1991) argued that the mystical veil can be lifted. Specifically, new tools for data analysis (justification) can inspire new theories. This tools-to-theories thesis is twofold:

- *Generation of new theories*: The tools a scientist uses can suggest new metaphors, leading to new theoretical concepts and principles.
- *Acceptance of new theories within scientific communities*: The new theoretical concepts and assumptions are more likely to be accepted by the scientific community if the members of the community are also users of the new tools. Examples include Fisher's analysis of variance, which provided the structure for Kelley's causal attribution

theory; Neyman-Pearson's statistics, which turned into signal detection theory, multidimensional scaling turned into exemplar theories of categorization; and the digital computer, which provided the structure of Simon's mind-as-computer view (Gigerenzer, 2003). In each case, scientific practice preceded theory generation; methods of justification inspire discovery. In recent work, Sturm and Gigerenzer (in press) analyzed the implications of this work on the philosophical discussions of the discovery/justification distinction as well as on the attacks on it by Thomas Kuhn and others. If new methods inspire new theories, which in turn inspire new kinds of data, this process sets the importance of scientific practice in the foreground and provides new insights into a deep circularity in the relationship between method, theory, and data.

We Need Statistical Thinking, Not Statistical Rituals

Future historians of psychology will be puzzled by an odd ritual: the routine testing of null hypotheses, which largely eliminates statistical thinking. Textbooks and curricula almost never teach the statistical toolbox, which contains tools, such as descriptive statistics, Tukey's exploratory methods, Bayesian statistics, Neyman-Pearson's decision the-

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ory, and Wald's sequential analysis. Instead, texts tend to feature one single 3 step procedure:

The Null Ritual:

(1) Set up a statistical null hypothesis of "no mean difference" or "zero correlation." Don't specify the predictions of your research hypothesis or of any alternative substantive hypotheses.

(2) Use 5% as a convention for rejecting the null. If significant, accept your research hypothesis. Report the result as $p < .05$, $p < .01$, or $p < .001$, whichever comes next to the obtained p -value.

(3) Always perform this procedure. This procedure (also called Null Hypothesis Significance Testing, NHST) is inconsistent with every existing statistical theory, including Fisher's theory of null hypothesis testing with which it is often confused (Gigerenzer, 2004e).

Gigerenzer argued that the Null Ritual undermines the theoretical progress in psychology by giving researchers no incentive to specify their hypotheses. By focusing only on significance, researchers tend to have a blind spot for effect size, power, and other relevant properties of data—and the exclusive reliance on significance tends to foster collective illusions about what significance actually means. Gigerenzer, Krauss, and Vitouch (2004) tested whether students and teachers from six German universities understand what a p -value means. "Suppose you use a simple independent means t -test and your result is significant ($t = 2.7$, $df = 18$, $p = .01$)."

The correct answer is that this p -value is the probability of the observed data (or of more extreme data

points), given that the null hypothesis H_0 is true, defined in symbols as $p(D|H_0)$. The most frequent illusions include that the p -value specifies the probability that the null hypothesis is correct, that the alternative hypothesis is correct with 99% probability, or that if one repeated the experiment many times, a significant result would be obtained in 99% of the cases.

After successfully completing one or more statistics courses in which significance testing was taught, 100% of the students believed in at least one of these illusions ($n = 44$). But 90% of lecturers and professors of psychology ($n = 39$), and 80% (!) of statistics teachers ($n = 30$) also believed into at least one of the illusions. The ritual and its associated illusions seem to be culturally transmitted from those who teach statistics in psychology departments (who typically have no degree in statistics) to the students. Gigerenzer (in press) reviewed the attempts of statisticians, editors, and outside observers (such as the physicist Richard Feynman) to replace the existing statistical rituals by statistical thinking. Berg (2004) proposes a constructive technique for eliciting key scientific judgments from the user. The technique addresses the question of which of two theories is better supported by a given set of data, while allowing for the possibility of drawing no conclusion at all. Procedurally similar to the classical hypothesis test, the proposed No-Decision Classification technique features three, as opposed to two, mutually exclusive data classifications: reject the null, reject the alternative, and no decision. In contrast to the classical

hypothesis test, No-Decision Classification allows users to control both Type I and Type II errors by specifying desired probabilities for each. Thus, No-Decision Classification integrates judgments about the economic significance of estimated magnitudes and the shape of the loss function into a familiar procedural form.

We Need to Use the Appropriate Performance Measures

Whether a particular measure used to assess experimental data is appropriate depends on the processes that generated the data. Schooler and Shiffrin (in press) explore what happens when the measure does not match the underlying processes. Through extensive simulations, they demonstrate that such mismatches can lead to the misinterpretation of experimental results. They generated hypothetical experimental data, according to the model underlying a d' analysis (Green & Swets, 1966). There, the assumption is that each stimulus results in a single numerical value that is used as evidence. If this value exceeds a criterion, subjects respond "signal," and if it falls below this point they respond "noise." Many researchers, including some who hold to the d' model, analyze such signal detection experiments by subtracting false alarms (e.g., saying the stimulus was present, when it was not) from hits (e.g., saying the stimulus was present, when in fact it was). Such a mismatch could lead researchers to incorrectly interpret what are differences in response bias (i.e., how prone subjects are to say that a signal is present) to differences in sensitivity (i.e., the ability to

detect the signal when it is present). Moreover, when the data are sparse, a d' analysis can also lead to incorrect interpretations of data. The authors suggest analysis methods that help to remedy these problems.

The Role of Representative Design in an Ecological Approach to Cognition

Half a century ago, Egon Brunswik stressed that psychological processes are adapted to the uncertain environments in which they evolved and function. He argued that psychology's accepted methodological paradigm of systematic design was incapable of fully examining the processes of vicarious functioning and achievement. As an alternative, he proposed the method of representative design. Representative design involves randomly sampling real stimuli from the environment or creating stimuli in which environmental properties are preserved. Thus, it departs from the tradition of systematic design endorsed in research texts. Dhami, Hertwig, and Hoffrage (2004) reviewed the development of representative design, from Brunswik's original ideas, and how they were adapted and modified by neo-Brunswikians and others. In the second part of this paper, Dhami et al. focused on the research practices of those who have been committed to the notion of representative design. Two major findings emerged from the review of neo-Brunswikian policy-capturing research. First, most of the studies that presented participants with real cases satisfied Brunswik's recommendation of probability or non-probability sampling of stimuli. Sec-

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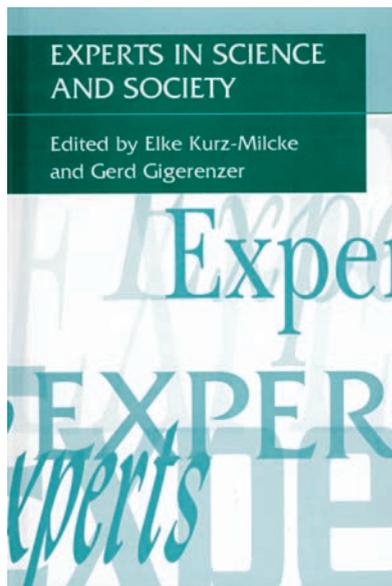
ond, there was a striking discrepancy between Brunswik's ideal and the research practices of most neo-Brunswikian studies that presented participants with hypothetical cases. Neo-Brunswikians often failed to represent important aspects of the ecology toward which their generalizations were intended.

In the third part, they discussed whether or not representative sampling matters for the results obtained. Unfortunately, only a small body of research has compared judgment policies captured under representative and unrepresentative conditions, and their results are mixed. Whereas some studies reported that representative conditions affected judgment policies, for instance, in terms of cue weights, others con-

cluded that captured policies were independent of the representativeness of the stimuli. To date, the strongest evidence for the effect of representative stimulus sampling stems from research on the overconfidence effect and on hindsight bias. With regard to the former, a recent review of studies that manipulated the sampling procedure of experimental stimuli demonstrated that representative item sampling reduces, in fact, almost eliminates, the overconfidence effect—although Hoffrage and Hertwig (in press) have shown that this not only depends on the sampling procedure but also on a factor that has most often been overlooked, namely, the size of the reference class from which the stimuli are sampled.

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Experts in Science and Society

How do experts balance their commitment to science with that to society? How does a society actually determine who counts as an expert? What makes new forms of expertise emerge? These and related questions are addressed in *Experts in Science and Society* (edited by Elke Kurz-Milcke and Gerd Gigerenzer), a book based on a Schloessmann Seminar sponsored by the Max Planck Society. One recurring focus of the book is on the cultural differences of the environment in which the expert acts—social, historical, and legal. The arguments made include that in many areas, including criminal law, expertise is not wanted, and experts are mainly called in when the scientific basis is weak; and that we will witness an emerging new profession, the philosopher as a moral coach. The topics examined include experts in the fields of politics, science, medicine, and the law.

Future Directions

A major goal for the near future is to finish our collective new book on the match between heuristics and environments, thereby highlighting the interconnection between research on bounded rationality and ecological rationality. Another goal is to explore how heuristics are shaped and shape institutions. For example, what are the legal implications of (the use of) heuristics and the way information is communicated. To this end, we continue our active collaboration with the Max Planck Institute for Research on Collective Goods in Bonn. With this institute and Max Planck Institute for Research Into Economic Systems in Jena, we are developing a proposal for an international Max Planck Research School on Bounded Rationality. In collaboration with Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, we have begun to search for neural correlates of the use and application of the recognition heuristic. We hope to expand this promising avenue of research by thoroughly grounding the heuristics we study in basic cognitive and brain processes.

Summer and Winter Institutes on Bounded Rationality

The Summer and Winter Institutes on Bounded Rationality promote a view of decision making that is anchored in the psychological possibilities of humans rather than in the fictional construct of homo economicus. The third Summer Institute in 2003, in collaboration with Pompeu Fabra University, Barcelona, and the University of Nottingham, UK, with support from the VW Stiftung, focused on applications in the law. In 2004, the fourth Summer Institute, supported by the Deutsche Forschungsgemeinschaft, was in collaboration with Max Planck Institute for Research Into Economic Systems, Jena, where the fifth Summer Institute is scheduled to be hosted in the summer of 2005. For the first time, members of the ABC group, with the support of *Der Deutsche Akademische Austausch-Dienst*, held a Winter Institute on Bounded Rationality in Psychology and Management at the Indian Institute of Management in Bangalore. Students and professors came together from across India for this two-week intensive course.



Winter Institute on Bounded Rationality in Bangalore, India.

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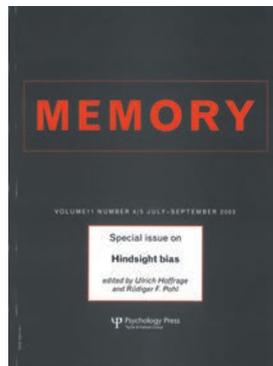
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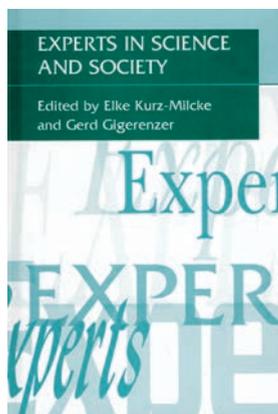
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Center for Educational Research

Contents

| | |
|---|-----|
| Introductory Overview | 77 |
| Research Area I Opportunity Structures of School and Individual Development in Adolescence and Young Adulthood | 80 |
| Research Area II Establishing a Monitoring System for Educational Performance: Foundational Studies | 91 |
| Research Area III Promoting Language Skills and Reading Literacy: Intervention Studies | 103 |
| Research Area IV Learning and Instruction: Cognitive Activation and Cognitive Tools | 117 |
| Projects of W. Edelstein, Director Emeritus | 142 |
| Publications 2003–2004 | 144 |

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Introductory Overview

The specific concern of the Center for Educational Research is the study of development and learning from the perspective of institutionalized education. Educational settings, such as schools, are conceived as providing a specific structure of opportunities and constraints for learning and development. This structure offers a variety of developmental opportunities, but, at the same time, excludes others. How do aspects of schooling affect learning within, and across, subject domains, impact on the intra- and interindividual differentiation of personality traits, and guide career-forming processes? Such questions are explored by a multidisciplinary team which includes educational scientists, psychologists, mathematicians, and sociologists. A strong theoretical focus is combined with an applied approach in the fields of system monitoring, professionalization of teaching, and improvement of learning and instruction.

Conceptual Orientation: Schooling as a Cultural Artifact and an Authentic Part of Life

The Center's research program is institutional as well as developmental in orientation. This calls for a multi-level research perspective:

- (1) With regard to the social structure of societies, formal education can be conceived as a career-forming process, even in its initial stages.
 - (2) From an institutional perspective, the focus is on facilitating and fostering cumulative learning within, and across, subject domains.
 - (3) From an individual point of view, learning development can be conceptualized as a process of inter- and intraindividual differentiation.
- The Center's research agenda is shaped by each of these perspectives.

It is a structural paradox of formal education that the experiences made available within institutions of formalized education are always vicarious—selected and prepared with the aim of facilitating learning processes which the learner must nevertheless perceive as personal and authentic.

The more educational institutions try to integrate authentic everyday experiences into their programs, the more obvious the paradox becomes. The acquisition of knowledge in educational institutions is confined by the structural properties of the institution, regardless of whether or not authentic learning is emphasized. This constitutes the difference between learning inside and outside of school-like institutions.

At the same time, however, school is a central part of the student's life, and impacts strongly on cognitive activities, beliefs, and behavior outside of school. Educational institutions command a large part of the time of children, adolescents, and young adults, and thus constitute social environments in their own right. The social rules and regulations of educational institutions not only create the conditions for systematic instruction and learning but provide the setting for immediate everyday experiences. In our research program, this effect of schooling is taken into particular consideration in longitudinal studies,

exploring individual development in terms of cognitive competencies, motivational and social resources, and value commitment.

The way in which educational institutions have structured content areas into different academic subjects determines the **high domain-specificity of knowledge acquisition**. This is taken into account in our research on the structure of knowledge—including domain-specific epistemological beliefs—acquired in school. In large-scale assessment studies, classroom studies, and experimental training studies, **we focus on domains of knowledge which represent basic cultural tools** and, as such, are critical for individual development in modern societies. **Mathematics and science education and reading comprehension** constitute main areas of research. Special emphasis is placed on the question of how cognitive activation and self-regulation can be stimulated and supported by instructional environments. In all our research on the interaction between the individual learner and the institutional educational setting, the learner is perceived as the producer of his or her own development—not only in the constructivist sense of active and idiosyncratic acquisition of knowledge but also in the sense that he or she proactively selects and shapes the developmental environment.

Summary Outline

The following summary of the Center's research program is not comprehensive. Rather, research projects have been selected to illustrate the major lines of inquiry pursued in the

Center, and provide a representative overview of the four areas of our current research.

Research Area I focuses on the relationship between the opportunity structure of schools, and the optimization of individual development in terms of cognitive competencies, motivational and social resources, value commitment, and successful transitions to university education, vocational training, and the labor market. Two longitudinal studies form the basis for this research program. The ongoing, multi-wave, multiple-cohort study **Learning Processes, Educational Careers, and Psychosocial Development in Adolescence and Young Adulthood (BIJU)** was initiated in 1991 with a sample of more than 5,000 13-year-olds. Data from six measurement points are now available for the main cohort. The longitudinal **Transformation of the Upper Secondary School System and Academic Careers (TOSCA)** study started in 2002; a second measurement took place in 2004. The homework project, which uses data from multiple sources (e.g., BIJU, PISA), establishes a link between Research Areas I and II.

Research Area II comprises projects representing the first steps toward the establishment of a national monitoring system to gauge the performance of the German school system. These foundational studies combine basic research and system monitoring in an international comparative perspective. The major project in this research area is the OECD's **Programme for International Student Assessment (PISA)**. In addition to international coopera-

tion, the project has intensified collaboration between researchers at different universities and institutes within Germany. At our Institute, our involvement in the PISA study has prompted the development of a closely associated research program that underpins the methodology of the PISA study and supplements its findings. This program includes studies designed to investigate the role of test motivation and coaching, the validity of the translations used in international comparisons, and theoretical dimensions of reading literacy. Furthermore, the Center has played a leading role in developing and evaluating measures for the assessment of self-regulated learning. These measures have now become an integral component of the international PISA project. The large-scale assessments have also been used to demonstrate how the evaluation of comprehensive school reform measures can be combined with national reference data. The research questions being addressed within **Research Area III** draw on a key finding of PISA 2000. In Germany, at least 25% of the upcoming generation represent a potential at-risk group as far as reading literacy is concerned. Most of the projects in this Research Area have been designed to investigate, from the theoretical and empirical perspectives, the functional mechanisms underlying intervention programs aiming to foster metamemory and learning strategies in the domain of reading comprehension. The studies are experimental or quasi-experimental in design. They include an investigation of an experimental training program based on the recip-

rocal learning approach, a study of a training program targeting metamemory and reading strategies within the family context, and an examination of the role of phonological awareness in the language development of bilingual children. Finally, the **Jacobs Summer Camp Project** investigates the role of implicit and explicit language learning, with a particular focus on proficiency in school-related academic language.

Research Area IV consists of projects on learning and instruction with an experimental or quasi-experimental approach. Most of these studies address research questions that have emerged directly from the first and second areas of research. They are conducted either in the laboratory (**ENTERPRISE**) or as longitudinal studies in school environments with a strong emphasis on teacher expertise (**COACTIV**). In the field of mathematics education, the Center closely collaborates with the Center for Adaptive Behavior and Cognition. Building on a strong theoretical background, these studies have practical implications for the optimization of classroom instruction and teacher training.

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Research Area I

Opportunity Structures of School and Individual Development in Adolescence and Young Adulthood

Educational Institutions as Developmental Environments

The successful development of human beings across the entire life span is dependent both on their individual internal characteristics and on external socializers, such as significant others and social institutions. The relative importance of internal and external promoters varies across the life span and between areas of individual functioning. While parents play a dominant role in their children's development during infancy, childhood, and early adolescence, for example, their influence decreases during adolescence and often ceases entirely in adulthood. The social institution of the school also plays a major role during childhood and adolescence, particularly in the domain of academic learning and, more generally, cognitive development. Furthermore, schools have an impact on the formation or development of motivation, emotions, attitudes, and other personal characteristics.

Given its theoretical focus on institutional influences on human development, the research conducted at the Center for Educational Research entails longitudinal, multilevel stud-

ies that collect data at school, class, and individual levels, cover more than one knowledge domain, and allow both intraindividual change across domains and interindividual

The BIJU Study—Aims and Data Collection

BIJU has four guiding components:

- (1) providing institutional and individual baseline data on the integration of the East and West German educational systems; since 1991;
- (2) analyzing domain-specific learning as a function of personal resources and institutional opportunity structures;
- (3) analyzing long-term trajectories of psychosocial development in adolescence and young adulthood;
- (4) analyzing ways of coping with the transition from school to vocational training or university.

Data collection began with a survey of the main cohort (longitudinal cohort 1) in the 1991/92 school year (see Figure 1). Data was gathered from 7th graders at three measurement points. The first point of measurement coincided with the transformation of the unitary school system of the former East Germany to the tracked system adopted from West Germany. The fourth wave of data collection was conducted in Spring 1995, when the main cohort students were in the final grade of lower secondary school. The fifth wave took place in Spring 1997, when participants were either in vocational education or in the academic track of upper secondary level. The sixth wave of data collection was conducted in 2001, and focused on how students had mastered the transition from school to university or from vocational education to the labor market.

The sample of school classes comprises some 8,000 students from 212 secondary schools of all types in the states of Berlin, Mecklenburg-West Pomerania, North Rhine-Westphalia, and Saxony-Anhalt. In Spring 1993, the sample was supplemented by a second longitudinal cohort of 1,330 students in the final grade of lower secondary schooling. In order to provide a baseline for an East-West comparison at the end of lower secondary education, a separate cross-sectional study of approximately 1,600 10th graders was also carried out. This study concentrated on issues of political socialization, and the transition to vocational training and working life.

www.biju.mpg.de

differences in patterns of intraindividual change to be investigated. The two flagship studies in Research Area I, *Learning Processes, Educational Careers, and Psychosocial Development in Adolescence and Young Adulthood* (BIJU), and *Transformation of the Secondary School System and Academic Careers* (TOSCA) were designed to investigate the effects of learning contexts in high-school and college environments on human development, bearing in mind the requirements of multilevel longitudinal designs. Recently, the TOSCA and BIJU studies have been supplemented by a set of studies allowing in-depth analyses of the effects of homework assignments and homework completion on academic achievement. In the following, some current research from BIJU, TOSCA, and the homework project is presented in more detail.

Opportunity Structures and the Development of Self-Concept and Interest in Upper Secondary Schools

In recent years, ample evidence has been accumulated to confirm that motivational components, such as self-concept and interest, are powerful predictors of students' achievement and achievement-related behavior. Moreover, several studies have shown how factors at the person level and features of the learning environment impact on a student's motivation to learn. The longitudinal BIJU study (see Figure 1 for an overview of the research design) provides an excellent opportunity to examine the dynamic interplay between self-concept, interest, and achievement (e.g., Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). The wealth of information that has been compiled on educational opportunity structures within the BIJU study also permits in-depth analyses of how composition and context factors in-

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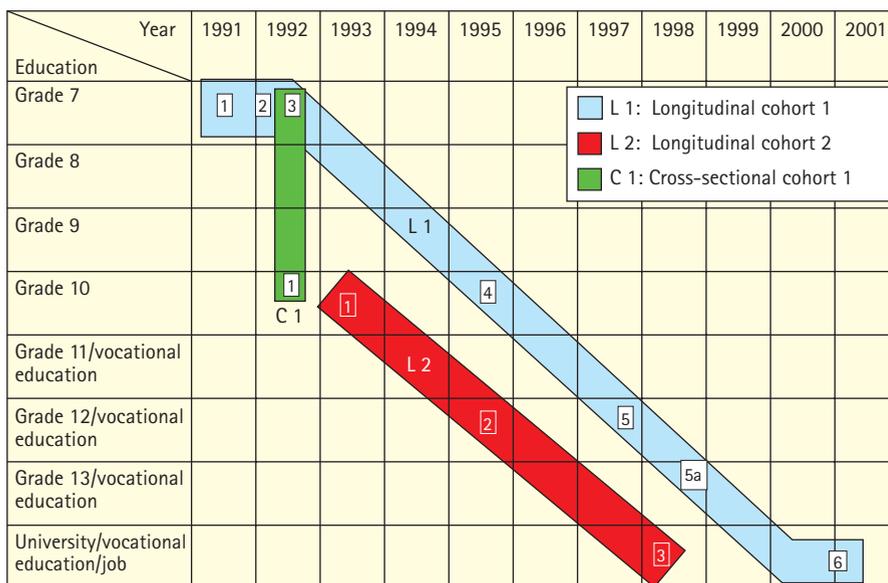


Figure 1. Research design of the BIJU project.

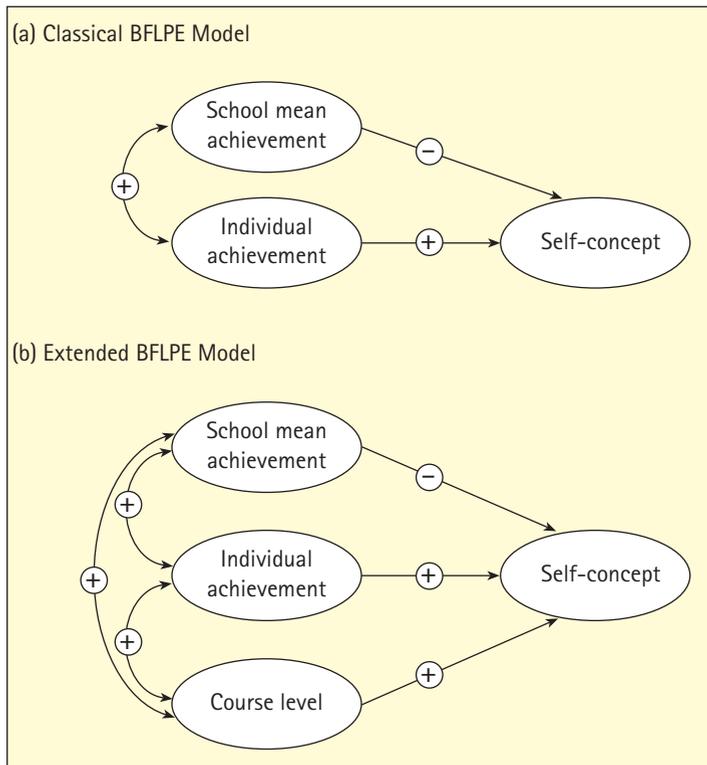


Figure 2. The Big-Fish-Little-Pond Effect (BFLPE).

fluence human development (e.g., Baumert, Trautwein, & Artelt, 2003; Nagy, Trautwein, Köller, Baumert, & Garrett, in press; also see Lüdtke, Köller, Marsh, & Trautwein, in press). For example, a series of analyses has been conducted with the BIJU data to investigate the influence of the mean performance level of a class on the self-concept of the individual members of that class (e.g., Köller, 2004a; Marsh, Köller, & Baumert, 2001; Marsh & Köller, 2004). These and many other studies illustrate that a person's self-concept of ability is heavily influenced by the achievement of others in his or her immediate environment, and less so by his or her objective standing. This phenomenon is now commonly held to result from a "frame of reference

effect." Individuals tend to construct their frames of reference from the people close to them. Very often, the frame of reference is simply the physical environment: classmates, members of the same athletic club, people who work in the same institution.

In education, frame of reference effects result in students developing comparably low self-concepts in high-achieving groups and comparably high self-concepts in low-achieving groups. Herbert Marsh has coined the term "Big-Fish-Little-Pond Effect" (BFLPE) to describe the finding that students in high-achieving groups develop lower self-concepts than equally proficient students in low-achieving environments. The classical BFLPE model is illustrated in Figure 2(a). According to the BFLPE, students' self-concepts are strongly influenced by the act of comparing or *contrasting* their own performance with that of their classmates. For this reason, researchers have also used the term *contrast effect* to describe the negative path coefficient from school-average achievement to students' self-concepts.

In recent years, however, educational researchers have begun to ask whether the contrast effect really does tell the whole story. Does membership of a high-status group not have any positive effects at all? Is there no "basking in reflected glory" or "assimilation" effect of being placed in a high-achieving group? In other words, might self-concept in fact be enhanced by membership of groups that are positively valued by the individual? This kind of assimilation effect might counterbalance the

negative effects experienced by students in academically selective classes who use their classmates as a basis of comparison. Thus, a (negative) contrast or social comparison effect (e.g., "A lot of students are better than I am, so I can't be as good as I thought") might compete with a (positive) assimilation effect (e.g., "I must be smart because I am in a selective course")—this phenomenon is illustrated in Figure 2(b). To date, very little empirical support has been found for assimilation effects, though studies of the phenomenon have been rather sparse. We investigated possible assimilation effects in the last two years of Gymnasium schooling (Trautwein, Köller, Lüdtke, & Baumert, in press) by capitalizing on a specific feature of upper secondary education in Germany: the differentiation between basic and advanced courses. Course selection is an integral part of the last two years (grades 12 and 13) of the Gymnasium, the most academically competitive college-bound track in Germany, with students selecting two (and only two)

advanced courses in addition to their core classes. Thus, in contrast to the US, for example, even students who perform well across the board are forced to specialize. Although certain restrictions apply, students can choose from a wide range of subjects. Importantly, poor prior achievement does not preclude enrollment in a specific subject although, in practice, high achievement is a major predictor of course selection. Advanced courses differ from basic courses in several ways. They involve five lesson hours per week, compared to two lesson hours for basic courses; they cover more material and do so on a more challenging level. Once enrolled in an advanced course, students find themselves in a new "pond" of students "specializing" in that subject. This leads to a higher overall level of achievement in advanced courses than in basic courses. Given the contrast effect typically found in high-achieving settings, one might expect a student's self-concept in a subject to decline when he or she embarks on

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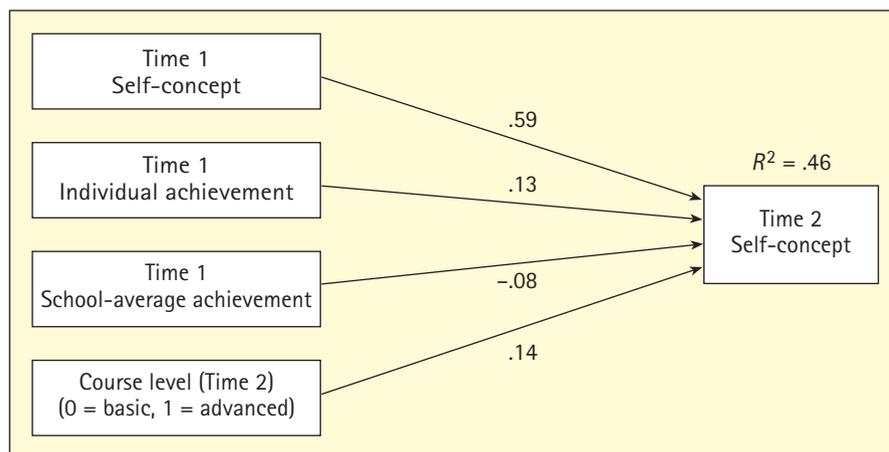


Figure 3. Regressing grade12 self-concept on four predictors: Results of multilevel modeling.

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an advanced course in that subject. At the same time, however, given the high general level of achievement in advanced courses, attending a course of this type might have positive effects on the student's self-concept in that subject. Moreover, course selection is a part of identity formation. Seen from the perspective of well-being and psychological growth, it makes sense to "self-enhance" in areas that play an important role in one's life.

We used data from the fourth and fifth waves of the BIJU study to examine the effects of advanced math course selection on math self-concept. The key results of a set of multilevel regression analyses are shown in Figure 3. A student's math self-concept in grade 12 was strongly predicted by his or her math self-concept two years earlier. Grade 10 math achievement also impacted positively on grade 12 math self-concept. Most importantly, we found a *negative* effect of school-average math achievement on math self-concept (the typical BFLPE) as well as a *positive* effect of course level on math self-concept, indicating that assimilation effects are also in operation.

This pattern of results illustrates the powerful effects of educational opportunity structures on the development of student motivation. For the development of student motivation to be fully understood, in-depth analyses of the student environment—including institutional structures and educational practices—are essential.

Opportunity Structures and the Transition From School to Work or University

Like the BIJU study, the TOSCA project addresses both educational and psychological research questions. From the educational perspective, TOSCA examines the opportunity structures open to students from different backgrounds, the educational standards attained in German upper secondary schools, and the comparability of the school-leaving qualifications awarded across Germany. It also attempts, on the basis of multiple measures and assessments, to predict the academic choices that students from different backgrounds are likely to make. From the psychological perspective, a strong focus of the TOSCA study is on self-selection versus socialization processes during the transition from school to work or university. Among other constructs, we examine personal goals, academic and nonacademic self-concepts, vocational interests, and personality.

Social Background

The extent to which differences in students' backgrounds impact on their academic outcomes varies from one school system to the next. The findings of the PISA study, for example, show that there is a link between social background and performance in all participating countries, but that nowhere is this relationship as strong as it is in Germany. One reason for this is the strict ability grouping of the German three-tier secondary school system, and the fact that students' chances of attending the most attractive school type (Gymnasium) hinge on

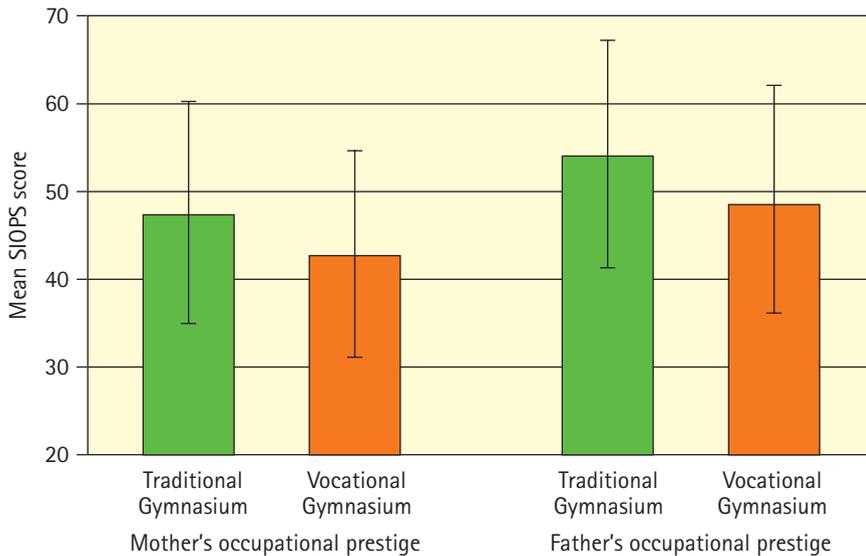


Figure 4. Parents' occupational prestige by type of Gymnasium school (means and standard deviations).

their social background. In recent decades, efforts have been made to weaken the link between student backgrounds and academic outcomes in Germany by establishing comprehensive schools and vocational Gymnasium schools (Chang, 2005; Köller, Baumert, Cortina, Trautwein, & Watermann, 2004; Köller, Watermann, Trautwein, & Lüdtke, 2004a). One of the stated goals of vocational Gymnasium schools was to open up alternative routes to higher education for talented students from less privileged backgrounds who had not transferred to a traditional Gymnasium immediately after primary school. How successful have vocational Gymnasium schools been in these attempts? In TOSCA, parents' occupations were coded on the Standard International Occupational Prestige Scale (SIOPS), thus providing an insight into students' social backgrounds. As shown in Figure 4, significant differences were found between the parents of students

enrolled in vocational and traditional Gymnasium schools (Maaz, Nagy, Trautwein, Watermann, & Köller (2004). Whereas the mean occupational prestige score for the fathers of students at traditional Gymnasium schools was $M = 54.31$ ($SD = 12.95$), the mean score for fathers of students at vocational Gymnasium schools was $M = 48.85$ (see Figure 4). A similar pattern emerged for the mothers.

Marked differences were also observed in the parents' educational qualifications. Overall, the parents had a high level of education, but significant differences were again discerned according to the type of Gymnasium school attended by their children. 44% of students at traditional Gymnasium schools reported that at least one of their parents was a university graduate. The corresponding figure for students at vocational Gymnasium schools was only half the size, at 24%. These results confirm that vocational Gymnasium schools do, to a certain

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Data Collection in TOSCA

At Time 1, the TOSCA project encompassed a representative sample of 4,730 students in their last year of upper secondary education (aged about 17-19 years) sampled between March and May 2002. All students were attending either traditional Gymnasium schools or one of the five forms of vocational Gymnasium school that have been established in the state of Baden-Wuerttemberg. More than 60% of these students consented to be recontacted for follow-up studies. The second wave of data collection took place from February to May 2004. A total of 2,316 students participated in this follow-up; most of them had since gone on to higher education.

Measures used in TOSCA focus on academic achievement variables (e.g., TIMSS tests, TOEFL scores) and cognitive abilities (indicators of IQ). Additional instruments include student self-reports on motivation and personal goals, academic and nonacademic self-concept, interests, and family background. Finally, the students' school and family context was further investigated using teacher, head teacher, and parent questionnaires.

extent, attract students who are not the "typical" clientele of the traditional Gymnasium in terms of their parents' educational levels or occupational prestige. Vocational Gymnasium schools are thus contributing to increased heterogeneity of student backgrounds in the group of school leavers qualifying for higher education.

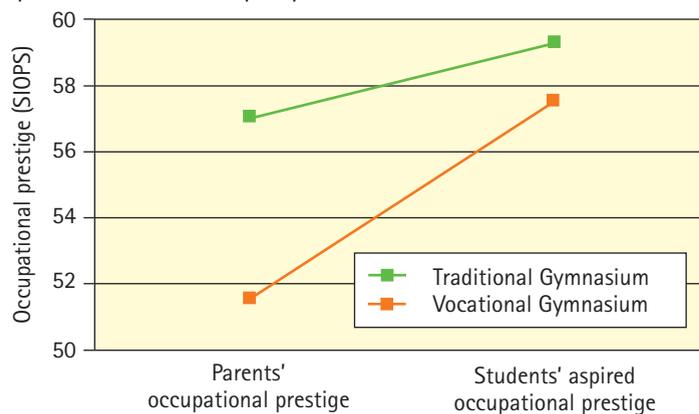
Given that the vocational Gymnasium is indeed offering students from less privileged homes access to university entrance qualifications, it is interesting to explore how students exploit these new opportunities. In other words, how do students' social backgrounds and the type of Gymnasium attended relate to the prestige of their long-term career goals? This question is approached from two perspectives:

(1) We explore whether any differences in the prestige of respondents' long-term career aspirations can be discerned as a function of the type of Gymnasium attended. (2) Respondents' long-term career goals are compared with their parents' occupational prestige to obtain a measure of *aspired social mobility* (difference between the two prestige scores). The aspired social mobility of the school leavers is then set in relation to the type of Gymnasium attended.

First, inspection of the mean prestige scores of the students' career goals shows that students at traditional Gymnasium schools (see Figure 5) aspire to jobs with higher mean occupational prestige than do their peers at vocational Gymnasium schools. If students at vocational

Gymnasium schools prove to come from lower socioeconomic status groups than their peers at traditional Gymnasium schools, this weak effect of the type of

Figure 5. Aspired social mobility by type of Gymnasium attended.



Gymnasium might indicate that differences in social background that already exist at entry to upper secondary schooling are perpetuated in students' career aspirations. For any conclusions about the reproduction of social inequality or differences in social mobility to be drawn, parents' occupations must also be taken into account. We define students' *aspired social mobility* to be the difference between the prestige scores of their long-term career aspirations and the prestige scores of their parents' occupations. We are particularly interested in any differences in aspired social mobility that can be discerned as a function of the type of Gymnasium attended. The mean occupational prestige of the careers aspired to by students at traditional Gymnasium schools is $M = 2.31$ points ($p < .001$) higher than the prestige of their parents' careers (more specifically, of their mother's or father's career, depending on which scores higher on the prestige scale). On average, the aspired social mobility scores of students at vocational Gymnasium schools exceed those of their peers at traditional Gymnasium schools by $b = 3.45$ ($p < .001$). Hence, students at vocational Gymnasium schools aspire to jobs scoring an average of 5.76 points higher on the prestige scale than their parents' jobs. This finding in itself could be interpreted as an indication of upward social mobility. It is also interesting to examine parents' occupational prestige scores as a function of the type of Gymnasium that their children attend. Parents of students in vocational Gymnasium schools score $b = -5.02$ points ($p < .001$) lower on this scale than par-

ents of students in traditional Gymnasium schools. The difference in the prestige scores of the careers aspired to by the students is much smaller, at just $b = -1.57$ points ($p < .001$), consistent with the differences observed in aspired social mobility (see Figure 5). Given that marked differences in social background characteristics were ascertained at the beginning of upper secondary schooling, these results indicate that vocational Gymnasium schools serve to reduce inequality. Figure 5 shows the social background, occupational prestige of the long-term career goal, and aspired social mobility of the two student groups. Further analyses will investigate the role of different occupational fields and university courses for the occupational prestige attained by the TOSCA respondents over time.

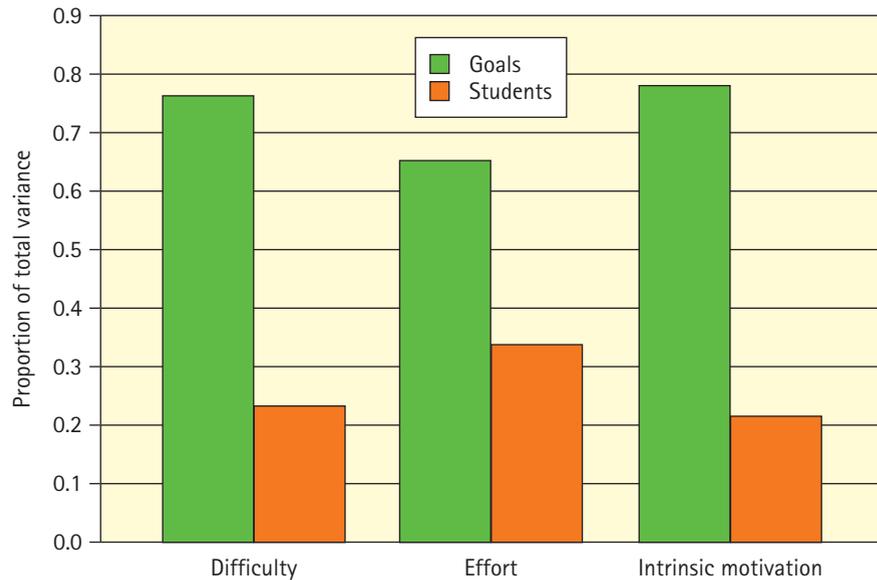
Personal Goals of Students at Gymnasium Schools

One of the central psychological components of the TOSCA study involves the in-depth investigation of students' personal goals. Two methods were applied. First, students were asked to rate their agreement with a list of goals ("To be rich and famous. How important is this goal to you?") presented in a questionnaire (Klusmann, Trautwein, & Lüdtke, 2005). Second, students were asked to name six goals they planned to pursue in the coming months and years (Lüdtke, in press). In the next step, they were asked to rate these goals on various dimensions; for example, how difficult it would be to achieve each goal, and why they wished to pursue it (e.g., self- vs. other-determined goals).

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Figure 6. Personal goal ratings: Variance at the goal and the student level.



Here, it is interesting to explore whether an individual rates all of his or her goals in the same kind of way. Do individuals rate all their goals to be similarly difficult, for example, or do they simultaneously pursue goals of varying difficulty levels? Do people pursue some goals for other-determined reasons (e.g., because their parents and friends expect it of them) and others for self-determined reasons? When addressing this question, it is important to remember that personal goals have a multilevel structure analogous to that familiar from school research: Goals are nested within individuals in the same way as students are nested within schools. In a multilevel analysis (HLM), we thus split the variance in goal ratings into two components: variance *between* individuals (i.e., at the student level) and variance *within* individuals (i.e., at the goal level). It emerged that most (between 65% and 78%) of the variance was within individuals. The results of the variance components

analysis for three selected goal attributes are documented in Figure 6. What are the implications of these findings for research on personal goals? In terms of *content*, it can be argued that there are significant differences in respondents' ratings at the goal level. These differences are neglected when data are aggregated at the person level, as is very often the case in research on personal goals. It is thus important to explore whether, and to what extent, these differences at the goal level constitute theoretically relevant variance that is related to key outcome measures. From a *psychometric* perspective, though, it is important to note that, even with large differences in goal ratings, satisfactory reliabilities for aggregated person scores can be attained by means of the *aggregation principle* provided that data are aggregated over a sufficiently large number of goals. The conclusion to be drawn is that future research involving personal goal ratings should provide a breakdown of variance.

Learning Opportunities Provided by Homework

Our work on the effects of homework assignments and homework completion originated from analyses conducted within the BIJU study (e.g., Trautwein, Köller, Schmitz, & Baumert, 2002; Trautwein & Köller, 2002), and has become an additional field of interest within Research Area I that forges a strong link to Research Area II. The homework project draws on data sets from different sources, such as PISA 2000, PISA 2003, and a study conducted in collaboration with the University of Fribourg, Switzerland.

From a conceptual and methodological point of view, homework research calls for a multilevel perspective (Trautwein & Köller, 2003b) in which the effects of homework assignments (teacher variables) and of homework completion (student variables) are separated. Trautwein and Köller (2003e) have proposed a multilevel homework model as a general framework for homework research. According to this model, students' homework behavior impacts on their achievement, whereby effort and the use of learning strategies are predicted to be more important than the time spent on homework. Moreover, in line with the predictions of expectancy-value theory, as described in the work of Jacquelynne Eccles, homework behavior is believed to be heavily influenced by motivational predictors (e.g., belief in being able to solve homework problems, perceived utility of homework problems). The effects of cognitive abilities and personality as well as the impact of the family context and parental behavior are seen

as (partially) mediated by motivational predictors. Likewise, effects of the instructional environment (e.g., homework quality and control) are expected to be partially mediated by homework motivation.

Among the questions addressed by the homework project, several are of great practical interest to teachers, students, and their parents (e.g., Trautwein & Köller, 2003e; Trautwein & Kropf, 2004). For instance, do homework assignments improve student achievement? Our studies (e.g., Trautwein, Köller, Schmitz, & Baumert, 2002) indicate that frequent homework assignments in 7th-grade mathematics are positively associated with achievement gains on the class level, but that long time-consuming assignments do not show positive effects. Focusing on individual students within the same classroom, those who put a lot of effort into their mathematics homework (but do not necessarily report long study times) fare better than those who invest less effort. In contrast to common beliefs, homework control by teachers and parents is only loosely connected to the effort invested in homework.

A second question of great practical relevance is whether—as some teachers claim—students' homework behavior is largely dependent on stable personality characteristics of the students and less so on the characteristics of a specific academic subject or the quality of homework. Our results only partially support this view. On the one hand, there is indeed a substantial significant correlation between students' homework behavior across domains. On the other hand, the strength of this cor-

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Some results of the Homework Study as featured by the German daily paper *die tageszeitung*, December 1, 2004.

die tageszeitung

Annoying Parents

Anyone who has ever been to school knows that homework is a pain. But now there is scientific evidence to confirm that homework is particularly annoying **when Mom (or even Dad) sits down uninvited at the table**, offering help and motivation. Educational scientist Ulrich Trautwein has investigated the **educational value of homework** and identified the main motivational problems facing young people. These include the interference of overly concerned parents—and the time that homework takes. **The longer kids spend at home puzzling over math problems, the less fun they have**—and the less they learn. But **teachers also make mistakes** when setting homework. Instead of giving students **individualized assignments**, they expect their charges to continue **drilling what has been learned in the lesson, mechanically applying set routines**. So is homework pointless? No, says

Trautwein, researcher at the Max Planck Institute, with homework it's a case of "no pain, no gain." It's just important to realize that, in this case, pain does not mean the amount of time spent on homework, but "the effort made to do it properly."

NERVIGE ELTERN
Dass Hausaufgaben ätzend sind, weiß jeder Schüler. Nun ist aber wissenschaftlich nachgewiesen, wann die Heimarbeit besonders nervt – wenn Mama (oder gar Papa) sich ungefragt mit an den Tisch setzt, um zu helfen und zu motivieren. Der Bildungsforscher Ulrich Trautwein hat den **pädagogischen Wert von Hausaufgaben** untersucht und dabei die wichtigsten motivationalen Probleme für Jugendliche identifiziert: Die **fürsorgliche Belagerung durch die Eltern** gehört dazu. Und der Zeitaufwand für Hausaufgaben. **Je länger die Kids zu Hause an Mathe knobeln, desto weniger Spaß haben sie – und desto geringer sind die Lerneffekte. Aber auch die Lehrer machen Fehler.**

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Trautwein, U. & Köller, O. (2002). Der Einfluss von Hausaufgaben im Englisch-Unterricht auf die Leistungsentwicklung und das Fachinteresse. *Empirische Pädagogik, 16*, 285–310.

relation leaves room for factors other than stable personality characteristics as well. Data from more than 80 classrooms with French as a second language (joint project with the University of Fribourg) revealed teacher effects on both homework motivation and homework effort.

Students' perceptions of homework quality have a significant impact on their homework motivation (expectancy and value) which is, in turn, associated with a higher percentage of homework tasks completed (e.g., Trautwein & Köller, 2003e).

Research Area II

Establishing a Monitoring System for Educational Performance: Foundational Studies

Germany is one of the few industrial states which has only recently begun to establish a national system of quality control to monitor the outcomes of educational processes. The Center for Educational Research's involvement in large-scale assessments and studies on associated methodological and content-related topics is an integral part of this process of establishing a monitoring system for educational performance in Germany. The country's participation in TIMSS and PISA has provided reliable data on the performance of selected cohorts of students in curricular and cross-curricular domains (Stanat & Lüdtke, in press). After conducting the first cycle of the PISA study in 2000, the Center handed over responsibility for future large-scale assessments, particularly the second wave of PISA (PISA 2003), to the Leibniz Institute for Science Education at the University of Kiel.

The Programme for International Student Assessment (PISA)

In 1997, the OECD launched a program to monitor the outcomes of education systems in terms of student achievement, and to provide internationally comparable indicators of performance in key domains on a regular basis. All 16 of the German states are participating in PISA. The Center for Educational Research headed the consortium responsible for the management of PISA 2000 in Germany. The Center is also involved in the 2003 assessment, using it mainly as a vehicle for research.

PISA is designed to provide information on the outcomes of school systems in the participating countries. The project assesses the knowledge, skills, and competencies of 15-year-old students in reading, mathematics, and science as well as in cross-curricular domains. Because the assessments take place on a regular basis, with three-year cycles, the study presents a tool for monitoring changes in the performance of coun-

tries' education systems and for gauging the effects of measures taken to improve learning outcomes. PISA allows for in-depth analyses of the outcomes of educational systems within and across the participating countries. The project is designed to yield three types of indicators:

- Profiles of the knowledge and skills acquired by students approaching the end of compulsory education in curricular and cross-curricular domains. These profiles pinpoint the strengths and weaknesses of educational systems and locate areas requiring action.
- Contextual indicators relating performance to student and school characteristics. Information on these relationships can shed light on the effectiveness of educational systems and draw attention to possible points of intervention.
- Trend indicators showing how results change over time.

Data collection for the first cycle of PISA took place in the year 2000, and a total of nine reports were sub-

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Wolfgang Schneider (University of Würzburg),
Klaus-Jürgen Tillmann (University of Bielefeld),
Manfred Weiß (German Institute for International Educational Research)

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sequently published by the PISA 2000 consortium as well as members of the Center. The second cycle of PISA was conducted in 2003, with the first report being published in 2004 (Prenzel et al, 2004). Based on theoretical approaches from psychology, sociology, and education, the Center for Educational Research has systematically extended the international design of the project, allowing us to explore basic research questions from multi-

ple perspectives with representative samples of students (see Table 1). In addition to the three curricular domains of reading literacy, mathematical literacy, and science literacy, the research design covers cross-curricular competencies. The Center played a leading role in establishing (Baumert et al., 1998; Artelt et al., 2000) and evaluating (Artelt, Baumert, Julius-McElvany, & Peschar, 2003) a framework for a self-report measure to assess cross-

Table 1
Some national supplements to the international PISA design for analyses of knowledge structures and their determinants

| Reading | Mathematics | Science | Cross-curricular competencies | Student background |
|--|---|--|--|--|
| <ul style="list-style-type: none"> Assessment of learning from texts as a component of reading literacy distinct from working with texts Assessment of proximal antecedents of text comprehension to identify possible points for intervention | <ul style="list-style-type: none"> Fine-grained differentiation and description of competency classes Addition of a broader range of items assessing aspects of mathematical literacy not covered by the international test Ratings of items based on a theory of cognitive demands Identification of effects of curricular and didactical traditions on knowledge structures | <ul style="list-style-type: none"> More comprehensive assessment of understanding of scientific concepts to test the distinction between concept and process components of scientific literacy Identification and description of competency levels Differentiation of five cognitive competencies defined in terms of processes in working out science problems | <ul style="list-style-type: none"> Assessment of general problem-solving skills and validation of the construct Assessment of aspects of social competence Exploration of the role schools play in the development of cross-curricular competencies | <ul style="list-style-type: none"> Assessment of mental ability as a control variable for estimating effects of individual-level and school-level factors Assessment of additional indicators for students' social background More differentiated assessment of families' migration history Assessment of peer-group characteristics |

curricular competencies, particularly affective constructs related to self-regulated learning. The implementation of the scales developed (Baumert et al., 1998) was optional for the countries participating in PISA 2000, but has become a permanent component of future PISA cycles and of other large-scale assessments.

Reading Literacy

Each cycle of the international PISA program focuses on one of the three assessment domains. In the first cycle, this major domain was reading. The international framework for the assessment of reading literacy is largely based on a structural model developed by Kirsch and Mosenthal (1998), which strongly influenced both the US National Assessment of Educational Progress (NAEP) and the OECD's International Adult Literacy Study (IALS). For the purposes of reporting, three scales were constructed, summarizing students' performance in retrieving information, in interpreting texts, and in reflecting and evaluating.

The PISA reading assessment covers a broad range of text types. In addition to continuous texts, which are typically organized in sentences and paragraphs (narratives, etc.), it also includes noncontinuous texts, such as graphs, tables, and forms, that present information in a variety of different ways. Thus, PISA adopts a relatively broad notion of what constitutes a text. In-depth analyses of both the international reading literacy tests and the German extension assessments (of learning from texts and additional proximal antecedents, see Table 1) are presented in a thematic

report on the structure, development, and teaching of reading literacy, edited by Schiefele, Artelt, Schneider, and Stanat (2004).

Mathematical Literacy

Mathematical literacy was a minor domain in the first survey cycle, but became the major domain of the 2003 assessment. The international PISA framework for the assessment of mathematical literacy is strongly influenced by the "realistic mathematics" approach introduced by Hans Freudenthal. The approach starts with the assumption that mathematical concepts and ideas have primarily been developed as tools for grasping and structuring phenomena of the physical, social, and mental world. In line with this assumption, the international PISA test consists mainly of items that require students to apply their knowledge and skills in authentic situations. Moreover, the composition of the test reflects the idea that problems involving modeling and application present the best indicators for mathematical understanding. The "realistic mathematics" approach reflects current ideas on constructivist teaching and situated learning that are quite popular in research on instruction. Detailed analyses of the international test conception as well as the German extension assessments (see Table 1) have been published in a thematic report examining mathematical literacy among students in Germany (Neubrand, 2004).

Scientific Literacy

Scientific literacy was also a minor component of the first PISA cycle. It

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Schiefele, U., Artelt, C., Schneider, W., & Stanat, P. (Eds.). (2004). *Struktur, Entwicklung und Förderung von Lesekompetenz: Vertiefende Analysen im Rahmen von PISA 2000*. Wiesbaden: VS Verlag für Sozialwissenschaften.



Neubrand, M. (Ed.). (2004). *Mathematische Kompetenzen von Schülerinnen und Schülern in Deutschland*. Wiesbaden: VS Verlag für Sozialwissenschaften.



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Baumert, J., Stanat, P., & Watermann, R. (Eds.) (in prep.). *Herkunftsbedingte Disparitäten im Bildungswesen: Differenzielle Bildungsprozesse und Probleme der Verteilungsgerechtigkeit*. Wiesbaden: VS Verlag für Sozialwissenschaften.

will be the major domain of the third cycle, which will take place in 2006. In line with the Anglo-American notion of scientific literacy, as described in documents, such as the Benchmarks for Science Literacy published by the American Association for the Advancement of Science, the international PISA framework emphasizes process skills. It defines processes as "mental (and sometimes physical) actions used in conceiving, obtaining, interpreting, and using evidence or data to gain knowledge or understanding" (OECD, 1999, p. 61) and distinguishes five such processes: (1) recognizing scientifically investigable questions, (2) identifying evidence needed in a scientific investigation, (3) drawing or evaluating conclusions, (4) communicating valid conclusions, and (5) demonstrating the understanding of scientific concepts. Although some scientific knowledge is needed for all five processes, only the fifth primarily focuses on this particular aspect of scientific literacy. In other words, the understanding of scientific concepts is not intended to be the main challenge posed by the items designed to assess the first four of the processes covered in the international PISA test.

The scientific framework was supplemented by items (see Table 1) that allowed for further differentiation of cognitive competencies, also in terms of the curricular domains of chemistry, biology, and physics. An overview of the international and national test conceptions and the main results is provided in a thematic report on science education in Germany, published by Rost, Prenzel, Carstensen, Senkbeil, and Groß (2004).

Besides the relatively low performance of German students in the 2000 PISA assessment, other aspects of the results sparked widespread debate. While there is a link between social background and achievement in all PISA countries, nowhere is this relationship as strong as it is in Germany. PISA covers a broad range of student background indicators. A thematic report provides in-depth analyses of the role of student background, in terms of both socioeconomic status and migration background.

In response to the PISA results, the Center has established a new Research Area (see Research Area III) to analyze effective ways of improving reading and language comprehension, focusing particularly on the needs of students from migration backgrounds and families with low socioeconomic status.

In the following, we outline key findings on the topics of school-effectiveness, reading literacy, and cross-curricular competencies, and present three analyses of methodological research questions in the area of large-scale assessment.

School-Effectiveness Research in the Context of Large-Scale Assessments

Using the instruments developed within large-scale assessment projects, our Center has carried out several studies to evaluate innovative school programs. These studies demonstrate how system monitoring and research on whole-school reform—two traditions that, for a long time, were considered to be largely incompatible—can be linked. Building on an investigation of five com-

prehensive schools in the Land of Hesse using instruments from TIMSS and BIJU (Köller & Trautwein, 2003c), we performed an extensive evaluation of the *Laborschule Bielefeld*. The *Laborschule* is one of the most interesting and controversial schools in Germany, having implemented substantial structural changes. It is a comprehensive school that aims at attracting a heterogeneous student body, adopts an experience-oriented approach to teaching and learning, and gives learning reports instead of grades as performance feedback. Due to its strong emphasis on developing the skills and orientations necessary to function as an autonomous citizen, moreover, the school tries to provide an environment that functions like a small society and gives students the opportunity to experience being part of a democratic system. We explored the extent to which this kind of set-up can succeed in meeting the school's stated goals in the domains of personality development and civic education as well as learning goals in the curricular domains of reading, mathematics, and science. The findings indicate that the school is indeed very effective in developing students' competencies, interests, and attitudes in political and social domains. In terms of curricular achievement, however, the picture is mixed. In reading and science, the students at the *Laborschule* reached levels of proficiency that one would expect them to reach on the basis of their background (value-added analyses). In mathematics, however, they clearly lagged behind comparable peers in other schools. This pattern of findings suggests that the

structural changes implemented by the *Laborschule*, some of which are quite similar to Scandinavian school systems, cannot necessarily be expected to result in improved performance. Instead, the crucial factor seems to be quality of instruction, which is apparently higher in some domains of the *Laborschule* than in others.

Reading: Comparison of Performance on Narrative and Nonnarrative Texts

In Germany, the PISA results also prompted a discussion on the adequacy of the reading literacy assessments implemented in the study. It was speculated that the relatively high proportion of noncontinuous texts and the low proportion of continuous narratives might have resulted in German students' performance being underestimated, given that German curricula/standards traditionally pay relatively little attention to noncontinuous texts and—especially in higher grades—concentrate on literature rather than on other text genres.

As a first step, we tested whether these two dimensions could be distinguished. Previous research has shown that there are good reasons for distinguishing narratives from other text genres, particularly those that include graphs and pictures, when it comes to reading and text comprehension (Schnotz & Dudtke, 2004). Dimensionality analysis of the reading items confirms that reading literacy can be differentiated along these dimensions. Of the 129 reading items that were administered in PISA 2000, 17 items referred to 4 narrative texts, 70 items to other

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types of continuous texts, and the remaining 42 items to noncontinuous texts, like maps, graphs, etc. The task demands of the different text genres proved to differ. As expected, the lowest correlations among the three factors were found between narratives and noncontinuous texts (Artelt & Schlagmüller, 2004). Comparison of mean student performance on the three separate reading literacy factors (narratives, other continuous texts, and noncon-

tinuous texts) shows that, overall, German students did not do better on narrative texts, but in fact performed relatively worse on these tests than on the other text types. Table 2 lists means and standard errors for the three reading factors broken down by countries. Note that, due to the study design, the country means of countries with special education schools are overestimated. Because the test booklets for special education students did not cover all

Table 2
Mean student performance on the three reading factors (narrative texts, continuous texts, noncontinuous texts) by country

| Narrative texts | | | Continuous texts | | | Noncontinuous texts | | |
|------------------------------|------------|------------|------------------------------|------------|------------|------------------------------|------------|------------|
| Country | Mean | SE | Country | Mean | SE | Country | Mean | SE |
| Finland | 540 | 2.6 | Finland | 558 | 3.2 | Finland | 558 | 2.6 |
| Canada | 529 | 1.9 | Canada | 537 | 1.9 | New Zealand | 545 | 3.0 |
| Korea | 526 | 3.1 | Korea | 534 | 2.7 | Australia | 545 | 3.6 |
| Ireland | 521 | 3.8 | Australia | 533 | 3.9 | Canada | 540 | 1.9 |
| New Zealand | 520 | 3.2 | Japan | 531 | 5.6 | Ireland | 537 | 3.9 |
| Norway | 518 | 3.7 | New Zealand | 531 | 3.5 | United Kingdom | 537 | 2.5 |
| United Kingdom | 516 | 3.0 | Ireland | 528 | 3.9 | Sweden | 529 | 2.9 |
| Australia | 513 | 4.0 | Sweden | 524 | 2.5 | Korea | 525 | 2.9 |
| Sweden | 511 | 2.7 | United Kingdom | 519 | 3.0 | Belgium ¹ | 525 | 3.5 |
| Iceland | 509 | 2.5 | Belgium ¹ | 517 | 3.6 | Japan | 522 | 5.7 |
| Austria | 509 | 3.2 | Iceland | 515 | 2.0 | Norway | 520 | 3.5 |
| Japan | 505 | 4.3 | Austria | 513 | 3.2 | France | 518 | 3.1 |
| Hungary ¹ | 505 | 4.2 | Norway | 507 | 3.5 | Iceland | 515 | 2.5 |
| Czech. Republic ¹ | 502 | 2.6 | United States | 507 | 7.1 | Denmark | 512 | 3.0 |
| OECD Mean | 499 | 0.8 | OECD Mean | 506 | 0.7 | United States | 510 | 6.8 |
| Belgium ¹ | 497 | 3.6 | France | 502 | 3.4 | OECD Mean | 508 | 0.8 |
| United States | 497 | 7.6 | Switzerland | 502 | 4.8 | Czech. Republic ¹ | 507 | 2.9 |
| Portugal | 496 | 4.9 | Denmark | 501 | 3.2 | Austria | 505 | 2.8 |
| Russ. Federation | 492 | 4.2 | Germany¹ | 499 | 3.0 | Germany¹ | 500 | 2.7 |
| Spain | 488 | 3.4 | Italy | 495 | 3.3 | Spain | 498 | 3.4 |
| Germany¹ | 485 | 3.6 | Czech. Republic ¹ | 495 | 3.0 | Switzerland | 497 | 4.7 |
| Greece | 485 | 5.0 | Spain | 494 | 2.8 | Hungary ¹ | 490 | 4.7 |
| Denmark | 483 | 3.0 | Hungary ¹ | 487 | 4.4 | Italy | 486 | 3.5 |
| France | 483 | 3.4 | Greece | 482 | 6.3 | Portugal | 466 | 5.1 |
| Italy | 477 | 3.2 | Portugal | 472 | 4.8 | Russ. Federation | 458 | 4.7 |
| Switzerland | 475 | 4.4 | Latvia | 463 | 5.6 | Greece | 458 | 5.4 |
| Latvia | 472 | 5.5 | Russ. Federation | 461 | 4.6 | Latvia | 456 | 5.4 |
| Luxembourg | 445 | 3.0 | Luxembourg | 443 | 2.3 | Luxembourg | 447 | 2.3 |
| Mexico | 435 | 3.5 | Mexico | 427 | 3.8 | Mexico | 406 | 4.3 |
| Brazil | 416 | 3.5 | Brazil | 396 | 3.5 | Brazil | 369 | 4.0 |

¹ Without students from special education schools.

Countries marked in grey: Not statistically different from the OECD mean. SE = Standard error.

three factors, these students had to be excluded from this analysis, resulting in reduction of 4% of the age cohort in Germany (and an overestimation of the combined reading literacy scale of about 10 points). Some countries, including the Russian Federation, Brazil, Portugal, and Hungary, score higher on the narratives factor than on the combined reading literacy scale. Germany is among the 17 countries that score lower on the narratives factor than on the combined reading literacy scale (Artelt & Schlagmüller, 2004). What are the implications of these findings? For one thing, it is clear that the low coverage of narrative texts in the PISA test does not mean that the overall performance of 15-year-olds in Germany is underestimated. Given that narratives and literature are a major focus of German language arts classes, the findings also indicate that the approach taken in German schools does not seem to help students to interpret narratives and literature.

Assessment of Cross-Curricular Competencies

Our Center has contributed substantially to the development of large-scale assessments by drawing up a framework for the assessment of cross-curricular competencies and developing a brief self-report measure of affective constructs, covering processes relevant to lifelong and self-regulated learning.

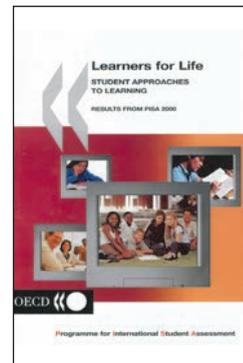
What is the Rationale for Assessment Cross-Curricular Competencies Within Large-Scale Assessments?
PISA is the first international assessment study that goes beyond the

measurement of knowledge and skills in curricular domains and attempts to capture so-called cross-curricular competencies that can be applied in a broad range of situations. This approach follows the general idea that the goals of formal education are not restricted to maximizing curriculum-based knowledge. The approach taken to measure affective constructs related to self-regulated learning is based on Boekaerts' (1997) model of self-regulated learning, which assigns equal status to the cognitive and motivational components of learning. Boekaerts defines self-regulated learning as a complex interactive process involving motivational as well as cognitive self-regulation. Ideally, at the end of their school career, students should have acquired not only competencies in school subjects but also the ability to evaluate whether their approaches to learning are effective, and to gauge their own levels of interest, motivation, and proficiency. Motivation is vitally important for young people leaving school. Similarly, the capacity to evaluate one's own effectiveness and learning strategies is relevant for working life as well as for leisure activities. A positive self-concept, finally, helps individuals to overcome barriers in such activities.

By analyzing students' approaches to learning, namely their motivation, their use of learning strategies, and their academic self-concepts, PISA focuses on central prerequisites for effective self-regulation and lifelong learning. Given that almost no affective scales have been used in former large-scale assessments, the evalua-

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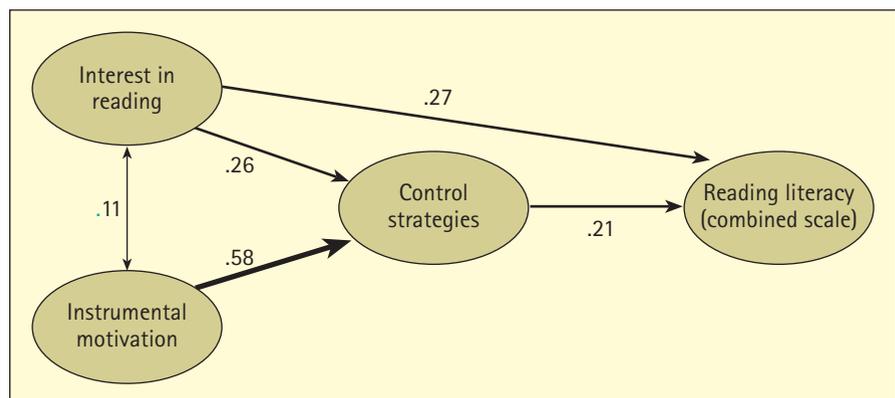


tion of scale equivalence across nations had to be analyzed systematically. As could be shown with multi-group structural equation models as well as comparisons of model fits within each country, the factor structure of the scale does hold (Artelt et al, 2003; Marsh et al., submitted).

The data obtained from the 26 countries that participated in the assessment of affective constructs offer a variety of opportunities to address basic research questions. For example, we investigated the invariance of structural (functional) relations between intrinsic and extrinsic motivation, and students' use of learning strategies as well as their performance on the reading literacy tests across countries. Although intrinsic and extrinsic motivation are often seen as antagonists, both might be important in the regulation of actual learning behavior. Indeed, both are part of the task value component of Eccles' expectancy-value model of achievement-related behavior (Wigfield & Eccles, 2000). In most countries, extrinsic and intrinsic motivation to learn proved to vary independently of each other, and it is

only in a few countries that students who express an interest in reading also seem to be motivated to study because they think it will improve their career prospects. It seems that, in general, the two types of motivation are by no means antagonistic. It was assumed that motivation determines the decision to become engaged in a task and that strategies are the tools used to actually accomplish a task. Indeed, in all countries, students' motivation to learn—especially their instrumental motivation—has a profound impact on their use of control strategies. In addition, this mediation model lends strong support to the hypothesis that students will only control their learning if they are well motivated. Since control of the learning process (like motivation to learn) is, to some extent, an outcome in its own right, helping students to become lifelong learners, this finding is important. It suggests that in all countries, adopting an effective learning strategy depends not just on having cognitive tools (knowing how to learn) but also on having certain attitudes and dispositions (wanting to learn). Figure 1 summarizes these results,

Figure 1. Illustration of the functional relationships (SEM, county average) between motivation, control strategies, and reading literacy.



presenting average path coefficients across countries.

What are the effects of interest in reading and instrumental motivation on reading performance? Interest in reading has a particularly strong link with performance, which is largely independent of the fact that good readers are more likely to adopt certain strategies. On the other hand, students motivated by external factors like getting a good job perform better only where they have other strengths, such as controlling their learning. Students who take a self-evaluative perspective to learning, that is, make frequent use of control strategies, tend to far outperform their peers. The effect of instrumental motivation on performance in the reading literacy assessment can thus primarily be considered a mediated effect (Artelt, in press).

Thus, even where it proves hard to engender a strong love of learning for its own sake among students who have not had this message reinforced in their home and social environment, the evidence shows that students driven by factors, such as job prospects, are more likely to set and monitor learning goals and therefore give themselves a better chance of performing well.

Although there are differences between the 26 participating countries, the picture to emerge from the findings is relatively consistent across the countries. Within the individual educational systems, students who have acquired the prerequisites for self-regulated learning in terms of motivation and learning strategies are at a relative advantage in developing academic competencies. Both intrinsic and extrinsic forms of moti-

vation play an important role in the learning process, although possibly via different mechanisms.

Validity of Large-Scale Assessments

A second focus of research at the Center for Educational Research is concerned with the methodological aspects of large-scale assessment. Research findings related to the following three questions are presented below:

- (1) How do different incentives affect test motivation, effort, and performance on the PISA assessment?
- (2) Is students' performance on a low-stakes test sensitive to coaching?
- (3) Are PISA test scores comparable across countries?

(1) How do Different Incentives Affect Test Motivation, Effort, and Performance on the PISA Assessment?

Large-scale assessments like PISA are often low-stakes tests. In other words, performance on the test has no direct consequences for the students themselves. Given also that neither high-stakes nor low-stakes assessments are very common among German students, we were interested in whether different incentives would affect students' motivation or test performance. We conducted an experiment to test the effects of different types of test motivation on student performance, investigating the impact of (1) social incentives associated with participation in an international study, (2) informational feedback on performance, (3) grades, and (4) performance-contingent financial rewards.

Key References

Brunner, M., Artelt, C., Krauss, S., & Baumert, J. (submitted). Coaching for the PISA test.

Baumert, J., & Demmrich, A. (2001). Test motivation in the assessment of student skills: The effects of incentives on motivation and performance. *European Journal of Psychology of Education, 16*, 441–462.

The findings suggest that all of these conditions make various components of test motivation equally salient. Accordingly, no differences were found with respect to either intended and invested effort or test performance (Baumert & Demmrich, 2001).

(2) Is Students' Performance on a Low-Stakes Test Sensitive to Coaching?

Coaching is known to improve student performance on tests with high personal relevance (high-stakes tests). To our knowledge, however, there is no research on whether coaching prescribed by outside agents (low-stakes situations) produces similar effects to coaching programs that students elect to join in order to boost their test scores and hence enhance their future prospects (high-stakes situations). We thus explored whether student performance on the reading and mathematics tests of the PISA assessment can be fostered by coaching (and administering a pretest). More specifically, we explored the

potential effects of authentic coaching by a class teacher, and thus investigated the effects of coaching activities that might actually have been implemented by the teachers of students participating in PISA 2003. Coaching and pretest effects were studied for each content domain separately in a pre-/posttest quasi-experimental design. To examine the differential effects of academic tracks, samples were drawn from German Hauptschule and Gymnasium schools (a total of 1,323 students from 66 classes). Teachers prepared their students for the PISA assessment during regular lessons in the week between the pre- and posttest based on the insights they had gleaned from the published frameworks, the released test items, and the mathematics and reading literacy chapters of the German PISA 2000 report. Results show that only the combined effects of pretesting and coaching have substantial positive effects on student performance. The incremental effects of coaching and pretesting in high-stakes tests are slightly

Table 3
Means and standard deviations at pre- and posttest and effect size of differences broken down by subject, school type, and treatment condition

| | | | Pretest | Posttest | |
|---------------------|-------------|----------------------|------------------------|------------------------|----------|
| Treatment condition | | | <i>M</i> (<i>SD</i>) | <i>M</i> (<i>SD</i>) | <i>d</i> |
| Reading | Hauptschule | Coaching and pretest | 426 (81) | 422 (93) | -.04 |
| | | Pretest | 431 (75) | 417 (84) | -.17 |
| | Gymnasium | Coaching and pretest | 565 (59) | 577 (89) | .18* |
| | | Pretest | 566 (67) | 557 (91) | -.13 |
| Mathematics | Hauptschule | Coaching and pretest | 429 (59) | 438 (69) | .16* |
| | | Pretest | 445 (54) | 457 (69) | .20 |
| | Gymnasium | Coaching and pretest | 539 (63) | 563 (68) | .36* |
| | | Pretest | 562 (64) | 568 (62) | .11 |

higher, but comparable to the effects found in the present study (aggregated across academic tracks). Thus, the personal relevance of the test results seems to play a minor role (see also Baumert & Demmrich, 2001). Coaching in a classroom setting (e.g., for PISA) can be almost as effective as professional coaching programs (e.g., for the SAT). In line with the research literature on high-stakes tests, the effects observed are higher in mathematics than in the reading domain (Brunner, Artelt, Krauss, & Baumert, submitted).

(3) Are PISA Test Scores Comparable Across Countries? Language Background of Items as a Systematic Source of Variance

The possibility that students are at an advantage when working on reading literacy items from their own cultural and linguistic background in an international large-scale assessment can be seen as a threat to the fairness of a test. Effects of this kind have been reported quite frequently in the assessment literature (Allalouf, 2003; Gierl & Khaliq, 2001). The relative difficulty of items often shifts when they are administered in different countries, due to either translation issues or differential opportunities to learn. The international PISA reading literacy assessment consists of test material (texts) from eight different source languages.

An IRT-based analysis of differential item functioning (DIF) was performed for the PISA reading literacy items to investigate whether students of equal ability, but from different language groups, have a sys-

tematic advantage when processing items originating from their own cultural and linguistic background. Effects of this kind were discerned, especially items originating from France ($d = .21$) and Greece but also for German items. Translated to the PISA scale ($M = 500, SD = 100$)—and assuming that these effects generalize—the effect size of .21 indicates that French students would score 21 points higher if the test consisted of items originating from French-speaking countries only. Given that only a few items from non-English-speaking countries were contained in the PISA assessment, this phenomenon does not significantly affect the mean performance of these countries, as a reanalysis of student performance on a test without the biased items shows.

But does this mean that students from English-speaking countries are at an advantage? Since the majority of items stem from English-speaking countries, these effects were modeled by rescaling rather than DIF

Key Reference

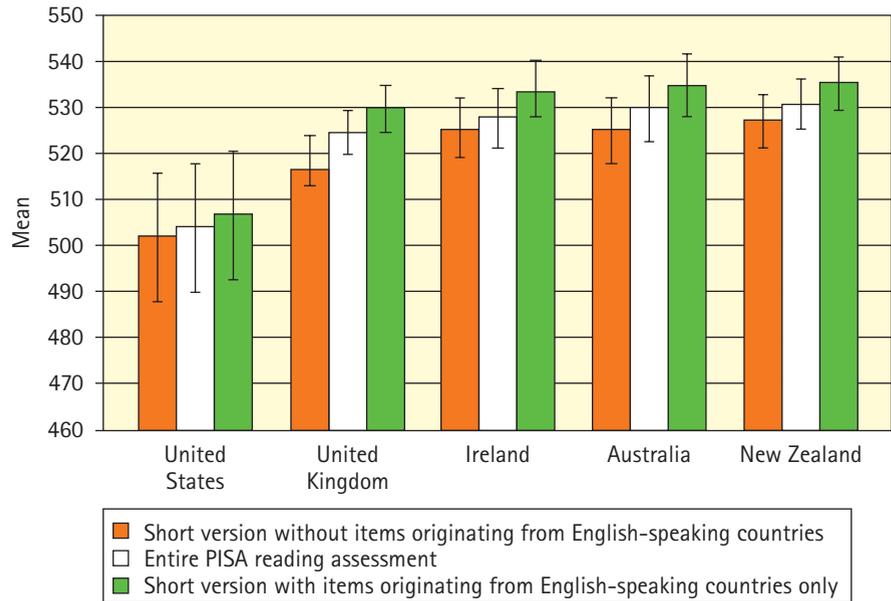
Artelt, C., & Baumert, J. (2004). Zur Vergleichbarkeit von Schülerleistungen bei Leseaufgaben unterschiedlichen sprachlichen Ursprungs. *Zeitschrift für Pädagogische Psychologie*, 18 (3/4), 171–185.

Table 4
Absolute numbers and relative proportions of items from the PISA reading literacy assessment by source language

| Source language | Absolute number | Relative proportion (in %) |
|------------------------|-----------------|----------------------------|
| English | 66 | 51 |
| Finnish | 11 | 8 |
| French | 18 | 14 |
| German | 5 | 4 |
| Greek | 3 | 2 |
| Spanish | 4 | 3 |
| Swedish | 6 | 5 |
| Danish | 1 | 1 |
| IEA items ¹ | 16 | 12 |
| Total | 129 | 100 |

¹ These items were taken from the *International Adult Literacy Study* initiated by the *International Association for the Evaluation of Educational Achievement* (IEA).

Figure 2. Country means for five English speaking countries in the overall reading test and two short versions, consisting either only of items originated from English speaking countries or all items but those from English speaking countries.



Error indicator: Standard error ($\pm 2 SE$).

analysis. We rescaled the achievement scores of students from English-speaking countries for the set of items originating from English-speaking countries only as well as for the set of all other items. The relative advantages discerned for students in the English-speaking countries are far less pronounced (see Figure 2) than would be expected based on the results for the items originating from French-speaking countries.

The fact that most items stem from the Anglo-American background does not mean that students in the five English-speaking countries perform significantly better than their peers elsewhere. Rescaling achievement scores for the set of items originating from English-speaking countries only does not lead to significant differences relative to results on the entire assessment, and it

is only in the United Kingdom that scores on the set of items from English-speaking countries are significantly higher than those on the set of items from non-English-speaking countries.

Overall, results confirm that the source language of the items implemented in international student surveys can be regarded as a systematic source of variance. The cultural bias that may result can be addressed—as was done in PISA 2000—by administering a balanced multi-cultural mix of test items (Artelt & Baumert, 2004).

Research Area III Promoting Language Skills and Reading Literacy: Intervention Studies

Partly in response to results from the *Programme for International Student Assessment (PISA)* that is part of Research Area II within the Center for Educational Research, we launched a series of intervention studies on approaches to promoting students' language skills and reading literacy. National and international analyses of the PISA data revealed that students in Germany perform below the OECD average in reading literacy and that this relative disadvantage is particularly pronounced among students at the lower end of the achievement distribution (Schiefele, Artelt, Schneider, & Stanat, 2004). Almost 25% of the 15-year-olds in Germany failed to reach proficiency level II as defined in PISA and are therefore likely to encounter problems in making the transition from school to work. In addition, the relationship between reading literacy and family background was found to be quite strong within the German school system. Poor readers are highly over-represented among students from families with lower socioeconomic status and among students from immigrant families (Baumert, Stanat, & Watermann, in press; Schümer, Tillmann, & Weiß, 2004). Similarly, there are pronounced differences between students from families with higher and lower socioeconomic status in terms of other important learner characteristics, such as interest in reading, self-efficacy beliefs, and the frequency with which students use learning strategies (Artelt, Baumert, McElvany, & Peschar, 2003). This pattern of results indicates that, overall, Germany seems to be less successful than other countries in helping students with different backgrounds reach acceptable levels of achievement in central domains.

As a consequence of these findings, a new research program has been initiated at the Center for Educational Research that aims at developing and evaluating measures designed to help students acquire proficiency in German language skills and reading literacy. Building on the theoretical framework of PISA, the program focuses on basic competencies representing prerequisites for learning in most domains. Taking into account that, to a large extent, success within the German school system hinges on the transition from elementary to lower secondary school, the studies are targeted primarily at students who have not yet

made this transition. Thus, Research Area III explores the development of central foundations for school success in the domains of language and reading. This complements the ENTERPRISE project within Research Area IV, which analyzes similar foundations in mathematics and science. The new line of research involves four ongoing projects and one completed study. The investigations aim at developing and evaluating approaches to promoting language and literacy skills within the contexts of schools, families, and summer programs. Two of the studies attempt to specify dimensions of second-language acquisition that present spe-

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Key Reference

Schiefele, U., Artelt, C., Schneider, W., & Stanat, P. (Eds.). (2004). *Struktur, Entwicklung und Förderung von Lesekompetenz: Vertiefende Analysen im Rahmen von PISA 2000*. Wiesbaden: VS Verlag für Sozialwissenschaften.



Key References

Baumert, J., Stanat, P., & Watermann, R. (in press). *Herkunftsbedingte Disparitäten im Bildungswesen: Differenzielle Bildungsprozesse und Probleme der Verteilungsgerechtigkeit*. Wiesbaden: VS Verlag für Sozialwissenschaften.

Schümer, G., Tillmann, K.-J., & Weiß, M. (Eds.). (2004). *Die Institution Schule und die Lebenswelt der Schüler: Vertiefende Analysen der PISA-2000-Daten zum Kontext von Schülerleistungen*. Wiesbaden: VS Verlag für Sozialwissenschaften.



Figure 1. Father and daughter participating in the parent-child reading program.

cific hurdles for immigrant students' school success and should thus be targeted by interventions. The other three projects explore the effectiveness of programs designed to promote language and literacy skills for students with, and without, migration backgrounds. Experimental and quasi-experimental designs with multiple outcome measures and longitudinal components are employed in all of the studies. After a short overview of the five projects, two of these investigations will be presented in more detail.

Promoting Language Skills and Reading Literacy: Overview of the Projects

The *Reciprocal Teaching and Learning Project* aims at identifying the mechanisms underlying a training program developed by Palincsar and Brown (1984) to improve students' use of strategies in reading and text comprehension. The *Reciprocal Teaching and Learning Program* has been shown to have large effects in a number of studies, yet the processes responsible for these influences have not been specified. In our study, the different components of

the program were systematically varied in the context of an experimental design. The goal was to gauge the separate and combined effects of central elements of the training program, such as teaching students declarative knowledge about strategies, instructing them to monitor comprehension processes, and having them assume different roles in the teaching and learning process. The study explored the impact of these components on the application of reading and comprehension strategies and on reading achievement (Demmrich, 2005). The theoretical background and results of this investigation will be described more fully below.

The *Family and the Acquisition of Reading Literacy Project* was inspired by findings from PISA and other large-scale assessment studies revealing that the relationship between reading achievement and family background is particularly pronounced in Germany. It examines the development and promotion of reading literacy in the context of the family. The study has two main goals. First, based on longitudinal assessments in 33 elementary school classes during the 4th grade and directly after the summer break, it examines the extent to which the development of student achievement is determined by specific characteristics of the family, such as cultural capital. Second, within a quasi-experimental design, the study explores whether a newly developed parent-child reading program (McElvany, Artelt, & Holler, 2004) succeeds in improving the application of learning strategies and reading literacy. The reading program is



based on work by Vygotsky and on models of metamemory development. Outcome measures were assessed with reading tests, participant surveys, and comprehensive video documentations of the parent-child reading sessions. With this evaluation design, it is possible to determine the effects of the intervention in terms of multiple criteria (McElvany, in prep.).

The next three projects focus on central dimensions in the acquisition of German as a second language among elementary school students with migration backgrounds. A doctoral dissertation carried out within the context of the LIFE Research School, and supervised in collaboration with Hans Merkens from the Free University of Berlin, examines whether the same component processes are involved in beginning reading skills for native and nonnative speakers of German in the 2nd and 3rd grades (Limbird, in prep.).

The study, entitled *Phonological Processing, Verbal Abilities, and Literacy Development Among Bilingual Turkish Children in Germany*, focuses on the role of phonological awareness, which has been shown to be one of the strongest predictors of literacy acquisition (see, e.g., Chiappe, Siegel, Gottardo, & Stanovich, 1994). Over 200 2nd-grade children were investigated over two years with regard to their phonological awareness, vocabulary, short-term verbal memory, and performance on various tasks assessing reading skills. Children who reported speaking Turkish at home made up the largest immigrant group, and were thus tested in both Turkish and German to determine the extent to which they could

be considered bilingual. Based on literature relating language background to phonological processing skills, it was expected that bilingual children would perform better on such tasks than their monolingual peers. Initial analyses indicate that Turkish bilingual children do, in fact, show a somewhat enhanced capacity to perceive some types of phonological stimuli, while monolingual children have far stronger skills in tasks measuring vocabulary. In addition, it was found that a well-established model of literacy acquisition (Näslund & Schneider, 1991) fits both groups. As expected, phonological awareness proved to be a significantly more important predictor of reading for the monolingual children than for the bilingual children. At the same time, however, the proportion of variance in reading achievement explained by the model was considerably lower for the bilingual children than for the monolingual German speakers. This indicates that existing models of reading, which have mostly been developed with monolingual children in mind, do not sufficiently capture literacy development in multilingual situations, and may have to be extended by factors specifically relevant to second-language learners, such as more refined measures of syntactic development.

Another doctoral dissertation carried out within the LIFE Research School program (Müller, in prep.) explores the distinction between proficiency in general everyday language and in school-related academic language among second-language learners. Several authors have argued that this distinction is important for un-

In collaboration
with Hans Merkens
(Free University of
Berlin)

In collaboration with Jacobs Foundation, Zurich, Senator for Education and Science of the Free Hanseatic City of Bremen, Heidi Rösch (Technical University of Berlin)

derstanding and promoting immigrant students' school success (Cummins, 2002; Gogolin, 2004). They suggest that it is particularly difficult for second-language learners to attain proficiency in the language used in academic contexts at school, even when these students are able to communicate fluently in everyday situations. However, this assumption has not yet been tested empirically. Similarly, neither the theoretical arguments nor the empirical evidence that have been put forward to support the validity of the distinction between the two dimensions of language proficiency are satisfactory. The *Everyday Communication Skills and School-Related Language Proficiency of Second-Language Learners Project* aims at verifying the assumption that these aspects can, in fact, be differentiated, and that the performance gap between native and nonnative speakers of German is more pronounced for school-related language than for everyday language. In addition, an attempt is made to identify the core characteristics underlying this pattern. The study starts from the assumption that the two dimensions of language proficiency differ in terms of various attributes, such as the complexity of vocabulary and syntax or the degree of contextualization. These characteristics will be varied systematically in a series of videotaped dialogues in order to disentangle their effects on students' listening comprehension. The stimuli will include various school-related and everyday contexts. Contrary to Cummins' supposition that a lack of contextualization constitutes the main hurdle for second-language

learners in mastering the academic dimension of language, we expect to find that the effects of this factor will disappear when complexity of vocabulary and grammar are controlled.

The distinction between language proficiency in everyday and school-related contexts among second-language learners is also considered in the *Jacobs Summer Camp Project*, which is funded by the Jacobs Foundation and conducted in close cooperation with the Senator for Education and Science of the Free Hanseatic City of Bremen. Using the literature on summer setback and summer learning as a starting point, the study examines the learning trajectories of students with different family backgrounds over the summer vacation. It explores the extent to which immigrant students speaking German as a second language experience particularly pronounced learning losses during the break, and whether such losses can be compensated by a targeted summer camp program. Most importantly, the study aims at evaluating the effectiveness of implicit and explicit approaches to helping students with immigration backgrounds improve their German language skills. The Jacobs Summer Camp Project will be described in more detail below.

Reciprocal Teaching and Learning

As a consequence of the PISA study, which showed knowledge and effective use of reading strategies to be important predictors of reading literacy, Anke Demmrich (2005) evaluated the Reciprocal Teaching Program by Palincsar and Brown (1984) in her doctoral thesis. This program

aims at teaching students a number of specific reading comprehension strategies. The reciprocal teaching method has been used with students of different ages (from elementary school children to adolescents and even college students), students showing good and moderate levels of reading ability, but also students with comprehension problems or learning disabilities. The program has almost always been shown to improve reading comprehension, with large learning gains being observed. Reciprocal teaching is a particularly interesting approach because it tends to have considerable positive effects on reading comprehension. In a meta-analysis by Rosenshine and Meister (1994), for example, an average effect size of .88 was found. At the same time, however, little research has been conducted on the mechanisms causing these improvements in reading comprehension, or on the features of the program that are necessary for the learning gains to occur. Therefore, an experimental study was designed to address this research gap. It was assumed that reciprocal teaching helps students to acquire metacognitive knowledge and metacognitive skills, leading to a more efficient, goal-oriented and—by way of practice—partly automatic use of strategies. By being taught when, why, and how to use strategies (conditional strategy knowledge) and by practicing these strategies repeatedly, students acquire declarative knowledge about the strategies (specific strategy knowledge) and about the conditions of their use. During training, they also have ample opportunity to experience the utility of the different

strategies through repeated practice and frequent feedback from their peers and teacher. Thus, the reciprocal teaching procedure is in line with the model of mature metamemory proposed by Borowski, Milstead, and Hale (1988), and with the way these authors assume that metacognitive knowledge is acquired.

To determine which features of the strategy training program cause its pronounced effects, an experimental study was set up in which the tasks and responsibilities assumed by the participating children were varied systematically. As described by Palinscar and Brown (1984), children in the program were assigned to small cooperative learning groups, where they adopted varying roles. In the role of the teacher, they modeled and organized the learning process. In the role of the student, they applied the strategies.

During each session, students worked both as teachers and as students. The teacher role can be subdivided into monitoring activities and organizational tasks. Monitoring activities involve giving feedback on the content and application of the other students' strategy use, helping and guiding during the correction of answers, and "modeling" answers if necessary. Organizational tasks include assigning other students to apply a strategy, deciding when to move on to the next text passage, and managing the classroom setting. The study was based on the assumption that the content-related monitoring tasks of the teacher role are responsible for the large improvements observed in reading comprehension. To test this idea, two exper-

Key Reference

Demmrich, A. (2005). *Improving reading comprehension by enhancing metacognitive competencies: An evaluation of the reciprocal teaching method*. Unpublished doctoral dissertation, University of Potsdam.

Table 1
Assignment of tasks to children and trainer in the three experimental conditions

| Tasks | Experimental condition | | |
|--|------------------------|---------------|---------------|
| | Reciprocal teaching | Monitor | Student |
| – apply strategy to text | Student–Child | Student–Child | Student–Child |
| <i>Monitor Function</i> – select strategy to be applied – give feedback on content and application of the strategy – help and guide during correction of answer – “model” answer, if necessary | Teacher–Child | Monitor–Child | Trainer |
| <i>Organizational Function</i> – assign someone to apply a strategy – decide when to move on to the next text passage – classroom management: maintain discipline | Teacher–Child | Trainer | Trainer |
| – explain and model strategies – teach conditional knowledge about strategies – correct children when they make mistakes (with respect to content or to the application of the strategies) | Trainer | Trainer | Trainer |

perimental conditions (“reciprocal” and “monitor” conditions) were designed, varying the monitoring and organizational tasks associated with the teacher role. A third condition involved no reciprocal teaching and learning. Children in this group (“student” condition) only practiced the application of strategies, although they did so extensively. Table 1 summarizes the tasks and the assignment of the tasks to the three experimental conditions. Small, mixed-gender and mixed-ability groups of four to six children took part in a strategy training program after regular school lessons four times a week over a period of four weeks. Participation in the program was voluntary. During the first three sessions, the reading strategies *summarizing, questioning, clarifying,*

and predicting were introduced to the children in all experimental conditions. These strategies were then practiced in 12 consecutive sessions, with tasks being distributed differently depending on the experimental condition. Each group had a trainer and worked on fairly long expository texts, using all of the strategies that could be meaningfully applied to each paragraph before reading further. A total of 55 children in 12 groups participated in the strategy training program. Furthermore, all 5th graders in the participating schools completed pre- and posttests before and after training, such that the performance of the 55 participants could be compared to that of 86 control children who spent the training time on their regular after-

Table 2
Children's declarative knowledge about summarizing and clarifying in the experimental and control conditions

| Strategy | Experimental condition | | | | | | Control group | |
|--|------------------------|-------------|----------|-------------|----------|-------------|---------------|-------------|
| | Reciprocal | | Monitor | | Student | | Control | |
| | <i>M</i> | <i>(SD)</i> | <i>M</i> | <i>(SD)</i> | <i>M</i> | <i>(SD)</i> | <i>M</i> | <i>(SD)</i> |
| <i>Summarizing</i> | | | | | | | | |
| Contains most important content | .94 | (.24) | .95 | (.22) | .67 | (.48) | .51 | (.50) |
| Is shorter than the text | .88 | (.33) | .70 | (.47) | .78 | (.43) | .36 | (.48) |
| Is formulated in own words | .35 | (.49) | .50 | (.51) | .22 | (.43) | .13 | (.34) |
| Total <i>N</i> of characteristics identified | 2.18 | (.39) | 2.15 | (.87) | 1.67 | (.84) | 1.00 | (.89) |
| <i>Clarifying</i> | | | | | | | | |
| External: ask other people to help | 1.12 | (1.36) | 1.00 | (.97) | 1.22 | (.94) | .89 | (.66) |
| External: use other resources (dictionaries, etc.) | .71 | (.59) | 1.00 | (1.17) | .94 | (.64) | 1.13 | (.86) |
| Text-related strategies | 1.59 | (.94) | 1.60 | (1.05) | .94 | (.87) | .87 | (.94) |

noon activities. The dependent variables included various measures of metacognitive knowledge: knowledge about two specific reading strategies that were taught in the training program (summarizing and clarifying), relational and conditional strategy knowledge, and planning knowledge.

Table 2 shows selected results from the study. When comparing the three experimental conditions, the following picture emerges: Children in the *reciprocal* and *monitor* groups acquired more knowledge about the reading strategies *summarizing* and *clarifying* than did children in the *student* condition: They identified more features of a good summary and thought of more text-related strategies to clarify the meaning of unknown words or sentences. Large effect sizes of about .70 were observed for these measures. When comparing the two treatment groups that were expected to have positive effects (*reciprocal* and *monitor*) with the performance of the control

group, effect sizes range from .70 to almost 1.30.

As expected, the results for children's knowledge and performance measures in the *reciprocal* and *monitor* conditions did not differ significantly. Children in both of these groups outperformed their peers in the *student* condition, even though the number of learning opportunities for every child in the *student* condition was higher, given that this group had no other task than to practice strategies, and therefore worked through more text paragraphs than the children in the other groups. Additionally, children who received their strategy training in the *student* condition performed only marginally better at posttest than the control children.

Although significant results were only obtained for measures closely related to strategy training—strategy knowledge and strategy application—and not for more general components of metacognitive knowledge, the comparison between the

Key Reference

Stanat, P., Müller, A. G., Baumert, J., & Willker, W. (2005). Die Kofferbande auf Reisen in das Land der Sprache und des Theaters: Das Jacobs-Sommercamp Projekt. *Pädagogik*, 57, 57–58.

experimental conditions provides strong support for the assumption that metacognitive knowledge and skills are acquired when the reciprocal teaching method is used to teach reading strategies. Both conditions (*reciprocal* and *monitor*) that required children to give each other feedback on performance produced similar results. Not only did students in these conditions acquire more knowledge about the reading strategies *summarizing* and *clarifying*, they also applied the *summarizing* strategy better than the *control* children and the children in the *student* condition. These findings are consistent with the componential theory of metamemory advanced by Borkowski, Milstead, and Hale (1988). The authors propose that specific strategy knowledge, which is at the center of their model, represents a prerequisite for higher order components that, in turn, aid further acquisition of strategy knowledge. In these respects, the cooperative setting of the reciprocal teaching method seems to promote internalization of interindividual social processes. The dialogues that occur in the group apparently help the students to develop metamemory acquisition procedures and strategy knowledge. By adopting the role of the teacher (monitoring), the children have the opportunity to monitor, evaluate, and regulate other children's cognition. Few differences in results were detected between the *reciprocal* and the *monitor* conditions; both experimental settings produced virtually the same effects, thus supporting the assumption that it is not the adoption of the teacher role, but the task of monitoring,

evaluating, and regulating other students' strategy execution that makes the reciprocal teaching method so effective.

The Jacobs Summer Camp Project

Over the last four decades, Germany has developed into an immigration country, and the number of students learning German as a second language has grown. Various studies have shown that these students are highly disadvantaged in terms of their educational participation. Results from the first cycle of PISA, for example, show that the relative chance of attending the academic track rather than the lowest track of the three-tier secondary system is 4.4 times higher for students whose parents were both born in Germany than for children of foreign-born parents (cf. Table 3, Model I). Even when SES is controlled, the odds of attending the academic-track *Gymnasium* are almost 3 times higher for students of native parents than for students of immigrant parents (cf. Table 3, Model II). Thus, the social disadvantage that tends to be associated with an immigration background does not fully account for the disparity between immigrant and native students. One factor that does seem to explain this difference, however, is students' reading literacy in the language of instruction, that is, German. Given similar results on the PISA reading test, the relative chances of attending the highest or middle track are no longer lower for students with immigration backgrounds than for students from native families (cf. Table 3, Model III). These findings indicate that a lack of German language skills is the pri-

Table 3
Relative chances of attending different secondary school types as a function of family migration background (odds ratios)¹

| Migration background | Secondary school type (reference category: vocational track <i>Hauptschule</i>) | | | | | | | | | | | |
|--------------------------------|--|------|-----|----|------------------------------------|------|-----|----|----------------------|------|-----|----|
| | Intermediate track <i>Realschule</i> | | | | Academic track <i>Gymnasium</i> | | | | Comprehensive school | | | |
| | Model ² | | | | Model ² | | | | Model ² | | | |
| | I | II | III | IV | I | II | III | IV | I | II | III | IV |
| Both parents born in Germany | 2.64 | 2.19 | ns | ns | 4.42 | 2.69 | ns | ns | 1.92 | 1.71 | ns | ns |
| One parent born in Germany | 1.46 | ns | ns | ns | 3.46 | 2.10 | ns | ns | 1.86 | 1.76 | ns | ns |
| Neither parent born in Germany | Reference category (odds = 1) | | | | | | | | | | | |

¹ Only statistically significant findings reported.

² Model I: without controlling for covariates; Model II: controlling for SES; Model III: controlling for reading literacy; Model IV: controlling for SES and reading literacy.

mary obstacle for immigrant children at the transition from elementary to secondary school (see also Bos, Voss, Lankes, Schwippert, Thiel, & Valtin, 2004; Lehmann, Peek, & Gänsfuß, 1997).

Given the importance of language skills for school success, it is particularly alarming that Germany seems to be considerably less successful than most other countries at providing immigrant students with the necessary support in acquiring the language of instruction. Results from PISA indicate that the disadvantage in reading literacy among 15-year-olds whose home language differs from the language used in the PISA assessment is larger in Germany than in almost any other participating country (Baumert & Schümer, 2001; see also Schwippert, Bos, & Lankes, 2003). At the same time, little is known about the effectiveness of approaches to supporting the acquisition of German as a second language among immigrant students.

With this situation as the general starting point, the goal of the Jacobs Summer Camp Project is to explore the learning development of children with immigration backgrounds, and to provide evidence on the effectiveness of different approaches to helping these students attain proficiency in the language of instruction. The study builds on research related to summer setback and summer learning, most of which has been carried out in the United States. Within this

Figure 2. Theatre performance prepared in the implicit language support condition of the Jacobs Summer Camp.



Figure 3. Students in the explicit language support condition of the Jacobs Summer Camp.



line of research, a number of studies have found that patterns of learning development over the summer break differ for children from families with lower and higher socioeconomic status (for a meta-analytic summary, see Cooper et al., 1996). According to these findings, students from families with disadvantaged backgrounds show learning losses over the summer break in both reading and mathematics. For students from middle-class backgrounds, on the other hand, summer setback effects were identified in mathematics, but not in reading. In fact, the results suggest that the reading skills of this group tend to increase during the summer break, causing the gap between students from families with lower and higher socioeconomic status to widen. It has been estimated that the disparities resulting from these differential trajectories for reading achievement over the summer months are equivalent to a

learning gain of about three months (Cooper et al., 1996).

At the same time, the literature on summer learning suggests that the larger achievement losses among students from families with lower socioeconomic status can, to some extent, be compensated by summer learning programs. A meta-analysis of studies evaluating the effectiveness of summer schools concluded that both student groups profit from attending summer learning programs (Cooper et al., 2000). Therefore, summer schools that are specifically geared toward disadvantaged students should help to prevent the achievement differences from widening during the summer months.

Drawing on this body of research on summer setback and summer learning from the United States, the Jacobs Summer Camp Project was designed to pursue four main objectives:

(1) The first goal of the project is to determine whether, and to what extent, differential achievement losses are observed over the German summer break which, at roughly six weeks, is much shorter than in the United States. The main focus of the project is on children from immigrant families. Thus far, research on summer setback and summer learning has mainly examined the learning trajectories of students from different socioeconomic and ethnic backgrounds. Less attention has been paid to the potentially moderating role of the students' home language. Based on the finding that summer setback effects tend to be more pronounced for domains requiring factual and procedural knowledge (e.g., computation and spelling) than for more conceptually based domains (e.g., problem solving and reading), it might be suspected that second-language skills are particularly vulnerable to summer learning losses (Cooper et al., 1996). This contention has not yet been tested empirically, however.

(2) The second objective of the Jacobs Summer Camp Project is to develop, implement, and evaluate a program to promote German language skills during the school vacation. Two approaches are differentiated. The first aims to determine whether it is sufficient to engage students in language-intensive activities in order to counter the learning loss associated with the school vacation. Such activities are expected to trigger implicit learning processes that have positive effects on language development ("implicit language support component"). This component is operationalized in a

theater activities program devised by experienced theater teachers. The second approach to promoting German language skills consists in systematic instruction in German as a second language, designed to foster explicit language learning ("explicit language support component"). This component takes a systematic approach to language learning, the aim of which is to promote the conscious perception and use of linguistic structures (Rösch, 2003). Most students of non-German origin were born in Germany and have spent their entire school career in this country. Many of them appear to have a fairly good command of the German language. However, even children who speak German fairly fluently in conversational situations may not have acquired the "cognitive academic language proficiency" (Cummins, 2002) held to be a prerequisite for academic success. Key aspects in this regard include vocabulary and grammar. The implicit grammar that has been developed by minority language children often deviates markedly from the norm. The aim of instruction in German as a second language is to help students develop correct and explicit grammar knowledge.

(3) A third general goal of the Jacobs Summer Camp Project is to explore the distinction between proficiency in general everyday language and school-related academic language, which is considered to be critical for understanding and promoting immigrant students' learning development (e.g., Cummins, 2002; Gogolin, 2004).

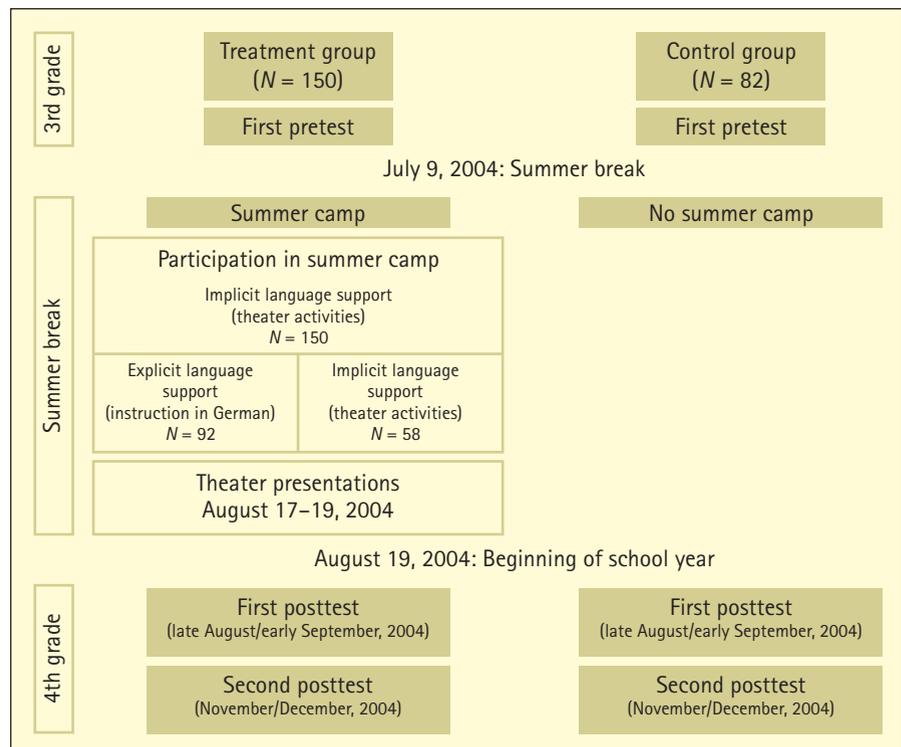
(4) The fourth and final aim of the study is more practical in nature,

that is, to find out whether it is feasible to implement a summer camp of this kind in Germany. One of the main questions was whether parents, some of whom have little or no command of German, are prepared to let their children attend a summer camp. This was particularly unclear for girls from Muslim families. It was also uncertain whether children would be willing to participate in a program where they were expected to attend lessons over the summer vacation. Even the children's readiness to engage in theater activities could not be taken for granted. Inasmuch as it is highly unusual for teachers in Germany to work during school vacations, moreover, we could not be sure that it would be possible to recruit qualified teaching staff for the camp. Because the Jacobs

Summer Camp is the first program of its kind to be run in Germany, analyses of these practical experiences also form an important part of the program evaluation.

Figure 4 shows the research design of the Jacobs Summer Camp Project, comprising an experimental approach with pre- and posttests. Because performance at the elementary level is decisive for educational success in the German school system, where students are tracked at a relatively early age, it was decided to aim the program at primary school students. In Germany, it is generally considered reasonable for children to spend longer periods away from home from the 3rd grade onward. The camp was thus directed at students who had just completed the 3rd grade. The project was carried

Figure 4. Research design of the Jacobs Summer Camp Project.



out in the city state of Bremen where the proportion of immigrant students in schools is relatively high. All students in more than 30 schools were invited to sign up for the summer program. Thus, in addition to immigrant students, the sample also includes children from socially disadvantaged German families.

To ensure that effects of a moderate size could be detected, an attempt was made to recruit at least 250 applicants for the program. With a total of 251 students signing up, this goal was reached. For logistic reasons, however, students from nine schools had to be excluded from participation, leaving an applicant pool of $N = 232$. Of these, 150 children were assigned at random to a treatment group and 82 to a control group. This ensured that the children in the different conditions would be comparable in terms of their willingness to attend a remedial program over the summer break. Moreover, all students in the classes of the *experimental* and *control* children who had not applied to attend the summer camp were included in the assessments as an additional comparison group. This opens up further opportunities for the evaluation of summer learning loss and the efficacy of the Jacobs Summer Camp Project in combating this loss. Most importantly, it allows for the differentiation of students' learning development as a function of their summer break activities, such as travel to their families' countries of origin. The children in the treatment group were distributed across two conditions. All of the children selected for the camp participated in the theater and recreational components. In two

of the three camps, the children also attended lessons in German as a second language. This design makes it possible to examine the extent to which learning gains are achieved by implicit language support, and which additional effects are associated with explicit language support.

The summer camp program comprised four phases: During the first two weeks, students commuted between the camp and their homes by bus. During the third week, they stayed in the camp overnight. The fourth week was devoted to recreational activities, such as a visit to the science museum and a day with the boy and girl scouts. During the fifth week, finally, the theatre performances that the students had developed at the camp were rehearsed and presented on stage in Bremen. Students' performance levels as well as indicators for their psychosocial development were assessed using a variety of tests and questionnaires at three points in time: (1) shortly before the summer vacation, (2) directly after the summer vacation, and (3) about three months after the end of the camp. The written assessments were administered to all children in the treatment and control groups as well as to all students enrolled in the classes of children who had applied to attend the Jacobs Summer Camp. In addition to written tests, oral language samples were collected from students in the treatment and control groups as part of the pretest and the first posttest assessment. More specifically, students who had applied to participate in the summer camp were video-recorded as they described picture stories and retold texts on everyday

and school-related topics that test administrators had read to them. Differential as well as overlapping effects are expected for the implicit and explicit language support conditions. For example, the implicit component entails motivational and affective goals, such as an increase in students' motivation to speak correctly and a reduction in anxiety associated with public speaking. The explicit component, on the other hand, should result in improvements with regard to structural aspects of language, such as use of pronouns and prepositions, declination, and conjugation. Both treatments are expected to have positive effects on vocabulary related to the overall theme of the camp ("travel") as well as on the appropriateness of spoken language.

Regarding the question of whether it is feasible to carry out a summer program geared toward immigrant students, we can conclude that the Jacobs Summer Camp was a success. We were able to reach the target of at least 250 applicants, which many school officials, principals, and teachers had predicted to be an unrealistic goal. Among the 149 students who came on the first days of the camp, 13 fell ill or were unable to attend every day for family-related reasons, such that they missed more than a week of the program. All of the remaining children came back practically every day. This also applied to most of the girls from Muslim families. Only two of these girls were not allowed to stay overnight during the third week of the program, and had to be bussed to camp every day.

All of the ten theatre groups in the Jacobs Summer Camp succeeded in developing performances and in presenting these on stage in Bremen at the end of the program. The children's parents, teachers, and principals as well as the general public were invited to attend the performances, and their responses were very positive. Within a period of just three weeks, the children and their theatre teachers had succeeded in putting together outstanding productions. This highly successful finale to the summer camp quite obviously boosted the children's self-confidence and underscored the integrating role of programs involving immigrants and nonimmigrants, parents and schools, school-type instruction, and the arts.

Both posttests for the Jacobs Summer Camp Project have been completed and the data are currently being analyzed. First results indicate that the treatment did have significant effects on students' language development. For the most part, however, these effects seem to be limited to the explicit instruction component.

Research Area IV

Learning and Instruction: Cognitive Activation and Cognitive Tools

Three cornerstones of competence acquisition have to be integrated into research on learning and instruction: the tasks to be mastered, the students (who have to be engaged in meaningful learning activities), and the teachers (whose task it is to facilitate students' learning). Each cornerstone highlights different aspects of the learning process. Focusing on the tasks means asking what kinds of knowledge structures and more general cognitive preconditions have to be accessible in order for certain tasks to be mastered. Switching to the students' perspective leads to the question of how the learners' existing knowledge can be modified, extended, cross-linked, hierarchically ordered, or how new knowledge can be generated, in order to master the tasks. The teacher's role is to mediate between the tasks and the students. By selecting learning materials, giving appropriate feedback, and involving students in meaningful learning activities, teachers can support learners in closing the gap between prior knowledge and the knowledge needed to master the tasks in question.

Insightful Learning: A Challenge for Teachers as Well as for Scientists

In comparison to the acquisition of facts, skills, and routines, insightful conceptual understanding—a central aim of science and mathematics instruction, in particular—is still a puzzle, for teachers as well as for researchers. Nonetheless, scientific progress in modeling and explaining the emergence of insights and conceptual understanding is evident. It is now widely accepted that new concepts and insights are not acquired through passive transmission of the expert's knowledge to the learner's mind, but rather that they are the result of the learner's active process of constructing increasingly complex and elaborated cognitive structures. Powerful learning environments stimulate students' cognitive activation, that is, students' mental involvement in the tasks to be mastered. In so doing, learners

have to make use of, and are constrained by, the knowledge already available to them. Particularly for science and mathematics, it has been widely shown that students enter classrooms with intuitive concepts and belief systems which are partly based on universal conceptual primitives. These may have innate roots, but are also shaped by schooling. The negative consequences of ignoring this kind of prior knowledge have been demonstrated, particularly for physics and mathematics education. Students often only adopt the knowledge taught at school at a superficial level and, therefore, can only use it when faced with problems that have already been dealt with at school. Overcoming certain misconceptions that are deeply rooted in everyday experience is the most difficult task of science education. To effectively initiate and assist student learning, teachers need to take

into account students' specific prior knowledge and understanding, and they need to design and organize lessons and classroom discourse in a way that closely attends to the curriculum as well as to the social construction of meaning in classrooms. Teachers can only do a good job if they know what makes certain tasks particularly difficult, on the one hand, and are aware of the way their students learn, on the other. For instance, they have to know what kinds of mistakes and obstacles typically occur during the learning process, and whether students need special support to overcome these. In order to combine the task perspective and the student perspective, teachers need pedagogical content knowledge. This means that teachers have to know how particular topics, problems, or issues are organized, represented, and adapted to meet the diverse interests and abilities of learners, and how they should be presented during instruction. Teachers' classroom behavior thus needs to be based on an understanding of how students learn in the respective academic domains.

In order to provide teachers with appropriate pedagogical content knowledge, research on learning and instruction has to focus on students' insightful learning. Important questions to be addressed include the following: What is the structure of the knowledge to be acquired? What prior knowledge does the learner have to build on? What particular tasks, explanations, and interactive discourse will assist students' construction of intelligent knowledge? Is the understanding of certain concepts subject to conscious or uncon-

scious processes? At what stage of the learning process are feedback and direct instruction helpful? At what age can students make sense of certain forms of visual-spatial representation? What kind of practice do students need for the application of such tools in new content domains? Which tool is most appropriate for reasoning in a given content domain? What kinds of misconceptions can arise from using a tool that has not yet been fully understood?

The Orchestration of Students' Learning Activities

Classroom instruction is not the only factor that determines the knowledge structures and epistemological beliefs acquired by students. It is, however, the factor that is most likely to be affected by the institutions of the education system and the professional activity of teachers. Recent findings emphasize that classroom instruction rather than the school environment or management structures has the main impact on school effectiveness in terms of learning outcomes. As such, the question of what actually determines good instructional practice is central to the success of education and the functionality of the education system. For this question to be addressed, pedagogical concepts of instructional quality need to be combined with the analysis of individual and collective processes of knowledge acquisition in specific domains.

Insightful Learning Through Cognitive Activation in Powerful Learning Environments

There is now wide agreement among researchers in the field of learning and instruction as to the framework of insightful learning, summarized as follows by Baumert et al. (2004):

- Insightful learning is an active individual process of construction by which knowledge structures are modified, enhanced, integrated into networks, organized by hierarchies, or newly generated. Insightful learning crucially relies on the active mental processing that is implied in any active analysis of the social or natural environment or in the use of symbol systems.
- Insightful learning means making sense of things by mastering new contexts that organize and structure knowledge. For this, the object has to have a minimum intellectual and/or practical appeal for the learner.
- Insightful learning depends on individual cognitive conditions, but mainly on prior domain-specific knowledge. The quality and ease of further learning is crucially determined by the extent and organization of the available knowledge base.
- Insightful learning, while being highly systematic, is always situated and bound up with a specific context. Knowledge acquisition will typically occur in a social context, and knowledge will carry the marks of the specific context in which it was acquired. The fact that knowledge is situated often results in its being constrained in its range of application. In order to enhance this range, a variation of

the contexts in which knowledge is acquired and applied must be provided.

- Insightful learning is regulated by motivation and by metacognitive processes (e.g., planning, control, evaluation).
- Insightful learning is supported by certain cognitive mechanisms. These include the building of knowledge units with high informational content that can be remembered and retrieved as a whole (chunks), the emergence of which will be fostered by the use of multiple forms of knowledge representation. They also include the automation of action sequences and reasoning operations.

This framework of insightful learning can be applied to all kinds of subjects taught in school if it is linked up with an investigation of domain-specific knowledge structures. Research on learning and instruction can contribute to the improvement of classroom instruction by furthering an understanding of the psychological processes of insightful learning in a specific content domain. The goal of this kind of research must be to support teachers in getting a feeling for learners' prior knowledge.

This includes an understanding of the sources of students' errors and mistakes as well as an identification of such knowledge elements as learners can build on when presented with explanations or problems in the course of classroom instruction. A better understanding of learners' prior knowledge helps teachers to decide how instruction should be shaped in order to allow students to gain a deep understand-

ing of domain-specific concepts and to develop adequate, nonschematic epistemological beliefs.

In Research Area IV, we examine the conditions that are necessary to initiate insightful learning processes in the fields of mathematics and science education. The studies are conducted in the laboratory (ENTERPRISE), within a multimethod longitudinal approach (COACTIV), or as video-based studies in actual school environments (TIMSS-Video). Most of the investigations address research questions that have emerged directly from Research Areas I and II. For instance, one study (dissertation

project Mareike Kunter) combined data from the TIMSS achievement tests and questionnaires with information from video observations of teaching (TIMSS-Video). Investigating the impact of several instructional features on students' learning and motivational development over the course of one school year, the study revealed that cognitively activating instruction had positive effects on students' achievement gains.

The following section describes two of the major projects (COACTIV and ENTERPRISE) in more detail.

The Center for Educational Research 2004



Left to right: Rainer Watermann, Martin Brunner, Oliver Lüdtke, Andrea Müller, Kai Maaz, Ulrich Trautwein, Michael Schneider, Petra Stanat, Elsbeth Stern, Ilonca Hardy, Jürgen Baumert, Mareike Kunter, Cordula Artelt, Gundel Schümer, Stefan Krauss, Nele McElvany, Yi-Miau Tsai, Gabriel Nagy, Uta Klusmann, Hella Beister, Nicole Husemann (not pictured: Helmut Köhler, Detlef Oesterreich, Thomas Rochow).

COACTIV: Cognitive Activation in the Classroom: The Orchestration of Learning Opportunities for the Enhancement of Insightful Learning in Mathematics

Teaching for Understanding: Linking PISA to Research on Learning and Instruction

The aim of the COACTIV study is to investigate teachers' professional knowledge and the way this knowledge relates to domain-specific instructional processes. By assessing the professional knowledge of mathematics teachers, and then linking this knowledge to features of their classroom instruction and to the development of their students' mathematical literacy, the study provides unique insights into the prerequisites for students' mathematical learning.

The COACTIV study is embedded in the PISA 2003 assessment. With mathematics literacy forming the main component of PISA 2003, a differentiated investigation of the structure of the mathematical competencies acquired by the end of lower secondary level is possible. Moreover, the PISA 2003 study was extended to a longitudinal design, spanning the period of one academic year, with a sampling plan allowing for teachers to be assigned to the classes they teach, and for class and school effects to be separated systematically.

Insightful Learning and Cognitive Activation in Mathematics Classrooms—The Framework of the COACTIV Study

The COACTIV study, which is funded by the German Research Foundation (DFG), is based on preliminary work carried out in the context of *BIJU*, *TIMSS*, and *TIMSS Video*. In the following, we will outline the study's theoretical background and methodological approach and present selected findings on the learning environments provided by different school types.

The study investigates the three cornerstones of competence acquisition—that is, teachers, lessons, and students—in a combined approach. The theoretical framework that underlies this approach draws on aspects of teacher expertise, the process-mediation-product model, and the (social-)constructivist approach.

The main question guiding our analyses is as follows: How can teachers facilitate insightful student learning during lessons? The core ideas are outlined in Figure 1 and will be explained below.

We consider insightful learning to be a mental process characterized by the active and independent construction of domain-specific knowledge. The product of the learning process is a thorough understanding of domain-specific concepts comprising declarative knowledge, skills, and procedures. The process of insightful learning is supported by motivational variables, such as interest, and self-related cognitions, such as control beliefs.

Insightful learning processes take place in powerful learning environments (De Corte et al., 1996). Within the COACTIV theoretical framework, two aspects of the learning environment are considered to be particularly important for initiating and sustaining insightful learning processes: the degree of cognitive activation and the teacher's support of personal autonomy and competence.

Learning opportunities that stimulate insightful learning processes entail what we term *cognitively activating elements*. In the classroom context, cognitively activating elements can be found in the tasks that

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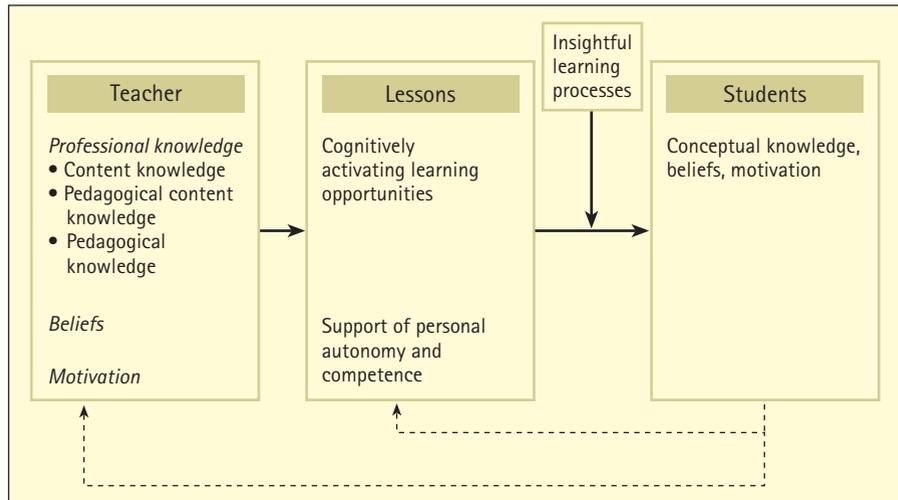
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Funded by the German Research Foundation (DFG) in the BIQUA priority program

Figure 1. Teachers' competencies, mathematics lessons, and students' learning: The three cornerstones of the COACTIV study.



students work on, or in the discourse between teachers and students. Cognitively activating tasks might, for example, draw on students' prior knowledge by challenging their existing beliefs. Cognitive activation can take place during class discussion when the teacher does not simply declare students' answers to be "right" or "wrong," but encourages them to evaluate the validity of their answers and solutions for themselves. The particular challenge of creating cognitively activating learning opportunities is therefore to teach at a level that ideally animates *all* learners to actively engage with the learning content, by challenging, but not overwhelming them. This is a demanding task for teachers in classroom situations—it is no easy matter to create optimal learning conditions for groups of students who may differ greatly in terms of motivation or prior knowledge. The adaptive orchestration of tasks is a key to meeting this challenge. Teachers have to select tasks that meet different individual student

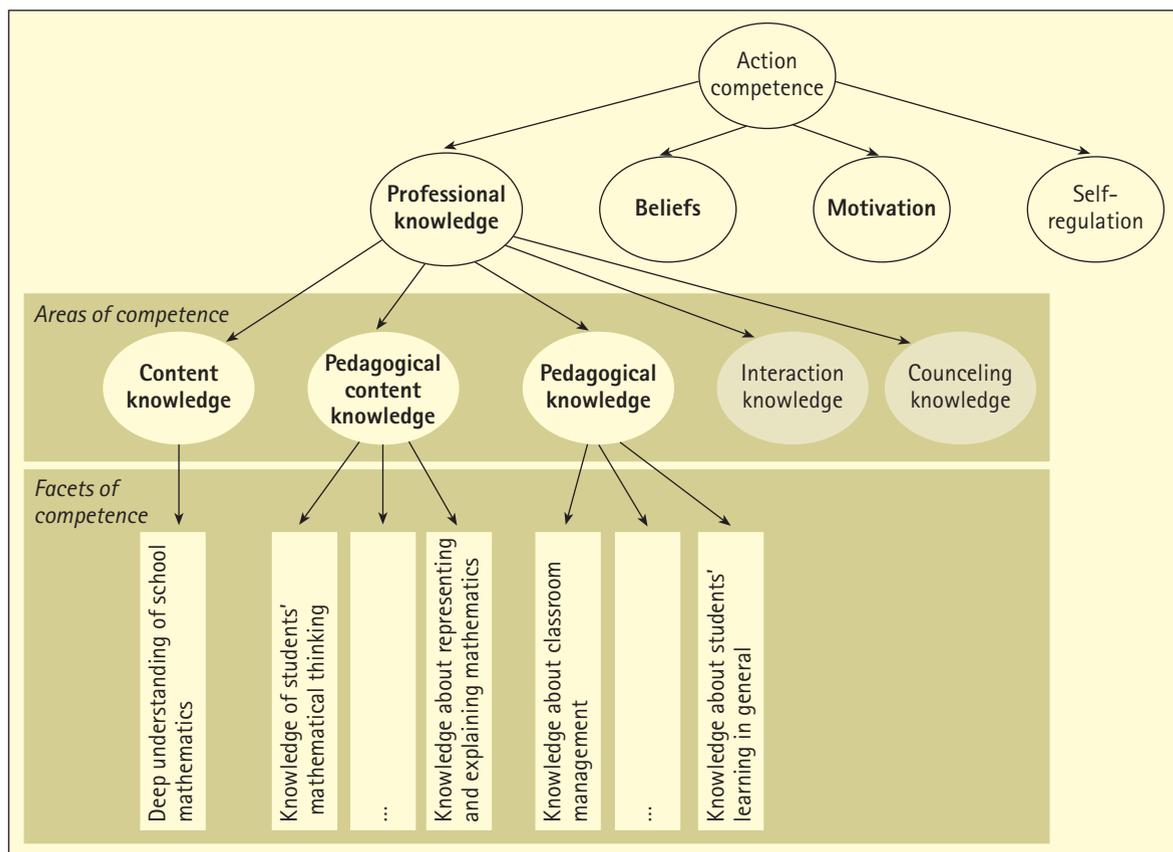
needs, that is, tasks that vary in terms of their difficulty and cognitive demands as well as—in order to help learners gain transferable knowledge—in structural and contextual terms. These tasks must be presented in an order that allows students to gradually expand their knowledge, and practice existing skills.

It takes more than demanding assignments to inspire students to engage in insightful learning processes, however. Studies based on the theory of self-determination developed by Deci and Ryan (2000) show that students engage in insightful learning processes, and develop intrinsic motivation, such as domain-specific interest, when they feel challenged as well as personally supported in their learning environments. Consequently, teachers need to implement tasks in a way that respects students' cognitive autonomy. At the same time, they need to be acutely aware of students' difficulties—be they comprehension problems or social and personal matters—

and to respond in a reassuring way. In other words, teachers need to give their students the feeling of being personally valued and supported. The teacher's *support of personal autonomy and competence* can thus be considered a second crucial aspect of powerful learning environments. Putting these two instructional aspects—cognitive activation and support of students' personal autonomy and competence—into practice requires a broad and profound base of knowledge on the teacher's part: first, a deep understanding of the contents to be taught; second, awareness of how best to present these contents to students; and third, knowledge about teaching and learning processes in general. Based

on the work of Lee Shulman (1987; also see Bromme, 1992), the terms of *content knowledge*, *pedagogical content knowledge*, and *pedagogical knowledge* have been established to describe these facets of professional knowledge. In addition to these types of knowledge, teachers' attitudes and beliefs about their subject and about teaching in general influence the way they teach. Whether teachers like and value the subject they teach and, even more importantly, whether they feel responsible for their students and aim at supporting their personal growth, may determine whether their teaching serves to create powerful learning environments.

Figure 2. Action competence of mathematics teachers (for an account of the concept of competence, see Weinert, 1999, 2001).



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Krauss, S., Kunter, M., Brunner, M., Baumert, J., Blum, W., Neubrand, M., Jordan, A., & Löwen, K. (2004). COACTIV: Professionswissen von Lehrkräften, kognitiv aktivierender Mathematikunterricht und die Entwicklung von mathematischer Kompetenz. In J. Dool & M. Prenzel (Eds.), *Bildungsqualität von Schule: Lehrerprofessionalisierung, Unterrichtsentwicklung und Schülerforderung als Strategien der Qualitätsverbesserung* (pp. 31–53). Münster: Waxmann.

In the COACTIV study, we apply this general theoretical framework to the context of secondary school mathematics teaching. Our focus lies on investigating mathematics teachers' expertise, on the one hand, and on reconstructing mathematics lessons, on the other.

Figure 2 describes teachers' knowledge and beliefs (left-hand box in Figure 1) in more detail and provides an overview of our theoretical approach to teachers' competence. In COACTIV, scales were constructed to assess teachers' action competencies in all areas, with the exception of those shaded in Figure 2 (Krauss et al., 2004).

Theoretically, mathematics lessons (middle box in Figure 1) are the crucial opportunities for insightful learning to occur. The underprovision of cognitively activating learning opportunities seems to be a particular weakness of mathematics teaching in German secondary schools, however. Results of international studies such as TIMSS Video show that German mathematics lessons typi-

cally focus on drilling routines rather than on developing conceptual knowledge. Teachers tend to guide students through new topics step-by-step, presenting the new ideas themselves, and rarely making reference to students' conceptions. In the next phase of instruction, students work on similar problems, and practice the skills that have been demonstrated in individual seatwork. The tasks set are usually very routine-oriented; their solutions require the application of procedures rather than conceptual understanding. This lesson format is so widespread in Germany that one might call it the "monoculture of mathematics teaching." One of the main questions addressed by the COACTIV study is whether teachers choose this "task monoculture" deliberately, based on traditional beliefs about learning, or because they lack the necessary professional knowledge.

The empirical investigation of teachers' professional knowledge and the reconstruction of mathematics lessons present great methodological

Methodological Approach of the COACTIV Study

COACTIV is embedded in the longitudinal component of the PISA 2003 study. Both the students sampled for PISA and their mathematics teachers were assessed twice—once at the end of the 9th grade, and once at the end of the 10th grade. We are thus able to combine student achievement and questionnaire data with their teachers' data, and to observe changes over the course of a school year. The teacher sample consists of 352 teachers and their math classes in the first wave and 223 teachers and their classes in the second wave (the reduction in sample size is due to students from vocational schools no longer being included in the assessment at the second wave). A total of 180 teachers participated in both waves of the assessment, and taught the PISA classes over the whole school year. Standardized questionnaires provide the first set of data. Both teachers and students were asked to report on and evaluate various aspects of their mathematics lessons. Most of these questions are based on scales that are already well established in the field of instructional research. To assess teachers' professional knowledge, we developed an array of new instruments, some of which are computer-based. In particular, we focused on developing new instruments to assess teachers' content and pedagogical content knowledge.

The second set of data is derived from the teaching material collated from the teachers, who were asked to submit the tasks they actually employed in their PISA classes (homework assignments, exams, and tasks used in introductory lessons). These tasks were coded by trained raters, using a newly developed classification scheme to tap various didactic aspects (e.g., task format, type of cognitive process needed to solve the task).

challenges. With its combined approach and use of various innovative methods, the COACTIV study offers a unique opportunity to gain insights into the prerequisites for students' mathematical learning. The study's methodological approach is summarized above.

Teaching and Teachers in Different School Types—Differential Patterns of Mathematics Instruction

COACTIV focuses on the empirical investigation of how students' mathematical knowledge is enhanced by cognitive activation and personal support during lessons, and on the role that teachers' professional knowledge plays in creating such learning contexts. In the following, we will concentrate on mathematics lessons and present selected findings on patterns of math instruction that are specific to certain school types in Germany.

The German secondary school system is characterized by the early tracking of students to different school types (vocational, intermediate, academic track; comprehensive schools) based on their ability. Studies, such as TIMSS, PISA, and BIJU, have repeatedly reported significant differences in the school achievement of students in different tracks. Moreover, it has been demonstrated that these differences are not only a corollary of early selection but that they continue to grow over the school career, with students from academic track schools showing relatively larger learning gains than other students (a phenomenon known as the St. Matthew effect). These different learning rates are associated with remarkable differences in the teach-

ing cultures of the various school types. Studies based on lesson observations (e.g., TIMSS Video) and on students' reports on their lessons (e.g., Gruehn, 2000) have identified differential patterns of teaching across school types. These differences are particularly pronounced when the academic track is compared with the other tracks. For instance, a reanalysis of the TIMSS Video data revealed notable differences in the way teachers create learning situations in early secondary school mathematics lessons (Kunter, 2004). Cognitively activating tasks that require the active construction of knowledge were only employed in academic track lessons, if at all. Elements of cognitive activation were rarely discerned in mathematics lessons in other school types, where there was a very strong focus on practicing skills and routines.

The data provided by the COACTIV study enable us to investigate these differences in teaching patterns from several perspectives. Drawing on preliminary work (Clausen, 2000), we assume differential validities for different data sources. A first indication of differences in the organization of learning opportunities is provided by the teachers' own reports of their lesson goals, preferred assignments and tasks, and general approaches to mathematical learning. These reports provide us with insights into the principles that guide teachers' lesson planning. Whether these principles are actually put into practice in the classroom can be evaluated by reference to the tasks teachers set. Finally, we consult students' reports on their lessons to

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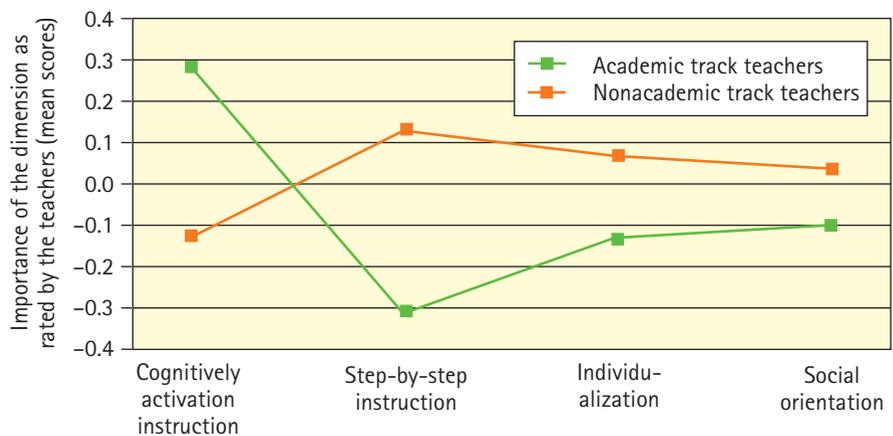
find out how students experience the learning environment, and to what extent they feel challenged and supported. In the following, we will present selected results that illustrate patterns of instruction specific to different school types in all of these areas. The results are based on (1) the teacher questionnaire on teaching goals and preferred lesson structures, (2) our categorization of the tasks assigned by the teachers, and (3) the student questionnaire on mathematics lessons. The teacher questionnaire provides us with information about the principles underlying classroom instruction. Assuming that teachers are best positioned to report on the didactic and methodological set-up of their lessons, we asked them about their educational goals, beliefs about mathematical learning, preferred task types, and the principles guiding their lesson planning. We can thus investigate whether teachers agree with our conception of cognitive activation and personal support being the core elements of teaching and, in addition, whether the opinions of

teachers in different school types converge. The assessment covered dimensions such as the following, each of which was measured by several scales.

- Cognitively activating instruction: To what extent do teachers aim at providing their students with cognitive challenges, and attempt to support the active and independent construction of knowledge?
- Step-by-step instruction with close supervision: To what degree do teachers prefer a step-by-step approach in which they proceed gradually, giving detailed instruction, focusing on routine practices, and providing close supervision?
- Individualization: To what degree do teachers consider within-class differences in students' prior knowledge when selecting tasks and evaluating students?
- Social orientation: How important is it for teachers to maintain good social relationships with their students, and to provide them with personal support?

When these dimensions are combined, the profile to emerge reflects

Figure 3. Approaches to teaching in academic track and nonacademic track schools.



All scales have a mean of 0 and a standard deviation of 1, all differences are significant with $p < .05$.

prototypical patterns in teachers' approaches to instruction. These patterns are characteristic of certain school types, as can be seen in Figure 3.

As shown by Figure 3, it is mainly the teachers in the academic track who report applying the principle of cognitive activation in their lessons. Accordingly, these teachers do not endorse step-by-step instruction. Rather, this form of teaching is preferred by teachers in nonacademic track schools, where cognitively activating elements do not feature strongly. In terms of individual student support, however, it is the teachers in nonacademic track schools who stress the importance of individualization and social orientation in the classroom. These aspects seem to have relatively little significance for academic track teachers. These results show that mathematics teachers in German secondary schools do not unanimously support our conception of powerful learning environments presented above—the aspects of cognitive activation and support for personal autonomy and competence are not generally considered to be the two guiding principles. In fact, two different patterns of teaching aims emerge: Whereas academic track teachers endeavor to establish cognitively challenging learning environments, but attach less value to the provision of personal support, the reverse is true of the nonacademic track teachers. Because these data were drawn from teacher self-reports, these profiles reflect differences in teachers' conceptions of teaching, but do not necessarily provide valid insights into actual differences in classroom

learning opportunities. To find out more about the actual classroom situation, we will now examine the tasks assigned by the teachers in their mathematics lessons.

The tasks that teachers employ in their lessons indicate the degree to which they succeed in translating their teaching principles into corresponding learning opportunities in the classroom. Cognitively activating tasks require conceptual knowledge and understanding. In COACTIV, we assessed a subset of the math problems that the teachers set as homework assignments, in exams, or to introduce new topics. On average, 100 problems per teacher were assessed. These problems—which were coded by trained raters—reflect the cognitive demands of the lessons. Several categories of cognitive activation were evaluated.

All tasks were classified as either technical tasks or modeling tasks, based on the cognitive processes that are required to solve them. Technical tasks require only factual knowledge or computational skills. Modeling tasks, on the other hand, require students first to construct a representation of the problem situation by interpreting the information given in the task statement. This situational model then has to be translated into a mathematical model, from which the mathematical solutions needed to solve the problem can be derived. These solution strategies then have to be implemented, interpreted, and validated. The match between the situational model and the mathematical model determines the quality of the task solution. Modeling tasks are further categorized as computational mod-

Table 1
Even tasks on a low difficulty level may imply conceptual understanding:
Examples of tasks with diverse levels of curricular knowledge
and cognitive demands

| | Low level of curricular knowledge | High curricular level of knowledge |
|--------------------------|--|--|
| Technical task | Consider the function $f(x) = 3x - 1$. Find the value of x when $f(x) = 11$. | Let f be the quadratic function $f(x) = 2x^2 + 5x - 3$. Write $f(x)$ in vertex form. |
| Conceptual modeling task | How does the surface area of a square change when the side length is tripled? Show your reasoning. | Thomas' father wants to give him some money towards a motorbike. He makes Thomas two offers: (1) 15€ today, a further 20€ tomorrow, a further 25€ the next day, and so on for a two weeks (i.e., increasing the sum by 5€ every day). (2) 5 cents today, a further 10 cents tomorrow, a further 20 cents the next day, and so on (i.e., doubling the sum every day), again for 14 days. Which offer should Thomas choose? Show your reasoning. |

ing tasks or conceptual modeling tasks. If the situational model is close to the mathematical model required to solve it, and the solution strategies primarily entail calculations and mathematical algorithms (even demanding ones), it is called a computational modeling task. If the mathematical model requires the students to link several concepts or strategies, or to draw inferences going beyond the information given in the task statement, the task is called a conceptual modeling task.

It is important to note that this classification *does not* equate with problem difficulty in terms of the average student success rate on a problem. All three types of problems—technical tasks, computational modeling tasks, and conceptual modeling tasks—can occur at all difficulty levels. Table 1 illustrates this point. Task difficulty was approximated by the level of curricular knowledge required to solve a task (this dimen-

sion indicates the grade level at which the task would be appropriate).

The task classification allows us to examine whether academic track teachers really do employ a relatively large proportion of cognitively activating tasks—particularly conceptual modeling tasks—in the classroom, in accordance with their teaching principles. Figure 4 presents the results for the homework assignments set by teachers during the 9th grade. Irrespective of the school track, these results illustrate that the focus on routine and practice considered typical of German mathematics classrooms is carried over to the tasks set as homework (Figure 4): In all school types, approximately half of the problems students are set are purely technical ones designed to drill routines. Yet the figure also shows differences between the school types, which are most pronounced for the class of conceptual

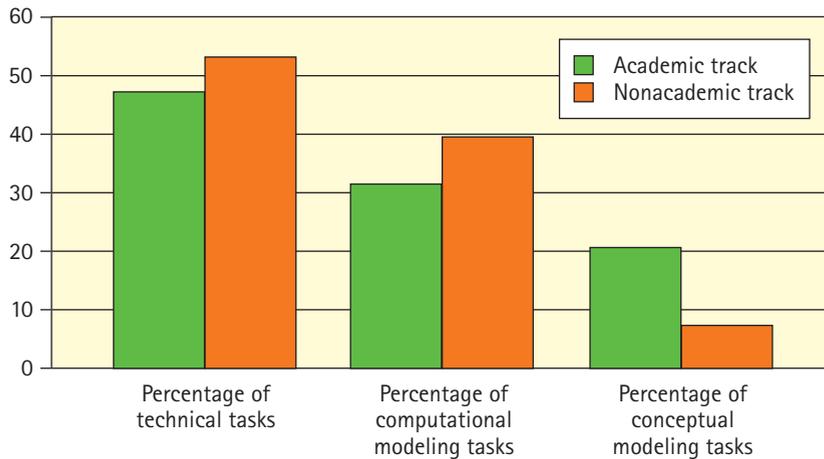


Figure 4. Distribution of the classes of homework problem set by teachers in academic track and nonacademic track.

modeling tasks. Only 7% of the problems set by teachers in nonacademic track schools were cognitively activating conceptual modeling tasks, compared with 21% of the problems set by teachers in the academic track. These differences remain even when controlling for the level of task difficulty.

Our results thus show that it is difficult to describe the state of mathematics teaching in Germany in general terms, as teachers' conceptions of instruction and the learning opportunities created in their classrooms differ remarkably across school tracks. The principle of cognitively activating teaching on which academic track teachers base their approach is indeed mirrored in the tasks that these teachers set for their students. Teachers in other school types seem reluctant to present their students with tasks that require active engagement with the content, and thus provide fewer opportunities for cognitive activation. Can we thus conclude that teaching in the academic track is in line with our conception of a powerful learning environment?

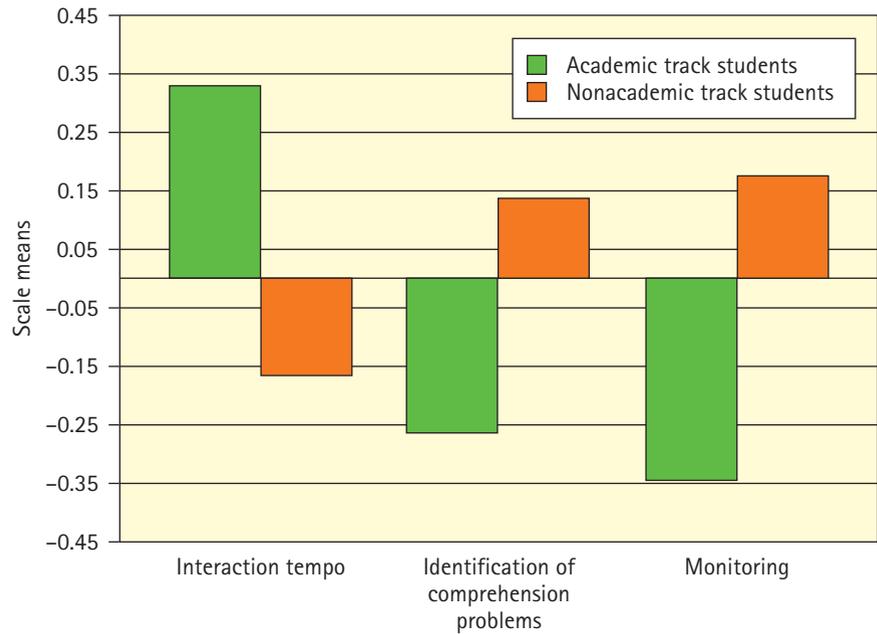
Our data indicate that the situation is not so clear cut. As mentioned above, challenging tasks alone do not suffice to initiate insightful learning processes. In order to foster students' cognitive autonomy and active construction of knowledge, teachers need to provide students with personal support by stimulating individual learning processes and assisting them when difficulties arise. The prerequisites for this kind of individual support are attentiveness to individual student problems, patience with every single student, and a respectful form of interaction that values the learner as an autonomous person—aspects we have subsumed under the support of autonomy and competence. As reflected by the teaching principles that they endorse, teachers in nonacademic track schools attach much greater importance to these aspects. Information as to whether this principle is actually put into practice in the classroom is best gained by reference to the students' reports.

In the following, we will thus present results from the COACTIV student questionnaire on mathematics

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Figure 5. Students' perceptions of support from their mathematics teachers by school type.



All scales have a mean of 0 and a standard deviation of 1, all differences are significant with $p < .05$.

lessons. In a written questionnaire, students evaluated aspects, such as (1) whether the interaction tempo gives them adequate time to think, (2) how well their teachers are able to diagnose the strengths and weaknesses of individual students and to identify comprehension difficulties, and (3) how well their teachers respond to student problems and distractions in lessons ("monitoring"). As shown by Figure 5, students at academic track schools consistently report lower levels of support from their teachers than do students at other school types. These data indicate that teachers at academic track schools seem to rely too heavily on their students' high levels of cognitive potential. They interact with their students in a high tempo that their students consider to be overtaxing and unreasonable, and tend not to actively monitor whether their

students are able to keep up. Teachers at other school types seem to be much more prepared to monitor their students' understanding, and to respond to individual difficulties. What are the implications of these findings as regards the prerequisites for insightful learning in mathematics lessons? First, our results indicate that truly powerful math instruction that supports independent and insightful student learning is a rather rare occurrence in German secondary schools. Second, mathematics lessons take very different forms in the different school types. Whereas, in academic track schools, the focus is on stimulating and fostering processes of comprehension, and teachers succeed in achieving this goal—to a certain extent, at least—through the tasks they select, mathematics teachers in other school types focus on practicing routines,

and give their students little opportunity to engage in the independent construction of knowledge. Nevertheless, students in nonacademic track schools seem to have a more positive attitude to math lessons; their teachers evidently do their best to provide students with personal support, an aspect which seems to be less well developed in academic track mathematics lessons. How might these contrasting patterns of instruction be explained? Our data suggest that teachers are not sufficiently able to gauge the potential of either mathematics problems or their students. With regard to tasks, German mathematics teachers seem to confuse the cognitive demands of tasks with their difficulty, assuming that challenging cognitive processes, such as mathematical modeling, are only possible with tasks requiring a high level of curricular knowledge. Consequently, particularly in the lower tracks, teachers fail to vary the cognitive demands of the problems they set, leading to the emphasis on routine exercises observed in COACTIV. At the same time, teachers seem to be under specific misconceptions as regards the potential of their students. For example, teachers at nonacademic track schools seem to assume that comprehension-oriented learning would overtax their students; thus, they focus on routine procedures. However, the findings of international educational assessments, such as PISA, indicate that this kind of approach might underestimate students' cognitive abilities. Indeed, results suggest that conceptual understanding is not simply a matter of general ability level—numerous

countries managed to foster conceptual mathematical understanding in the lower ability ranges much better than Germany. Teachers at academic track schools, on the other hand, seem to take the cognitive abilities of their students for granted, and to assume that they no longer require individual support, the upshot being that they tend not to individualize their instruction, even when setting cognitively demanding tasks. One possible effect of this lack of individual nurturing and support is also evident from the findings of PISA 2003. Students at academic track schools score lower on measures of math-related motivation (e.g., interest and achievement motivation) than do students at other school types. Although this phenomenon can probably largely be explained by reference group effects, it remains to be investigated whether these lower levels of domain-specific motivation result in students being less willing to engage in the critical and independent construction of mathematical knowledge.

To conclude, the findings from our investigation of mathematics teachers and mathematics lessons in Germany suggest that the necessary prerequisites for insightful learning are not fully in place in either academic or nonacademic track mathematics classrooms. Much could be gained from *integrating* the approaches of both school types. Future research will thus explore how it might be possible to balance cognitively demanding and individually supportive teaching, and to investigate the role that teachers' content and pedagogical content knowledge play in this relationship.

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Understanding comes from having a good representation

Novick & Hmleo



ENTERPRISE: Cognitive Activation in Elementary School Children: The Potential of Diagrammatic Tools

The ENTERPRISE project (Enhancing Knowledge Transfer and Efficient Reasoning by Practicing Representation In Science Education) aims to explore the conditions under which graphs and diagrams can serve as tools for structuring learning environments and, thus, foster conceptual understanding in science as well as other content areas.

It is now widely recognized that higher-order cognitive activities of humans, such as learning, reasoning, and transfer, are based on elaborated knowledge rather than on formal rigor (Haag & Stern, 2003). Knowledge dealt with in academic contexts is based on symbolic systems, such as script, formal mathematical language, pictures, and diagrammatic representations. Symbols can be understood as mental tools that allow for the construction of meaning in concepts, ideas, or plans. Within the mental-tool framework, understanding can be conceptualized as the ability to use representations in flexible ways. While pictures, number systems, and written language have a long tradition of use in human culture, visual-spatial tools, such as graphs and diagrams, were devised as tools for knowledge representation only about two centuries ago. Since then, space has been used to represent nonspatial information, particularly in formal domains, such as science and economics. Because computers have made the construction and modification of graphs and diagrams so easy, the frequency with which individuals encounter such representations has markedly in-

creased over the past decades. In view of this trend, cognitive science has been strongly committed to the research of diagrammatic literacy. Beyond the function of displaying information, however, diagrams and graphs can also serve as active reasoning and transfer tools (Stern, 2001). The ENTERPRISE project has put a major emphasis on the use of line graphs as powerful reasoning tools for understanding proportional scientific concepts, such as, among many others, speed, density, or the degree of concentration of different mixtures of liquids. Research was focused on elementary school children because the cognitive potential of this age group has long been underestimated (Stern, in press).

Line Graphs as Powerful Reasoning Tools: Effects of Different Contrasts on Understanding the Slope of Line Graphs

Line graphs are broadly disseminated in learning material dealing with topics of formal domains, such as science or economics. They are most appropriate for representing causal as well as incidental relationships between two variables. In Germany, students encounter line graphs as a means for data representation already in early secondary school, while core elements of graphs, such as the slope or the intersection on the y-axis, are part of the mathematics curriculum in 8th grade, when students learn to map linear functions on graphs. However, despite the value of graphs and diagrams as tools for knowledge structuring, reasoning, and problem solving, the competent use of such tools is not as widespread as would be

desirable (Stern, Aprea, & Ebner, 2003). In recent years, the interpretation of the slope of a graph could be shown as being within the reach of 4th graders (Koerber, 2003). It was therefore concluded that starting to use graphs already in elementary school might help students to gain deeper insight into the structure and the potential of these reasoning tools, and facilitate learning when, in accordance with the grade 8 mathematics curriculum, they start to use them for representing linear functions. Before students learn to map formulas on graphs, they should have been familiarized with their core elements, that is, the slope or the intercept. In an experimental training study, Anja Felbrich investigated methods of focusing students' attention on the meaning of the slope of the graph.

Students frequently confound the slope of a graph with its relative height or with the length of the line; they also tend to read graphs as pictures of situations. For example, if shown a distance-time graph, such as in Figure 1, with the visual appearance of a hill and asked to describe what happens, students will infer that a hill has been climbed, not recognizing the abstract nature of the relationship between the variables represented by the graph. Students who are not able to solve this problem lack the knowledge of graphs as mental tools with specific affordances and constraints. In order to appreciate a graph as a tool, one needs to understand its underlying structural principles and, thus, to know what actions and operations it affords, and whether and under

which circumstances certain constraints apply. One feasible method to learn abstract concepts underlying graphical representations is to learn from comparisons. Several studies have shown that *comparing or contrasting two cases* will facilitate insight and abstraction, lead to differentiated knowledge structures, and foster transfer of strategies. Figure 2 highlights how contrasts can shape the meaning. As learners actively construct and reconstruct their knowledge depending on new information offered by the environment, a recently acquired concept will be differentiated and shaped in correspondence with the new information offered by the learning material and, as a consequence, the learner's understanding of the con-

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This diagram shows the progress of a country walk.
Describe what happened!

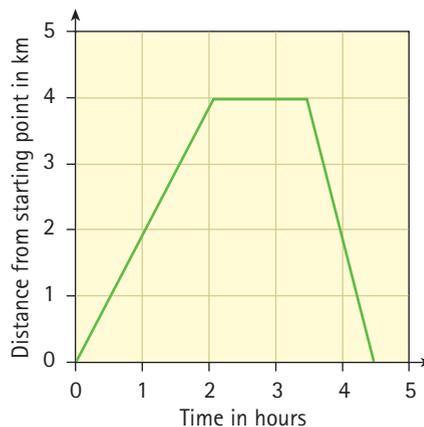


Figure 1. A source of misinterpretation of graphs.

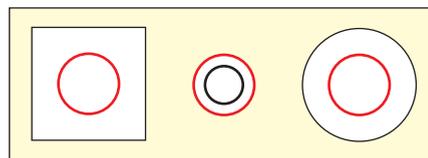


Figure 2. The contrast makes the meaning: What is the red object, a circle, a large circle, or a small circle?

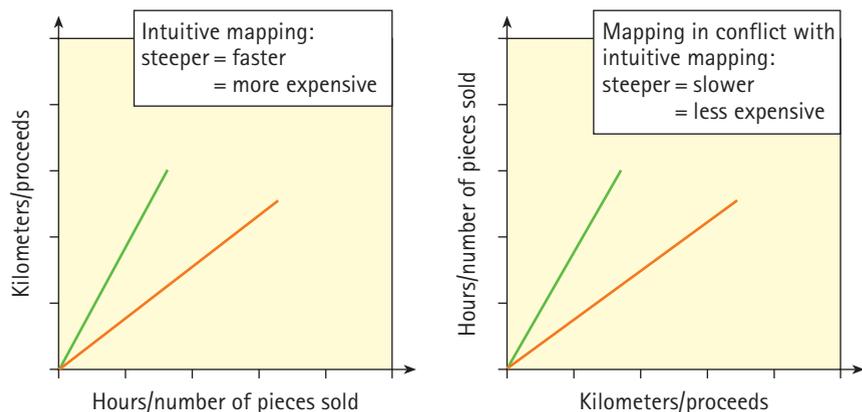
cept will change. Thus, for two learning opportunities to be considered as contrasting cases, an important constraint has to be satisfied: The second case has to highlight a new perspective and/or present new information with respect to the concept to be learned and, therefore, will have the potential of reshaping and furthering the current state of understanding. But what kind of information is perceived by the learner as being new or varying depends on the specific nature of the contrast, so that an efficient contrast has to be finely tuned to the learning goals. In designing learning environments which foster an understanding of graphs as tools it is, therefore, crucial to decide which elements or properties of graphs shall be contrasted. For developing an understanding of the slopes of line graphs as an integration of the information mapped onto the axes, two kinds of contrast were integrated in the learning environment.

Content contrast: A comparison of different meanings of the slope in different content areas highlights the fact that different proportional concepts, for example, speed or unit price, may be inferred from the

slope in a distance–time graph and in a graph showing proceeds and the number of pieces sold, respectively. With such a content-based contrast the learner is likely to perceive that the concepts mapped onto the slope are composites of variables mapped onto the axes, that is velocity as meter per second and unit price as proceeds per piece. However, this type of contrast also involves the risk of inappropriate overgeneralization. Although learners may come to perceive and interpret the slope as a (new) feature of graphs, they may conclude that the steeper line is always associated with a larger amount of the represented variable since both the faster speed and the higher unit price can be inferred from the steeper slope. The contrast in content does not focus on the meaningful integration of the two variables mapped onto the axes.

Structural contrast: A deeper understanding of the concept of slope can be fostered by contrasting two graphs, the content of which is the same while, in the second case, the assignment of variables to the axes is reversed. This switch of labels on the axes results in a reversal of the

Figure 3. This contrast thus highlights the specific ways in which information from the variables mapped onto the axes is integrated in the slope.



meaning of the slope, as shown in Figure 3. In the context of speed, the steeper slope now represents the slower speed since in this case it instantiates seconds per meter and not meter per second as in the first case.

In a study with more than 100 5th graders, Anja Felbrich tested whether students learning with the structural contrast do acquire a more flexible and transferable knowledge of the slope of a graph, compared to students learning with a content contrast. In order to test the cognitive potential of contrasts, an experimental training study was run, with four independent treatment group, and a baseline group who only did the tests but received no training. In the basic part of the two-afternoon training, which was the same for the four treatment groups, students were guided to discover that the relative speed of an object can be inferred from the slope of a distance-time graph. The second part of the training was different for the four treatment groups. For the no-contrast group, it was further practice with the same material. The structural-contrast group learned to integrate the information mapped on both axes. In the content-contrast group, the focus was on the applicability of the slope to different contexts. In the combined-contrast group, the variations of the content-group and the structural group were combined.

Prior to and after the training, two tests were administered where the slope of line graphs had to be interpreted. The Near-Transfer-Test contained items in a speed context, that is, the content area dealt with in the

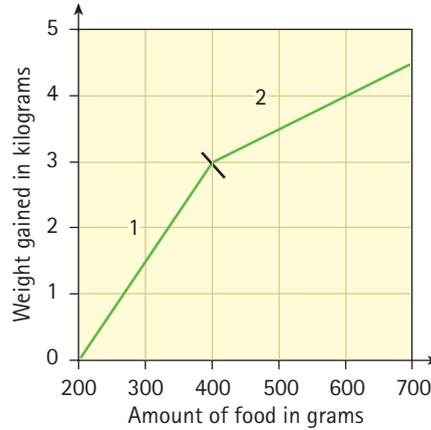
training, while the Far-Transfer-Test used contexts not covered by the training. In order to be able to differentiate between a flexible understanding of the slope (the meaning of the slope being derived from both axes) and a superficial understanding of the slope ("the steeper slope always represents more of something") the Far-Transfer-Test contained both possible ways of assigning variables to axes: "conventional mappings" in line with graphing convention and "unconventional mappings" violating these conventions. Examples of items are presented in Figure 4.

Results revealed that children participating in the four training groups significantly improved their performance on the Near-Transfer-Test as well as on the Far-Transfer-Test tests from pre- to posttest, while participants from the baseline group did not.

The four training groups did not differ regarding either the Near-Transfer-Test or the conventional mapping items of the Far-Transfer-Test. At the same time, however, the no-contrast group performed less well on the unconventional mapping items in the Far-Transfer-Test than the three contrast groups. Thus, it seems that students in the no-contrast group entertain a superficial decision strategy which enables them to perform well on items with a conventional mapping, but fails when the meaning of the slope has to be inferred from the assignment of variables to axes, as is the case for items with unconventional mappings. The same tendency is observable for the content-contrast group.

Figure 4. Sample item with conventional and unconventional mapping of variables to axes.

Use the diagrams to answer the question in the box!

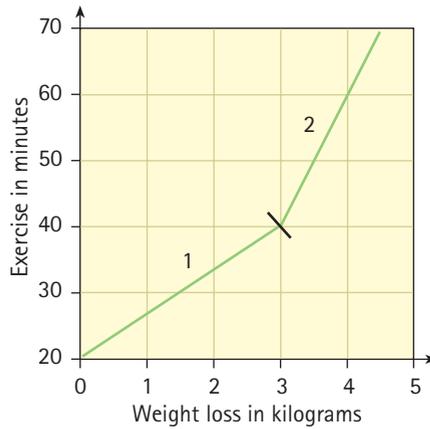


Conventional mapping

How many additional kilograms will the pigs gain in weight if they are given 100 grams *more* of food?
Fill in the spaces!

According to section 1:
_____ kilograms per 100 grams of food.

According to section 2:
_____ kilograms per 100 grams of food.



Unconventional mapping

How many additional kilograms will the person lose in weight if he or she exercises 10 minutes *more* than usual?
Fill in the spaces!

According to section 1:
_____ kilograms per 10 minutes of training.

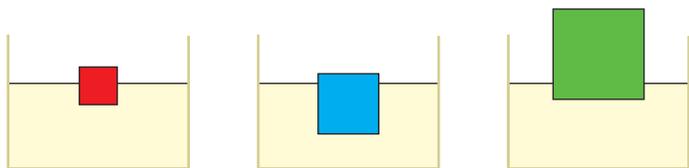
According to section 2:
_____ kilograms per 10 minutes of training.

The advantage of the structural-contrast group was revealed in the transfer test with unconventional mappings. However, combining both kinds of contrasts seems to overtax the ability of students, as no gains on the transfer test could be detected. Altogether, results suggest that 5th graders can acquire insightful knowledge about linear graphs in a learning environment which guides them in discovering structural elements of the graphs by contrasting cases.

How to Improve 3rd-Grade Students' Representational Competencies Within the Curriculum of Floating and Sinking of Objects

In recent years, learning environments for 3rd graders were worked out which support a basic understanding of the scientific concepts underlying the floating and sinking of objects in water, as there are buoyancy force and density. Results from a school study suggested that complex physics topics are already accessible to elementary school children on a permanent conceptual basis, especially if structured instruc-

Here are three cubes in water basins. They are made of different materials.



Which cube is made of the heaviest material? Make an X!

| | | | | | |
|----------|--------------------------|-----------|--------------------------|------------|--------------------------|
| red cube | <input type="checkbox"/> | blue cube | <input type="checkbox"/> | green cube | <input type="checkbox"/> |
|----------|--------------------------|-----------|--------------------------|------------|--------------------------|

Which cube is made of the lightest material? Make an X!

| | | | | | |
|----------|--------------------------|-----------|--------------------------|------------|--------------------------|
| red cube | <input type="checkbox"/> | blue cube | <input type="checkbox"/> | green cube | <input type="checkbox"/> |
|----------|--------------------------|-----------|--------------------------|------------|--------------------------|

Figure 5. An item from the test on floating and sinking which measures an understanding of density.

tion allows for an integration of students' preexisting and new concepts. At the same time, the study revealed certain deficits in the understanding of the concept of density, which were measured with items such as depicted in Figure 5. Many students still focused on weight and neglected volume. In a laboratory study, it was shown that especially a balance beam as a tool for representing two-dimensional concepts, as depicted in Figure 6, helped children to realize the inadequacy of their pre-conceptions as well as to integrate mass and volume to form the proportional concept of density (Möller, Jonen, Hardy, & Stern, 2002). Based on these results, the so-called integrative school study was run with 3rd graders to test the potential of the balance beam in classroom environments when integrated into the curriculum of floating and sinking, such as demonstrated in Figure 7. Similar to the curriculum worked out for the laboratory study, children

were trained in disentangling volume and mass by representing both dimensions with the help of Lego bricks on the two arms of the balance beam. On doing so, children learned that each kind of material can be represented at a fixed place on the arm of the balance beam. This helped children to understand that mass and volume have to be increased by the same factor in order to maintain the equilibrium of the balance beam. In independent groups, the effect of the balance beam was compared to that of self-constructed representations. In classrooms where self-constructed representations were practiced, students were equipped with a broad variety of material, such as paper, pencils, little bricks made of wood, and cardboards of different colours. The tests on understanding floating and sinking presented in the school study and the test for proportional reasoning presented in the laboratory study were used as pre- and

In collaboration with
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Angela Jonen
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Funded by the
German Research
Foundation (DFG)
in the BIQUA
priority program

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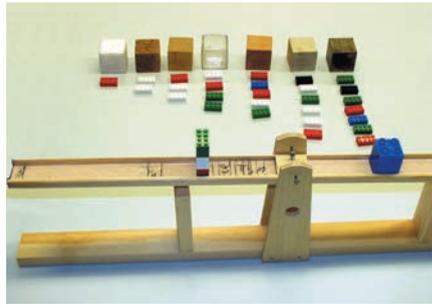


Figure 6. The balance beam represents different kinds of material.

posttest. Results of the altogether 98 students (each treatment was realized in two classrooms) revealed significant increases in both tests for both groups. No superiority of either form of representation was revealed (Hardy, Jone, Möller, & Stern, 2004). However, since the correct use of the balance beam is dependent on students' multiplicative additions on either end of the beam, they might get a deeper insight into the representation of two-dimensional concepts. It was hypothesized that students who had practiced representation with the help of the balance beam should have acquired some knowledge helping them to understand forms of representation which are based on similar princi-

Figure 8. A graph which can already be understood by 3rd graders.

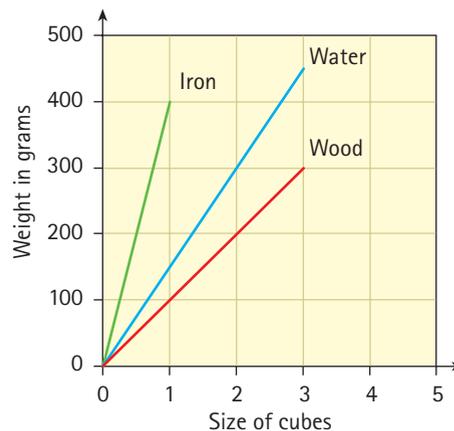


Figure 7. The balance beam in school.

ples, such as the graph of a linear function (Hardy, Schneider, Jone, Stern, & Möller, in press). Whether this was the case was tested in a follow-up study where a representative sample of 56 children from both groups received a short introduction on how to map the mass and the volume (labelled as weight and size of the cubes for the children) of certain materials on the axes of coordinate systems, and to construct a linear graph on this basis. A test on the use of graphs as reasoning tools in the context of density and speed was presented after the training. For instance, children were presented with a graph, such as depicted in Figure 8 and they had to predict whether an unknown material of size 2 and weight 400 will float or sink. Results revealed that students who had worked with the balance beam during the curriculum on floating and sinking outperformed students who had worked with self-constructed representations. This result suggests—in accordance with former findings—that the balance beam is an appropriate tool to support elementary school children's understanding of proportional concepts.

Contributions of the Center for Educational Research to the Preparation of New Research Fields

As a result of the PISA shock, the Germany Federal Ministry of Education and Research commissioned two reports focusing on research and practice which can be expected to improve school achievement.

(1) Fostering text and reading comprehension

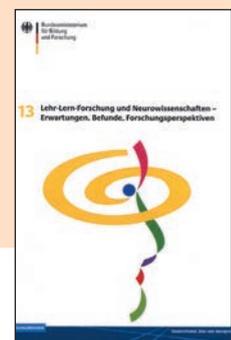
How can text and reading comprehension be improved among German students? Cordula Artelt was asked to bring together a team of experts that analyze approaches to fostering text and reading comprehension, leading to recommendations for approaches that might add to the projects already implemented in the federal states. Fourteen experts from different fields made contributions to the report, resulting in a recent overview over factors influencing text and reading comprehension from a developmental, a differential, and an intervention perspective. Against the background of the newly developed output orientation in the German school system, the report also looks at the potentials of systematic collaboration between schools and other institutions or groups to reach high standards in reading. There are different ways of supporting children in their processes of becoming expert readers. Instead of focusing a one-size-fits-all method, the report gives recommendations for the neglected content of interventions, and highlights processes of professional development and collaboration within schools as well as among schools and other institutions and groups to improve and supplement future attempts of improving text and reading comprehension among students in Germany.

(2) In what aspects can the neurosciences contribute to a better understanding of school learning?

In recent years, considerable progress has been made in understanding the neurobiological foundations of learning. Animal research allows researchers to investigate how the brain changes as a result of stimulus-response learning, and many of their findings can be expected to apply to the human brain as well. Yet, simple stimulus-response learning, despite its importance in everyday life, is not what is called for in schooling which, rather, relies on insightful learning based on the use of symbol systems as thinking tools. As yet, little is known about the brain functions typical for human beings. Brain imaging methods only provide a very rough insight in what happens when human beings show cognitive activities, such as reading, doing arithmetic, or solving problems. Despite this vague scientific basis, findings from brain research often give rise to more or less unfounded hopes concerning their direct use for improving school learning. Elsbeth Stern was asked to work out a perspective for research collaboration between scientists specialized on learning and instruction, on the one hand, and neuroscientists, on the other hand. Together with Roland Grabner, an experienced EEG researcher, she invited more than 20 experts to take part in a workshop discussing methods of brain research and their potential contribution to understanding school-related learning, compared to more conventional methods, such as achievement measures or observation of behavior. The conclusion reached was that, while no hints for short-term improvement of learning and instruction can be derived from brain research, collaboration may, in the long run, contribute to a better understanding of brain functions in cultural contexts.

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Public Understanding of Science: Activities of the Center for Educational Research in Disseminating Important Results on Learning and Instruction

After the publication of the PISA report in December 2001, the Research Center got into the spotlight of public attention. Germany was not only shocked by its average ranking in academic achievement but also by two other prominent results: the underrepresentation of German students on the highest achievement level and their overrepresentation on the lowest level. The whole country called for explanations, and the PISA group was flooded by invitations for talks and interviews. Around 80 presentations were given in 2002. It was remarkable that invitations did not only come from schools, centers for teacher education, and politicians but also from institutions that traditionally are not concerned with questions of classroom education, for example, trade unions, employers' associations, and large companies. In the years 2003 and 2004, public interest increased even further. In these two years, more than 100 presentations and more than 30 interviews in newspapers were given by members of the Research Center at the following occasions: Workshops for teacher education; Meetings of school administrators and/or school principals; Meetings of politicians responsible for education; Conferences for applied education; Institutions for adult education; Meetings of business organizations, such as trade unions or employer associations

For many years, German educational traditions were dominated by the humanities rather than by empirical research. At the same time, public discussion about education was driven by contrasting ideological beliefs. Given this background, the opportunity of presenting the basic ideas of an education based on scientific evidence was taken very seriously by the members of the Center. By presenting the audience with a broad variety of methods of data collection and data analysis, it was demonstrated how empirical data can constrain decisions for designing educational systems in case of contradicting beliefs and opinions.

The common message of all presentations was that the highest priority for change is on a content-gearred improvement of learning environments at school. Improving academic achievement means that teachers have a core role: They have to present their students with tasks which foster cognitive activation. No reform of the school system can ever be expected to succeed without tackling learning environments.

A major message of presentations based on results of the TIMS Video Study was that classroom interaction can be investigated in a scientific way, and that we now know that the kind of instruction most German students have experienced is not typical for the instruction in more successful countries, such as Japan. The so-called questions-developing teaching style typical for Germany means that teachers only accept answers to their questions which fit into their own knowledge system. Those who criticize this teaching style call it the "Easter-bunny-pedagogy," which means that teachers hide knowledge and students have to search for it.

Presentations of the longitudinal BIJU and TOSCA projects focused on the effects of differential opportunity structures as provided by the highly differentiated school system in Germany, the effects of the so-called vocational Gymnasium in terms of broadened access to university education, and the role of minimum achievement standards for school evaluation and development.

The main message of the ENTERPRISE project was that early education should aim at laying the foundations for knowledge construction. For science and mathematics this means that children have to be involved in activities that allow them to develop basic concepts which later can be re-structured and extended.

„Bildungsstandards sind revolutionär“

n Instituts für Qualität im Bildungswesen, über Leistungstests, Gesamtschulen und die bevorz
s. L. zum Trotz – nichts tut eine höhere *allgemein* arbeit. Auch Fo
Lernfähigkeit im Kindesalter. Vieles spricht sogar

sehen
BT ES BEI TOSCA BESSERE NOTEN FÜR DAS LAND

mnasien
? Studie stellt beruflichen Gymnasien ein gutes Zeugnis
Bildungsforscher: Wichtiger Beitrag zur Modernisierung des Bildungssystems – Chance zum Ausgleich sozialer Unge
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nders lernberei
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Durchführung eines „Ja-
Stadtteilen Oslebshausen,
Gröpelingen, Huchting und
Horn. Die Camp-Teilnehmer
haben im Einzelnen die tür-
Zeichens Leiter der Pisa-Stu-
die. Auf die Kinder, die täg-
lich mit dem Bus von zu
Hause zum Naturerlebn-
stündigen Deutschunterricht.
Die Mehrzahl der Kinder
wird in Deutsch als Zweit-
sprache unterrichtet. Einige
Teils ist eine am
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Anwesenheit der E
findende Theater
Das Motto d

Nach der Pisa-Studie: Unterricht auch in den Sommerferien

Großes „Jacobs-Sommerncamp“ mit 150 Bremer Kindern in Hepstedt, Verden und Syke

Schul-Schockierer mit guten Absichten

Einblick ins Max-Planck-Institut für Bildungsforschung, das die Pisa-Studie verantwortet

Was Hännschen lernt

Die Kognitionspsychologin Elsbeth Stern erforscht, wie Kinder sich Wissen aneignen / VON REINHARD

Arzte trinken Pipi.“ Große Heiterkeit in der Cafeteria des Berliner Max-Planck-Instituts für Bildungsforschung. Ein Vater zitiert seinen dreijährigen Sohn, der wegen einer Blasenentzündung ins Krankenhaus eingeliefert wurde. Anschließend verkünden die Ärzte, dass der kleine Hännschen lernbereit, wie uns einige Vertreter der „Neu-

Max-Planck-Institut für psychologische Forschung in München arbeitete sie sieben Jahre lang, bis sie 1994 einen Lehrstuhl für pädagogische Psychologie an der Universität Leipzig übernahm und 1997 nach Berlin wechselte. Auf dem Weg zu ihrem Lernlabor referiert Stern eine der Grundregeln der „Neu-

nicht wirklich sicher verarbeitet. Daher ist für Stern der Umgang mit Schwächen und Fehlern die Nagelprobe für die Intelligenz der Schule. Dürfen sich Schüler so zeigen, wie sie sind, ohne Nachteile zu befürchten? Oder werden sie sich bemühen, als wüssten sie besser?

Der „interessante“ stammt aus einer Studie des Schweizer Fritz Oser. Forscher wollten wissen, was die Kinder von dem Lehrer auf das Lernen zuhören.

sen sich einige
punktprogramm

»Mehr Mut zu Experimenten!«

Ein Gespräch mit dem Erziehungswissenschaftler Jürgen Baumert über Gesamtschulen, Leistung und Gerechtigkeit

Projects of W. Edelstein, Director Emeritus

Rise of a Right-Wing Culture Among German Youth: Prevention Through Quality Education?

Right-wing extremism has been on the rise in Germany during the past decade, especially among young people in the Eastern provinces. Numerous studies have shown that racist, xenophobic, and anti-Semitic attitudes have extended beyond the groups originally most affected by prejudice, and reached toward "the center of civil society" (Heitmeyer, 2002; Bromba & Edelstein, 2001). In the recent provincial elections in the East, the nationalist and xenophobic right obtained a significant proportion of the vote—up to 25% in some voting districts in Saxony, and well above that number among young male voters in some places.

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Both government agencies and civil society have attempted to counter the right-wing attacks: through police action, policy measures, and the funding of organizations dedicated to the service of democracy, citizenship education, and tolerance. What has been lacking, however, is preventive action and planning that reach beyond the problems and incidents of the present.

Effective prevention, however, presupposes a theoretical base which permits a historical, social, and psychological reconstruction of causes for the rise and expansion of right-wing mentalities, attitudes, stereotypes, and dispositions. Based on interdisciplinary approaches which originated in Elder's work on *Children of the Great Depression* across the lifespan (Elder, 1974; Elder & Caspi, 1988) and in our own longitudinal work on *Individual Development and Social Structure* in Iceland (e.g., Edelstein, Keller, & Schroeder, 1990; Edelstein, 1999), we have constructed a model of the multiple and interacting causes and antecedent conditions for adolescent vulnerability leading to the development of dispositions and mindsets that are

typical for right-wing youth in Germany—and in a number of other societies, in particular in Eastern Europe. In various forms, these appear typical of youthful rebels around the world (Larsen, Brown, & Mortimer, 2002; Larsen & Verna, 2002). Important features of the model comprise the interaction between long historical processes (the corrosion of tradition, the rise of individualism, and the expansion of anomie), cohort effects (the downfall of socialism in the East), context effects (socioeconomic deprivation in postunification Eastern Germany), and proximal factors constituted by the psychological implications of socialization (attachment patterns, identity formation, and the experience of schooling in the East). These factors, at the various levels, are empirically well supported (Edelstein, 2005).

Keeping vulnerable groups from attraction to right-wing causes and affiliations in adolescence calls for a substitution of those conditions that trigger the emergence of extremism and violence and that provide compensation for the experience of humiliation and exclusion. The com-

pensation for the right is provided by a sense of community, often enhanced by nazi rock music and feelings of superiority and negative affect toward those perceived as inferior, foreign, or weak. Violence plays a major role in this experience (Frindte & Neumann, 2002; Heitmeier, 2002, 2004).

School provides an important experiential context for the emergence of right-wing groups and associations. Various studies have shown that the number of youths embracing right-wing positions increases as schools fail to provide an experience of community, opportunities for participation, and teacher trust. In such schools, learning is perceived as meaningless, boredom is intense, and hope for the future is limited. In short, these schools are hotbeds of anomie-generating experiences (Sturzbecher, 1997, 2001).

As a response, a program of school development was proposed to the Joint Federal and States' Commission on Educational Planning and Research (BLK), which was designed to provide at least some of the opportunities for citizenship learning and participatory experience strongly felt to be lacking in many German schools (Edelstein & Fauser, 2001). The proposal passed the Commission in 2002 and the program was adopted by 13 out of the 16 States, with the Federal Ministry of Education providing one half of the proposed five-year budget of some 6 million Euro. The program was named "Learning and Living Democracy." It consists of four modules: instruction for democracy (including organizational elements, such as interactive course planning or mutu-

ally agreed portfolios); projects or workshops; school democracy and participatory processes; and democratic experiences in the community such as service learning. Teachers are offered advanced training opportunities involving a dozen areas of concern from self-efficacy to civic learning, from the skill of conducting dilemma discussions to self-evaluation of schools. Further, high-level training is provided to a set of some 150 expert teachers who will be certified as democracy agents serving the transfer of viable products and processes developed in the roughly 170 program schools. Each State entertains between one and four school sets including five or six schools each, with a coordinator organizing each network. The 25 network coordinators provide the organizational backbone of the program, which is served by a central agency located at the Department of Education, Free University of Berlin. The program necessarily transcends the original aim motivating its construction. It reaches beyond the need to respond to the peril of right-wing youth development with an attempt to provide models of democratic citizenship education in high-quality school settings. The focus is on transfer. In sum, the program represents a conception of experiential and situated learning for competence in a participatory institution. Derived from constructivist developmental theory and best practice models of democratic school reform, it marks a step toward quality schools where pupils feel respected as well as motivated for better performance.

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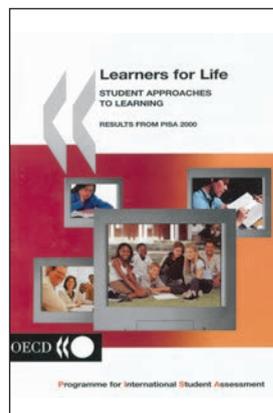
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Contents

| | |
|---|-----|
| Introductory Overview | 155 |
| Lifespan Psychology: Implications for Conceptions of Intelligence and Cognition | 159 |
| The Mastery of Life: Selection, Optimization, and Compensation (SOC) | 164 |
| Research Project 1 Intra-Person Dynamics Across the Lifespan | 166 |
| Research Project 2 Sensorimotor-Cognitive Couplings | 174 |
| Research Project 3 Berlin Aging Study (BASE): Trends and Profiles of Psychological Aging | 180 |
| Research Project 4 Selection, Optimization, and Compensation (SOC): Regulation of Goals and Preferences in Lifespan Development | 186 |
| Research Project 5 Interactive Brains, Social Minds | 194 |
| Research Project 6 Wisdom: The Integration of Mind and Virtue | 196 |
| Research Project 7 Toward a Psychological and Developmental Theory of Lifespan-Longing (Sehnsucht) | 201 |
| Integrative Project History, Theory, and Method in Lifespan Psychology .. | 205 |
| Publications 2003–2004 | 208 |

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But ... its eminent modifiability, and its predisposition to self-initiated action, may it develop little or much, and may it differ in amount between different individuals, is among the immutable features of humankind, which can be found wherever humans exist.
Johann Nicolaus Tetens, I, p. 766



J. N. Tetens (1736–1807), philosopher of the Enlightenment Era

Introductory Overview

The Center for Lifespan Psychology was created in 1981 when Paul B. Baltes was appointed Director. Ulman Lindenberger joined the Center as incoming Director in Fall 2003 and took over full responsibility as the Center's new Director in Summer 2004. Research and theory of the Center for Lifespan Psychology is conducted primarily from the perspectives of the field of developmental psychology. A special focus of the Center is on the study of plasticity (modifiability) of human behavior across the entire lifespan, including its societal and neuronal correlates, antecedents, and consequences (see Figure 1). The Center has been a major player in advancing the fields of lifespan psychology and the study of aging. It continues to pay special attention to the age period of late adulthood and old age, which offers unique opportunities for innovation, both in theory and practice.

Conceptual Orientation

The psychology of the ages of life, from childhood to old age and their interconnections, is the substantive scope of developmental psychology. Developmental psychologists aspire to understand the behavioral, men-

tal, social, motivational, and interpersonal characteristics and processes that constitute, accompany, and modify lifetime development. Major sources of lifespan development include (a) the long-term (distal) consequences of biocultural evo-

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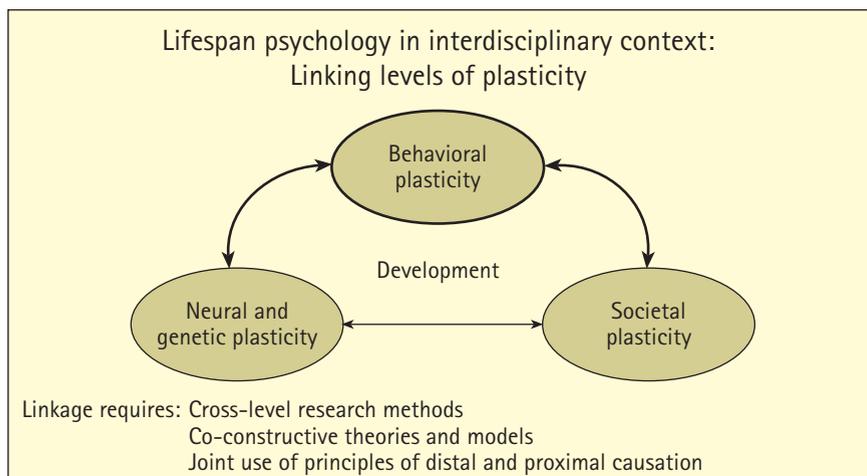


Figure 1. Lifespan development as bio-cultural co-construction. A central goal of lifespan psychology is to describe, explain, and optimize human potential and to identify its societal and neural causes and consequences. See also Baltes (2004), Li (2003), and Lindenberger, Li, and Bäckman (in press).

lution as expressed, for instance, in genome-driven brain plasticity and (b) the ongoing opportunity and inequality structures of society at large, and especially the more proximal microenvironments, such as families, friendships, schools, universities, firms, senior homes, and residential locations within which individuals live. In addition, the role of individual factors and processes, such as individual differences in learning histories, mental capacities, motivation, self-regulation, and strategies of life management take center stage when psychologists attempt to understand the course of life, including its many variations and faces.

As illustrated by the foregoing observations on the general sources of human development, developmental psychologists concern themselves primarily with the more proximal sources of individual behavior during the lifespan. However, to achieve a fuller understanding of individual development, it is necessary for developmental psychologists to engage themselves in collaborative efforts with the biological and the social sciences. This is the special opportunity of the transdisciplinary view of human development that guides work in the four centers of the Max Planck Institute for Human Development. In this vein, there has been considerable interaction of scientists in the Center for Lifespan Psychology with researchers in the other centers or from other institutions. A good example is the Berlin Aging Study in which medical researchers and behavioral and social scientists collaborate in the pursuit of knowledge about human aging in a changing

society. In 2004, the Max Planck Institute for Human Development was coopted to the Berlin Neuroimaging Center, a multisite center funded by the Federal Ministry of Education and Research also involving the Charité (University Medicine Berlin) and the Physikalisch-Technische Bundesanstalt. In a newly established project of the Berlin Neuroimaging Center, researchers from the Center for Lifespan Psychology, the Charité, and the Karolinska Institute at Stockholm are cooperating to identify neurochemical correlates of adult age differences in behavior and cognitive plasticity.

During the recent decade, lifespan and life-course research have become a major focus of the Institute's research profile. This emerging focus has led to an increased cooperation between all centers. The shared overall framework is the coordination of several lines of inquiry—psychological, sociological, educational, and, in cooperation with other institutions, neuronal—to understand the evolution and ontogeny of human behavior.

A sample of questions that developmental psychologists typically study is the following:

- How do nature and nurture interact in determining development, such as the emergence of the mind?
- How do relations between body and mind change with age?
- How and why do functions, such as intelligence and memory, vary within and across individuals, and how and why do they change with age?
- What are the special bodies of knowledge and dispositions, such

as life skills and wisdom, that make for successful aging?

- How and to what end do individuals acquire and maintain a sense of personal control? How do they plan and manage their lives?
- How do aging individuals cope with rapid technological change, and how can human engineering technologies facilitate the transition to old age?
- How do young children learn to coordinate their behavior with others, and how does interpersonal action coordination affect social and cognitive development?

These and similar questions are pursued with the aim to identify both the commonalities and the between-person differences in human development. The human condition is regarded as co-constructed by biology and culture and, therefore, offers much room for nonnormative (idiosyncratic) choices and pathways. In this spirit, additional topics of great concern are the ways by which individuals and their close partners can improve their own development as well as that of others.

What is special about the general research orientation that scientists in the Center for Lifespan Psychology display and use as mental scripts?

The theoretical and methodological perspectives and research agenda of the Center are summarized below in seven propositions. These propositions reflect what may be considered the theoretical framework of lifespan psychology (Baltes, 1987, 1997; Baltes, Lindenberger, & Staudinger, in press; Li, 2003; Lindenberger, 2001).

(1) Human development is viewed as occurring throughout the lifespan,

implying cumulative-continuous as well as innovative-discontinuous developmental processes and outcomes.

(2) The process of human development from childhood into old age is considered to be an age-related change in adaptive capacity, in which there is a continuous interplay between growth (gains) and decline (losses).

(3) Understanding psychological development requires theoretical models that are often identified as contextual, interactive, or dialectical. For example, ontogenetic development occurs in the context of bio-social systems that exert biocultural influences. Three macrostructural components are particularly relevant: (a) social change, (b) the system context provided by familial and/or generational transmission, and (c) the lifespan ecologies associated with social settings, such as the family, school, work, leisure, health care, and retirement.

(4) The plasticity or basic potential of development (i.e., its range and constraints) is a central focus of investigation. Of major concern are studies exploring the functional range within which individual developmental processes can be influenced. Objective and subjective knowledge about developmental plasticity (in either a positive or a negative direction) is essential for the formulation of strategies optimizing human development.

(5) Human activity and goal orientation during lifespan development are other conceptual emphases that guide the Center's studies. Such an emphasis makes explicit the role that individuals play as producers of

development—both their own as well as that of others.

(6) Another conceptual orientation is the notion of interactive minds. This orientation, an orientation that has much in common with the field of cultural psychology, reflects the notion that the psychological nature of the social context of human development is essentially collective and involves internal as well as external mechanisms of social transactions and collaborations.

(7) Understanding the nature of human development is facilitated by a perspective that attempts to link components of functioning into an integrated whole, that is, the individual. To this end, the search for general models of successful development and aging is a leitmotif of

research in the Center. One such model currently under investigation postulates that selection, optimization, and compensation constitute key functional elements of the developmental process. It is argued that their dynamic coordination and orchestration results in successful development, that is, the maximization of gains and minimization of losses across the lifespan.

The following summary of the research programs of the Center is selective rather than comprehensive. Its purpose is to highlight samples and illustrate the lines of inquiry that Center scientists pursue in making a contribution to research and theory in lifespan psychology as well as its implications for social policy and the future of humankind.

Lifespan Psychology: Implications for Conceptions of Intelligence and Cognition

Lifespan conceptions of intelligence provide a first general theoretical orientation of the research conducted at the Center (Lövdén & Lindenberger, 2005). One domain of psychological research that has undergone major changes in theoretical orientation during the last decades is the psychology of intelligence. Research on lifespan intelligence was one of the contributory sources for this change. To illustrate, the psychometric tradition of intelligence testing pioneered, for instance, by Stern and especially Binet close to 100 years ago is very much ingrained in people's everyday thinking of intelligence. In the minds of the general public, being smart and having a high IQ (Intelligence Quotient) is synonymous. In contrast, over the last couple of decades, the climates of the scientific inquiry about intelligence have shifted from the IQ-based tradition—usually measured with respect to limited sets of abilities associated primarily with academic performance and work productivity—to broader inquiries about the contextual and functional aspects of intelligence and its underlying cognitive, social-interactive, and neuronal sources. A new and productive integration of the psychometric, cognitive-psychological, cognitive-neuroscience, and ecological traditions is in the making.

Implicit in the psychometric approach is a focus of measuring intellectual abilities, as opposed to understanding the causes, contexts, and functions of intelligence. Specifically, this approach views intelligence as reflecting a collection of static abilities that characterize a person, as opposed to a dynamic system of contextualized and adaptive cognitive functions that individuals continue to acquire throughout their life course. One aspect of the Center's research program focuses on the theoretical and empirical investigations of lifespan intellectual development. This program has contributed to the conceptual shift in intelligence research by reconceptualizing intelligence as a system of contextualized and ontogenetically driven adaptive cognitive functions. We pursued several lines of inquiry in our search for a dynamic view of

intelligence that is both contextually and lifespan sensitive. Originally, our approach was guided by cognitive training research demonstrating more plasticity of the aging mind than is commonly assumed, and subsequently by age-comparative research on limits of functioning confirming the existence of a lifespan function of cognitive plasticity (Baltes, Lindenberger, & Staudinger, in press). Meanwhile, we have broadened this approach by adding new theoretical orientations, if not new conceptions, that stem from efforts to further integrate cognitive experimental and contextual thinking with the psychometric traditions of intelligence testing.

A key characteristic defining intelligence and intelligent behavior is its adaptive value in novel situations. Lifespan contexts include continuity and change in contexts of adapta-

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tion. In old age, for instance, an increasingly larger share of cognitive resources is invested into maintaining bodily functions rather than “academic” pursuits. Seen from this perspective, intelligence is intrinsically related to a lifespan perspective of human development that considers development as a process within which individuals continue to adapt their bodies of factual and procedural knowledge to changes and transformations in biological, environmental, and cultural constraints that inevitably take place throughout their life course.

In this spirit, and by extending the Cattell–Horn theory of fluid–crystallized intelligence (Cattell, 1973), we have presented a new dual–process model of intelligence (Baltes, Staudinger, & Lindenberger, 1999; Krampe & Baltes, 2003; Lindenberger, 2001) that highlights two distinct, but interacting dimensions of intellectual functioning (see Figure 2): the biologically driven cognitive mechanics and the culture–based cognitive pragmatics of the mind. On the one hand, the cognitive

mechanics are basic information–processing primitives for the memorizing and learning that people are capable of. They reflect the neurophysiological architecture of the mind as it has evolved during biological evolution. The speed, accuracy, robustness, and coordination of elementary information–processing mechanisms index cognitive mechanics. The primary substrate of cognitive pragmatics, on the other hand, is culture–based knowledge that is acquired through cultural learning and life experiences. Prototypical examples of cognitive pragmatics are being able to speak and understand the social implications of language, to acquire the knowledge and skills related to professional expertise, or the kind of life skills that are necessary to navigate the modern world.

In the following, we describe two general lines of our ongoing research aimed at extending conventional models of intelligence from the perspective of lifespan psychology. The first line of research focuses on the relations between cognitive mechanics and pragmatics with biological and cultural factors and their differential lifespan trajectories. A second line of research that has been motivated by our concept of the cognitive mechanics is the investigation of resource management in sensorimotor functioning. A third line, which comprises the study of wisdom of life longings, is described in the project reports.

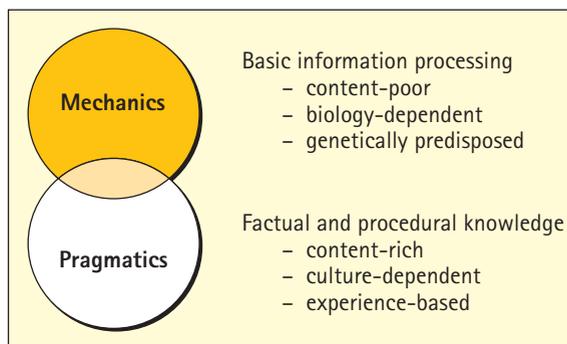


Figure 2. The dual–process model of lifespan intellectual development distinguishes between the cognitive mechanics and pragmatics of intellectual functioning (adapted from Baltes, Staudinger, & Lindenberger, 1999).

Sources of Age Differences in Cognitive Mechanics Versus Pragmatics

To test the dual-process model of lifespan intellectual development, our research, thus far, directly examined the relations between these two aspects of intellectual functioning and biological and cultural factors, and their differential lifespan trajectories. In our view, sensory and intellectual functions are closely related when cognitive primitives (mechanics) are operative in the task at hand. Congruent with this expectation, our empirical findings show that among old adults basic sensory processing is much more highly correlated with the cognitive mechanics than with cognitive pragmatics (see Figure 3). In contrast, sociobiographical predictors correlate more with cognitive pragmatics than with cognitive mechanics (Lindenberger & Baltes, 1997). The association between the more biology-based sensory-sensorimotor processes and cognitive mechanics is a robust phenomenon that generalizes to measures other than the average level of performance.

For instance, within-person week-to-week fluctuations in old people's sensorimotor performance also correlate highly with the cognitive mechanics. Accordingly, old people who varied more in their walking performance from week to week showed worse episodic and spatial memory (Li, Aggen, Nesselroade, & Baltes, 2001).

Given that biology and culture co-contribute differentially to the mechanics and pragmatics of intelligence, investigations of how these two aspects of intellectual functioning develop, maintain, and decline throughout life could offer insights into the complex and co-constructive interplay between the individual's biological and cultural "inheritances" in development (Baltes, Reuter-Lorenz, & Rösler, in press; Li, 2003; Li & Lindenberger, 2002). Drawing data from a lifespan sample covering the first to the eighth decades of life, we found differential lifespan trajectories for cognitive mechanics and pragmatics in line with our theoretical expectations. As is true for research on the fluid-crys-

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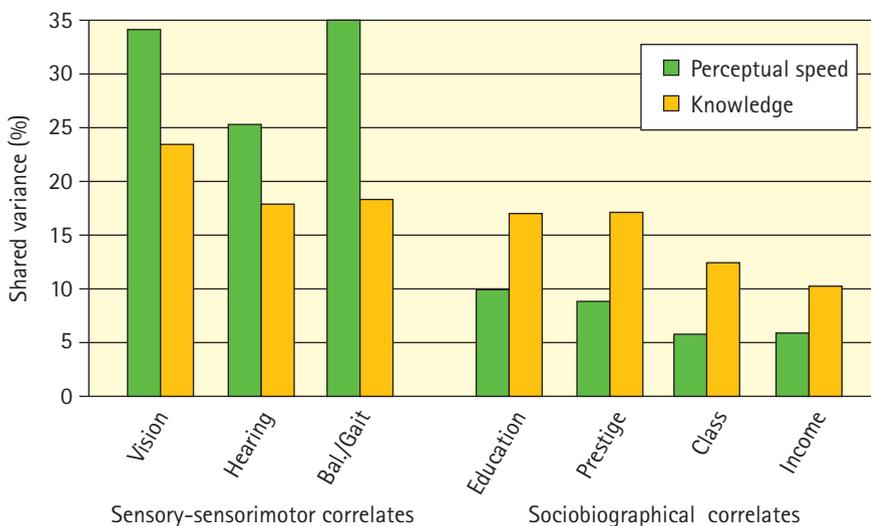
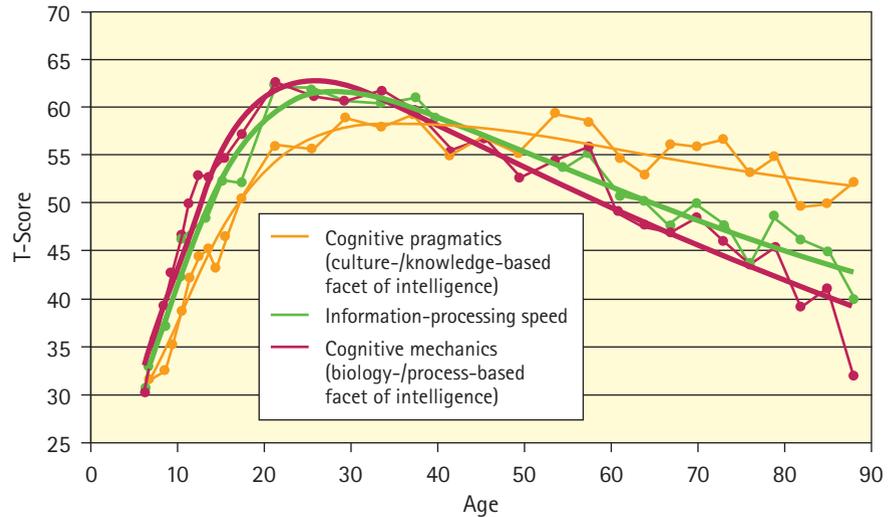


Figure 3. Differential correlational links of perceptual speed (a marker of the mechanics) and verbal knowledge (a marker of the pragmatics) to biological and sociobiographical indicators in old age (adapted from Lindenberger & Baltes, 1997).

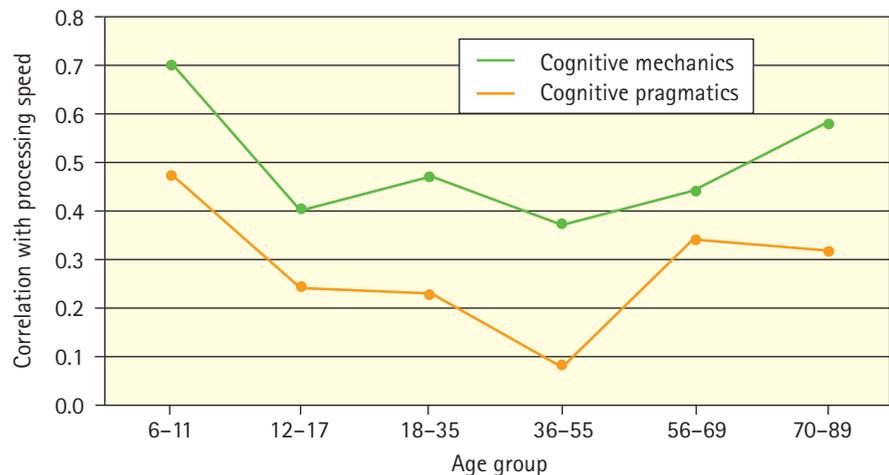
Figure 4. Lifespan age gradients of cognitive pragmatics, cognitive mechanics, and processing speed (adapted from Li et al., 2004).



tallized distinction, cognitive mechanics display an earlier growth pattern up to early adulthood. The growth of cognitive mechanics primarily driven by brain maturation can then be invested into the acquisition and refinement of culture-based cognitive pragmatics. However, because of their close ties to biology and genome-based determinants, continuous losses of cognitive mechanics start early in adulthood. In contrast, the culture-based pragmatics, represented by the abilities of knowledge and language, have a

later onset of decline which is less pronounced. In old age, however, the role of biology-based cognitive mechanics in regulating the cognitive pragmatics increases (Ghisletta & Lindenberger, 2003). Details in our evidence have provided further empirical support for the neurobiology versus acculturation distinction between these two domains of intelligence (Li, Lindenberger, Hommel, Aschersleben, Prinz, & Baltes, 2004). The lifespan age gradients of information-processing speed correspond very well with the age gradient of

Figure 5. Correlations between processing speed, cognitive mechanics, and cognitive pragmatics across six continuous age groups (adapted from Li et al., 2004).



cognitive mechanics, but much less so with cognitive pragmatics (Figure 4). Furthermore, overall information-processing speed correlated more highly with cognitive mechanics than with cognitive pragmatics, and especially at both ends of the lifespan (Figure 5).

Lifespan Differences in the Allocation of Cognitive Resources

In addition to the efficiency of basic information processes, the category of cognitive mechanics also encompasses the allocation of cognitive resources. Flexible resource allocation is especially important whenever the individual is faced with multiple tasks or situational constraints. An example of these tasks or situational demands comprises of basic sensorimotor functions, such as maintaining balance or walking while talking to a friend. Everyday life, for the most part, consists of such multi-task situations. In the context of lifespan development, age brings with it different adaptive demands for individuals at different parts of their life course. Basic sensorimotor functions, such as postural stability and walking accuracy, lose efficiency in later adulthood because of decreased muscular strength and reduced peripheral vision, as examples. As a corollary, we argue that such emerging deficits in the coordination of bodily functions require more and more cognitive resources. To illustrate: In our studies, we systematically combined sensorimotor tasks of varying difficulties (i.e., walking with or without obstacles, balancing on a stable or moving platform) with cognitively demanding tasks (memorization) (K. Z. H. Li, Lindenberger,

Freund, & Baltes, 2001; Lindenberger, Marsiske, & Baltes, 2000). Using dual-task and training research paradigms, the results suggest that older adults invest considerable cognitive resources to compensate for the decreased efficacy of their sensorimotor functions. On a larger scale, we assume that in later adulthood a considerable amount of cognitive resources, such as mechanisms for attentional control, tends to be permanently captured by sensorimotor functions that are predominantly automatized in younger adults. Unfortunately, these cognitive resources also decline with advancing age. In combination, these two classes of changes result in increasing demands on decreasing resources, and constitute the quandary of behavioral aging (e.g., Lindenberger, Marsiske, & Baltes, 2000). In our view, a key purpose of human engineering technologies is to attenuate the adverse effects of this quandary on development in later adulthood, old age, and very old age. Progress toward this goal requires the integrated consideration of sensory, motor, and cognitive changes (Lindenberger & Lövdén, in press).

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The Mastery of Life: Selection, Optimization, and Compensation (SOC)

A second general theoretical orientation of research in the Center for Lifespan Psychology is motivated by the question of how people develop successfully and avoid negative outcomes. To gain a better understanding of the factors contributing to successful development, that is, the simultaneous maximization of gains and minimization of losses, we attempt to specify the behavioral and cognitive strategies by which people, individually and collectively, master their lives. The focus of our theory is on the orchestration of selection, optimization, and compensation.

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According to the model of selection, optimization, and compensation (SOC), originally articulated by Paul and Margret Baltes (1990; Baltes, 1997) and developed further by Alexandra Freund (Freund & Baltes, 2000), Ralf Krampe (Krampe & Baltes, 2003), Michaela Riediger (Riediger, Li, & Lindenberger, in press), and others, successful development encompasses the selection of functional domains on which to focus one's resources, optimizing developmental potential (maximization of gains) and compensating for losses, thereby, ensuring the maintenance of functioning (minimization of losses).

The SOC model constitutes a general model of development defining universal processes of developmental regulation. These processes vary phenotypically depending on socio-historical and cultural context, domain of functioning as well as on characteristics of the system or unit of interest (e.g., person, group, society). The metatheory of SOC needs to be embedded in a specific theoretical framework for applying it to various domains of functioning (e.g., identity formation and maintenance, social relations, athletic performance) and to different levels of

analysis (e.g., societal, group, or individual level).

On a macroanalytical level, it is possible to apply SOC-related perspectives to questions of societal functioning. How do the American, German, and Japanese cultures differ in goals, ways to optimize, and strategies of compensation? This would be one example for a macroanalytic comparative study. An example of a microanalytic level approach to the study of SOC would be the investigation of cognitive and motor performance in dual-task conditions, and the way people of varying ages allocate resources differentially to memory and walking (K. Z. H. Li, Lindenberger, Freund, & Baltes, 2001).

(1) Selection

Throughout the lifespan, biological, social, and individual opportunities and constraints specify a range of alternative domains of functioning. From this large number of options, individuals, in collaboration with other forces, such as norms and parental expectations, select a subset on which to focus their resources. Selection of personal goals gives direction to development by focusing resources on specific life

domains and by guiding behavior across situations and time. The function of selection is nicely illustrated by the saying "Those who follow every path, never reach any destination." Selectivity can also be an adaptive response to losses threatening one's goals. We call this loss-based selection, in contrast to elective selection. An example of loss-based selection is concentrating on one's most important goals (e.g., enjoying being with one's family) and giving up less important personal goals (e.g., cultural activities) when an illness constrains the level of energy one can devote to various activities.

(2) Optimization

To achieve higher levels of functioning, goal-relevant means, that is, means that are conducive to goal attainment, need to be acquired, refined, coordinated, and applied in the selected goal domains. We call the acquisition and orchestration of such means of goal attainment optimization. An example of optimization is practicing scales when starting to learn to play the piano. By practicing scales, one can acquire flexibility in finger movements and stroke techniques, both important skills for playing the piano. Of course, which means are best suited for achieving one's goals depends on the goal domain (e.g., sports, friendships), the social and cultural context providing opportunity structures that make certain means more accessible than others, and personal characteristics, such as age or gender. We also need to recognize that in most cases there are different pathways of optimization; consistent

with the saying "There are many ways to Rome."

(3) Compensation

When transient or permanent losses or decline in goal-relevant means threaten one's level of functioning, it is necessary to invest resources into counteracting the losses in order to maintain a given level of functioning. We call the process of activating or finding such alternative means compensation. For instance, when knee problems do not allow going for walks any longer, using a wheelchair as a compensatory means of transportation can help to maintain one's routine of spending an hour in the park every day. As is true in the case of optimization, which means are best suited for compensating transient or permanent losses depends on the domain of functioning, the social and cultural context, and personal characteristics.

Recently, assumptions about SOC mechanisms have been formalized using differential equations to describe behavior in multiple-task settings in which the demands imposed by sum of all tasks exceeds the amount of available resources. We plan to intensify this line of work to study age differences in SOC mechanisms and arrive at SOC-based predictions of behavior.

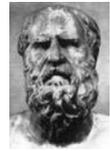
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Research Project 1 Intra-Person Dynamics Across the Lifespan

All is flux; nothing stays still.
Heraclite, ca. 500 B.C.



Conceptual Overview

Behavioral development comprises both short-term variability and long-term change, and is embedded into cultural and neuronal contexts. The unifying theme of this project is to explore theories and research designs that articulate behavioral development across timescales, levels of analysis, and domains of functioning (see Figure 1 and Table 1). Conceptually, working toward this goal is facilitated by a dynamic systems view that seeks to identify the functional organization of behavioral change (Li, Huxhold, & Schmiedek, 2004; Lindenberger & von Oertzen, in press). Empirically, the emphasis on integration across timescales, domains, and levels requires a drastic increase in observation density within individuals (cf. Makeig, Debener, Onton, & Delorme, 2004; Thelen & Smith, 2004). In this vein, Cattell (1952) pled to gather multivariate observations not only within occasions across persons but also within persons across occasions. Between-person differences and within-person variations represent two complementary and mutually irreducible sources of information about developmental mechanisms whose similarities and differences are a matter of conceptual and empirical inquiry (Lövdén & Lindenberger, 2005; Nesselroade, 1991).

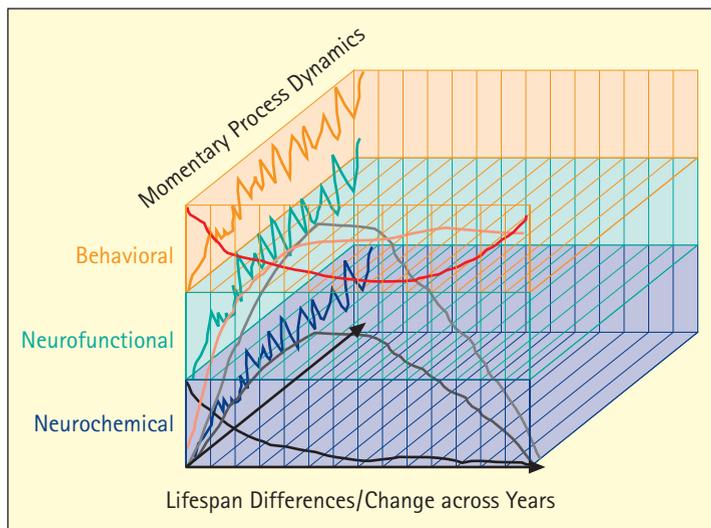


Figure 1. Long-term change and short-term variability in psychological functions. The Intra-Person Dynamics Project seeks to integrate the study of lifespan development across timescales and levels of analysis.

Types of Intra-Person Dynamics

Fiske (1955) distinguished between different types of intraindividual variations, some adaptive and some nonadaptive, that unfold with different degrees of reversibility over time and involve single or multiple functions. Specifically, short-term, relatively reversible variations in functioning need to be set apart from progressive, long-term, and relatively permanent developmental changes (Nesselroade, 1991). A main focus of this project is on describing and explaining lifespan age differences in relatively reversible variations that unfold within trials, training sessions, days, or weeks. Within this category of within-person variations, we functionally distinguish among

Table 1
Taxonomy of within-person variability in cognitive functioning across the lifespan

| Timescale | Scope | |
|--|--|--|
| | Variations in a single function (e.g., local, univariate) | Transformations in functional organization (e.g., global, multivariate) |
| <i>Microgenetic</i> (e.g., usually across trials, sessions, or weeks) | <p><i>Relatively reversible variations in one function</i></p> <p>Examples:</p> <ul style="list-style-type: none"> • processing fluctuation (processing lability or lack of processing robustness) • neural and behavioral plasticity (short-term learning potential) • within-task strategic diversity (richness of within-task behavioral repertoire) • adaptability/resilience to environmental perturbations • cyclic (e.g., state) variations in any specific function | <p><i>Relatively reversible variations in functional organization</i></p> <p>Examples:</p> <ul style="list-style-type: none"> • shifts in resource allocation, coordination, and compensatory behavior during multi-tasking • context-driven variations in mental set and functional organization (e.g., posture control with eyes open or closed) • situational choice and preference behavior |
| <i>Ontogenetic</i> (e.g., usually across months, years, or decades) | <p><i>Relatively permanent (e.g., cumulative, progressive) changes in one function</i></p> <p>Examples:</p> <ul style="list-style-type: none"> • physical growth • progressive (e.g., trait) changes in any specific cognitive function • long-term learning and skill acquisition | <p><i>Relatively permanent (e.g., cumulative, progressive) alterations in functional organization</i></p> <p>Examples:</p> <ul style="list-style-type: none"> • ability differentiation from adulthood to old age • ability dedifferentiation from childhood to early adulthood • corticogenesis and functional specification of brain areas during maturation and learning • functional reintegration of brain circuitry in old age |

Note. This taxonomy is not meant to be exhaustive. For instance, societal sources of variability are not systematically considered. All listed forms of variability can be studied at behavioral and neuronal levels of analysis. Examples are drawn from both levels. A major challenge for lifespan psychology is to identify mechanisms that link local to global variations, microgenetic variations to ontogenetic change, and neuronal mechanisms to behavior. Theories that link neuronal mechanisms in a single function acting at a microgenetic timescale to global ontogenetic transformations in behavior are high in parsimony and explanatory power (adapted from Lindenberger & von Oertzen, in press; cf. Li, Huxhold, & Schmiedek, 2004).

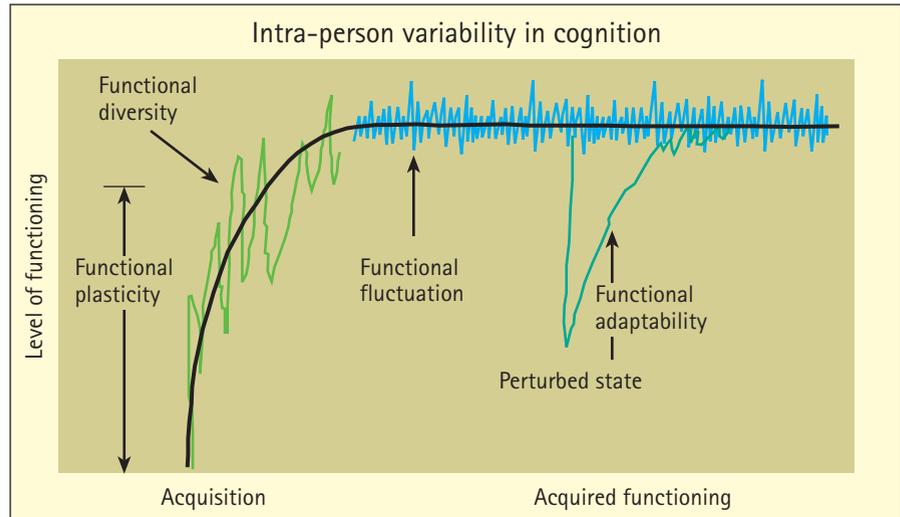
fluctuation, plasticity, diversity, adaptability, and temporal coupling (for illustration of some of these aspects, see Figure 2). Indicators of each processing function can be observed at behavioral and neuronal levels. *Processing fluctuation*, or lack of processing robustness (e.g., Li, Aggen, Nesselroade, & Baltes, 2001; Li, Lindenberger, Hommel, Aschersleben, Prinz, & Baltes, 2004) reflects stochastic fluctuations around a modal response, and is often best

observed near maximum levels of functioning. *Functional plasticity* refers to various forms of learning or adaptive changes, such as benefits from instruction, practice, and training (e.g., Baltes & Kliegl, 1992; Kliegl & Lindenberger, 1993; Singer, Lindenberger, & Baltes, 2003). *Functional diversity* refers to variations in responses to environmental demands, such as exploration of behavioral strategies during initial phases of complex skill acquisition

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Figure 2. Types of intra-person variability in cognitive functioning (adapted from Li, Huxhold, & Schmiedek, 2004).



(e.g., Lautrey, 2002; Siegler, 1994). *Functional adaptability* indicates an individual's ability to regain earlier functional levels after perturbations arising from either internal processing fluctuations (e.g., attention slips) or changes in the external environment (e.g., more demanding tasks). Finally, *temporal coupling* refers to temporal associations between two or more forms of processing within or across domains of functioning, such as concurrent covariation, lead-lag relations, and synchronization.

Overview of Subprojects

The Intra-Person Dynamics Project was initiated in September 2002 and expanded in Spring 2004. Currently, it consists of three subprojects. The first investigates adult age differences in intra-person variability within and across various domains of psychological and sensorimotor functioning. The second investigates lifespan age differences in the plasticity and components of episodic learning and memory. The third subproject aims at systematic, age-

comparative evaluations of inter-person and intra-person cognitive ability structures. Altogether, the project endorses a multilevel, multi-method approach that combines behavioral and neuronal observations with experimental, correlational, and computational methods.

Subproject I:

Adult Age Differences in Intra-Person Dynamics Within and Across Psychological and Sensorimotor Domains of Functioning

The initial aim of this subproject is to document and compare adult age differences in intra-person dynamics within and across sensorimotor, cognitive, emotional, and motivational domains of functioning. Given the multi-dimensionality and multidirectionality of lifespan development with respect to functional domains and patterns of change (Baltes, Lindenberger, & Staudinger, in press), we expect that patterns of age differences in intra-person dynamics are not uniform across domains of functioning.

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Li, S.-C., Huxhold, O., & Schmiedek, F. (2004). Aging and attenuated processing robustness: Evidence from cognitive and sensorimotor functioning. *Gerontology, 50*, 28–34.

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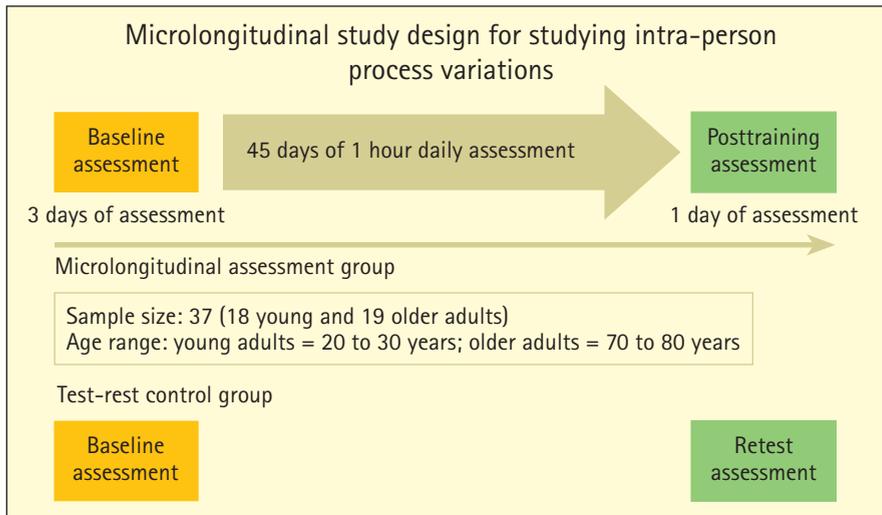
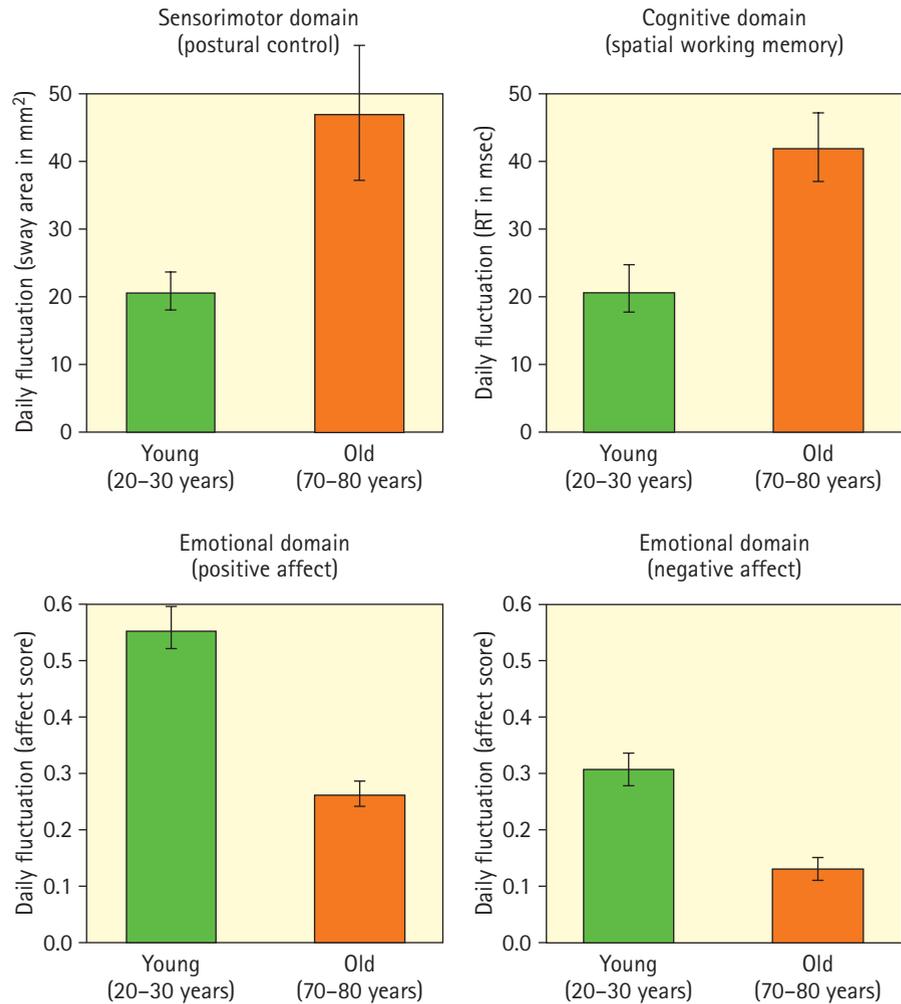


Figure 3. Microlongitudinal study design for investigating intra-person dynamics in multiple domains of functioning.

Using a microlongitudinal design that covered 45 daily measurement occasions (see Figure 3), we assessed daily fluctuations in postural control, spatial working memory, positive and negative affects, and task-specific motivation and performance appraisals in 18 young adults (20 to 30 years of age) and 19 older adults (70 to 80 years of age) across nine weeks. Overall, we observed substantial domain-related and person-related differences in within-person trajectories. Most individuals showed signs of learning (e.g., exponential performance functions) in spatial working memory and perceptual speed, with sizeable differences between individuals in learning rates and asymptotes. As for the sensorimotor domain, only about 60% of all individuals showed time-based improvements in postural control. Individual trajectories of emotional well-being and motivation also exhibited change over time, but there were substantial inter-individual and age-related differences.

As predicted, differences between younger and older adults in within-person fluctuations did not follow a unitary trend (see Figure 4). After controlling for trends, older adults exhibited more intra-person fluctuation in cognitive and sensorimotor functions than younger adults (Doctoral dissertation Oliver Huxhold). In contrast, older adults showed less intra-person fluctuation in emotion than younger adults (Dissertation Christina Röcke). The observed aging-related increments in within-person fluctuations in postural control and spatial working memory are in line with other recent findings, demonstrating greater processing fluctuation with advancing age in these domains of functioning (e.g., Hultsch et al., 2000; MacDonald et al., 2004; Rabbitt et al., 2001), and may point to senescent changes in brain integrity, such as attenuated neuromodulatory mechanisms (Bäckman & Farde, 2005; Li et al., 2001). In contrast, reductions in daily emotional fluctuations with age may point to increasingly more

Figure 4. Patterns of age differences in intra-person daily fluctuations (indicated here as detrended residuals) are not uniform across different psychological domains. Whereas aging is related with increased process fluctuation in sensorimotor and cognitive processes (Dissertation Oliver Huxhold), it is related with decreased fluctuations in measures of subjective well-being (Dissertation Christina Röcke).



efficient emotional regulation (e.g., Gross et al., 1997; Lawton et al., 1992), to age differences in the selection of everyday life contexts (Baltes & Baltes, 1990; Carstensen, 1995), or both. Taken together, our findings from this first study underscore the multidimensionality and multidirectionality of age differences in intra-person dynamics. Further analyses will focus on age differences in cross-domain temporal couplings. Methodologically, the influence of individual differences in intra-person fluctuations at lower

levels of temporal aggregation (e.g., trial by trial) on estimates of cross-domain temporal couplings at higher levels of temporal aggregation (e.g., day by day) needs to be formally expressed and statistically controlled. Adult age differences in intra-person between-domain couplings will speak to the relative importance of age-associated causal mechanisms common to more than one domain of functioning (cf. Lindenberger & Baltes, 1994; Baltes & Lindenberger, 1997). Adult age differences in couplings between daily fluctuations in

positive and negative affect and fluctuations in cognitive performance will provide insights into lifespan changes in the interaction between emotional and cognitive functions at the processing level.

*Subproject II:
Lifespan Age Differences in Plasticity and Components of Episodic Learning and Memory*

This subproject examines lifespan age differences in plasticity and components of episodic memory, and is partially funded by a research grant from the German Research Foundation (Deutsche Forschungsgemeinschaft, Forschergruppe 448, "Binding: Functional architecture, neuronal correlates, and ontogeny"). It pursues two interrelated goals: (a) to investigate age differences in intra-person plasticity of episodic memory from middle childhood to later adulthood; (b) to estimate the relative contribution of strategic and associative components to lifespan differences in episodic memory. In a first training study conducted at Saarland University in 2003, 23

younger children (9 to 10 years of age), 27 older children (11 to 12), 29 younger adults (20 to 25), and 29 older adults (65 to 78 years) were instructed and trained in a simplified variant of the Method of Loci, an imagery-based mnemonic strategy (Baltes, Kliegl, & Smith, 1990; Kliegl & Lindenberger, 1993). All age groups benefited from mnemonic training (Figure 5). At the same time, substantial age differences in gains were observed as a function of instruction versus training practice. Older adults showed considerable instruction-related performance gains (baseline reserve plasticity), but did not profit much from further training and practice (developmental reserve plasticity). In contrast, younger children initially showed smaller instruction-related performance gains, but considerably larger practice-related gains than older adults. The resulting memory plasticity advantage of middle childhood over late adulthood provides direct empirical support for central assumptions about lifespan changes in behavioral plasticity (Dissertation Yvonne

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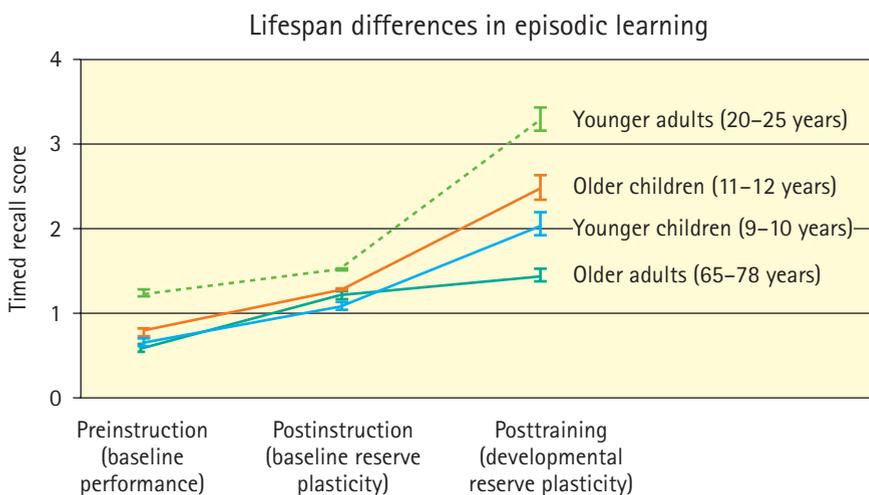


Figure 5. Lifespan age differences in episodic associative learning. Individuals in all age groups showed substantial memory plasticity. Whereas older adults showed a greater extent of baseline reserve plasticity after mnemonic instruction, younger children showed a greater extent of developmental reserve plasticity after mnemonic training (Dissertation Brehmer; Brehmer, Li, Müller, von Oertzen, & Lindenberger, in prep.).

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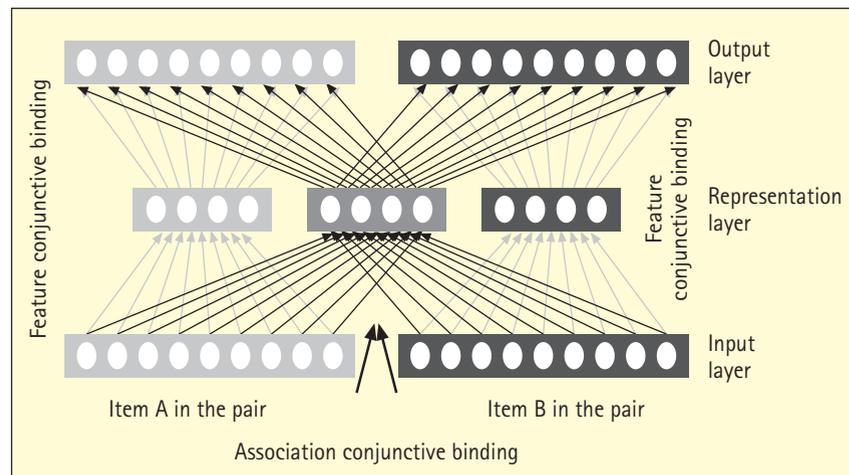
Brehmer). To examine lifespan age differences in maintenance of mnemonic skill (e.g., Neely & Bäckman, 1993), a one-year follow-up study has been carried out in 2004. Also, initial analyses of EEG data are currently underway. The general rationale of these analyses is to identify EEG patterns in the frequency domain that optimally separate recalled words from not recalled words at three nested levels of analysis: within individuals, between individuals within age groups, and between age groups.

Strategic and Associative Components of Lifespan Differences in Episodic Memory

In Fall 2004, a new series of experiments has been planned to provide a more process-oriented (mechanistic) explanation for lifespan differences in episodic memory, such as the relative magnitude of baseline and developmental reserves plasticity observed in the first study (see Figure 5). In this context, we posit two different, but closely intertwined, components of episodic memory

performance: strategic and associative. In terms of cognitive processes, the strategic component refers to the selection, organization, and elaboration of episodic features during encoding and retrieval. In contrast, the associative component refers to mechanisms that bind features into a coherent memory representation (trace). Due to the late maturation of prefrontal regions and associated neuronal pathways, we assume that the strategic component of learning and memory is less efficient in middle childhood than in early and young adulthood. In contrast, the associative component, which primarily involves mediotemporal structures, should be fully functional in middle childhood, so that differences to younger adults in this component should be small. With respect to older adults, we expect impairments in both strategic and associative components relative to younger adults, reflecting alterations senescent changes in both prefrontal and mediotemporal regions of the brain. A new series of experiments will test these predic-

Figure 6. Schematic diagram of a feature association conjunctive binding model for studying adult age differences in associative binding deficit (adapted from Li, Naveh-Benjamin, & Lindenberger, in press).



tions using a paired-associates recognition memory paradigm (cf. Castel & Craik, 2003; Naveh-Benjamin, 2000; Dissertations Yee Lee Shing and Markus Werkle-Bergner). At the same time, we have begun to expand our connectionist modeling to simulate lifespan differences in strategic and associative memory components (see Figure 6; Li & Lindenberger, in press; Li, Naveh-Benjamin, & Lindenberger, in press; Zimmer, Mecklinger, & Lindenberger, in press).

*Subproject III:
Comparing and Contrasting Intra-
Person Variability With Inter-Person
Differences*

The specific goal of this subproject, which started in Spring 2004, is to explore differences and commonalities between covariance structures of intellectual abilities measured either across individuals at a given occasion or across occasions within a given individual. Most of the existing research on intellectual abilities assumes that covariance structures based on interindividual differences generalize to intra-person structures. For instance, ability factors based on interindividual differences are supposed to reflect unitary ability constructs at the intra-person level, and intercorrelations among such factors are assumed to reflect relations

among underlying processes or resources at the intra-person level. Methodologically, differences between intra-person and inter-person structures are perfectly possible (e.g., Borsboom, Mellenbergh, & van Heerden, 2003; Lindenberger, & von Oertzen, in press; Molenaar, Huizenga, & Nesselroade, 2003). Conceptually, the malleability of functional organization at both behavioral and neuronal levels and the diversity of developmental trajectories and life experiences (Li & Lindenberger, 2002) render any strict congruence between intra-person and inter-person structures unlikely. What is needed, then, is to examine: (a) the degree of convergence between intra- and inter-person structures, and the extent to which this convergence differs by age; (b) the degree of convergence among different intra-person structures. To date, no studies with the multivariate measurements of cognitive performance and sufficiently high numbers of observations and individuals have been conducted to address these issues empirically. To conduct such a study, we currently are assembling a battery of cognitive tasks that are amenable to repeated testing and that represent well-established cognitive constructs of psychometric research.

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Research Project 2 Sensorimotor–Cognitive Couplings

This project investigates lifespan changes in interactions between sensorimotor and cognitive aspects of behavior (K. Z. H. Li & Lindenberger, 2002). Everyday life often requires integration of multiple sensory inputs and concurrent coordination of sensorimotor and cognitive demands. Examples are walking while trying to memorize a shopping list, maintaining one's balance on a bus while trying to read an advertisement, or trying to remember the way to a friend's house while driving in the hectic morning traffic. How do individuals of different ages adapt to these multiple demands and their changes across situational contexts? Everyday observation further suggests that older adults, and young children, need to invest more attention into sensorimotor aspects of their behavior than teenagers and young adults. For instance, when facing an obstacle on a narrow path, older adults may tend to stop talking and resume their conversations after the obstacle has been overcome, whereas the same obstacle will affect younger adults' conversation to a lesser extent.

The focus of this project is on lifespan changes in resource allocation in multiple-task settings that have a high degree of everyday validity, such as walking while memorizing. The project makes use of three different experimental paradigms: (a) walking tracks that allow for the assessment of walking accuracy, (b) balance machines permitting dynamic assessment of posture control (posturography), and (c) a virtual reality lab equipped with a treadmill to measure spatial navigation performance under varying conditions of sensorimotor support.

Dual-Task Costs in the Domain of Walking

Two earlier studies from our lab demonstrated that older adults invest considerable cognitive resources to compensate for the decreased efficiencies of their sensorimotor functions. Lindenberger, Marsiske, and Baltes (2000) had participants from three age groups walk different

tracks while memorizing word lists. They found that speed and accuracy of walking were reduced when participants had to simultaneously walk and memorize, particularly in older adults. K. Z. H. Li, Lindenberger, Freund, and Baltes (2001) systematically combined sensorimotor tasks of varying difficulties with a cognitively demanding memorization task and offered compensatory external aids (a handrail to optimize walking and a button-box that delayed the presentation of auditory stimuli). Whereas young adults optimized their memorization performances, older adults focused on the optimization of their walking by more frequently using the handrail. Thus, older adults selected walking efficiency over memory efficiency when their cognitive resources were challenged.

In a recently completed study, we (Krampe, Schäfer, Lindenberger, & Baltes, in prep.) investigated resource allocation in children (9 or

11 years old) and adults (young and older). To this end we used the walking track in combination with a semantic fluency task (Figure 1). In line with our earlier results, we found that young adults maintain their level of performance in the cognitive task and "accept" reductions in walking speed. Children, however, showed higher costs in walking than young adults, and 9-year-olds also demonstrated considerable costs in the cognitive task. These findings illustrate that the age-differential "protection" of gait and balance is not a result of the amount of available cognitive resources alone. Rather, ecological considerations are important: The consequences of withdrawing attention from gait or balance are far more serious for older adults than for young adults or children.

Dual-Task Costs in the Domain of Balance

Using dynamic posturography, two recently completed studies investigated balance performance while standing. Participants stood on a platform that can tilt at various angular velocities (Figure 2). The platform contains sensors that measure participants' stability (i.e., the distribution of their weights) at any given point in time. Bondar, Krampe, and Baltes (in prep.) had young and older adults perform choice reaction time tasks while maintaining upright stance despite unpredictable perturbations during trials. Older adults were found to have larger dual-task costs than younger adults. At the same time, they showed increased neglect of the cognitive task when



Figure 1. Dual-task experiment with walking track. Participants (9- or 11-year-old children, young and older adults) walk along a narrow track at their maximum speeds while simultaneously performing a cognitive task, for instance, memorization of a list of words presented over wireless headphones or generating exemplars for semantic categories like animals.

the experimentally induced perturbations were increased. In specific experimental conditions, participants were asked to emphasize performance in either the cognitive task, the balance task, or to place equal emphasis on both conditions. Older and young adults revealed similar flexibilities in resource allocation in the cognitive task. During trials with stronger perturbations, however, only young, but not older, adults were capable of flexible allocation of resources to stance maintenance. Again, these results can be interpreted as differences in overall resources and as older adults' specific selection of attentional emphasis on walking or maintaining a stable posture over simultaneous cognitive

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Krampe, R. T. & Charness, N. (in press). Aging and expertise. In K. A. Ericsson (Ed.), *Cambridge handbook on expertise and expert performance*. Cambridge, UK: Cambridge University Press.



Figure 2. Dynamic posturography. Balance performance on the moving platform can be assessed while participants simultaneously perform a cognitive task.

Key Reference

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tasks. In older age, sensorimotor functions require more and more cognitive resources. Because of their allocation to the sensorimotor domain, these cognitive resources are then no longer available for competing mental activities. Our results highlight the differential ecological relevance of tasks for young and older adults and its effects on resource allocation: Walking or maintaining balance is more critical for older than for young adults. Consequentially, older adults prioritize sensorimotor over cognitive functioning, especially when tested at their limits.

The findings by Bondar, Krampe, and Baltes imply that the observed prioritization in older adults reflects overlearned response tendencies resulting from long-term everyday experiences. This assumption was further supported in another study

using the balance-cognition dual-task paradigm. Rapp, Krampe, and Baltes studied young and older adults along with a group that is assumed to have deficits in attentional control or resource allocation, Alzheimer patients. Older adults showed a reliable *reduction* in sensorimotor dual-task costs when conditions of stable and moving platforms were compared, again suggesting that they protected their balance at the cost of cognitive performance. Alzheimer patients' dual-task costs were significantly increased relative to healthy age-matched individuals. However, the Alzheimer group showed the same prioritization when limits were challenged: When the platform was moving, Alzheimer patients invested most of their cognitive resources into the sensorimotor task, thereby maintaining almost the same stability as under single-task conditions (Figure 3). A subsequent inclusion of another group of nondemented older adults that was more similar to the Alzheimer patients with respect to their cognitive status (fluid intelligence) suggested that the exaggerated Alzheimer pattern was specific to dementia. These findings demonstrate how Alzheimer patients "know how to survive" in situations where memory and motor behavior are required at the same time. To further chart the terrain of sensorimotor-cognitive couplings across the lifespan, we conducted a large-scale study assessing postural stability, gait, and performances in standard psychometric measures of intelligence with 300 participants (age range 7 to 80 years). We used latent structure modeling approaches to

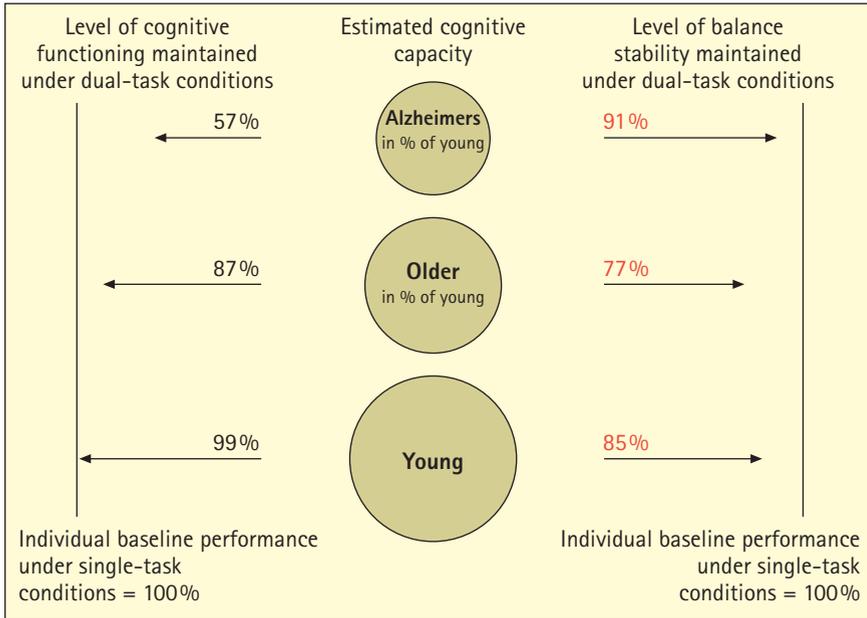


Figure 3. Resource investment into cognitive and bodily functions under dual-task conditions. Alzheimer patients exhibit smaller levels of cognitive functioning when their balance is challenged through the moving platform.

identify the correlations between these different capacities and their changes across the lifespan. These data are also used for the development of a mathematical model of postural control in different age groups that is based on random walk and diffusion concepts.

Sensorimotor Aspects of Spatial Navigation

The major aim of this part of the project is to explore the old-age quandary between increasing control demands of sensorimotor functioning and decreasing efficiency of relevant control operations in the domain of spatial navigation. A virtual environment maze-learning paradigm with a walking component was developed for this purpose. A scenery, designed to give participants the impression of walking through an art museum is projected in front of a treadmill. The movement of the treadmill is synchro-

nized to the visual flow of the virtual environment such that participants have the impression of actually walking through the virtual environment. The task for participants might be, for example, to find and remember the way from the entrance of the museum to the bistro. Figure 4 shows a prototype of the experimental paradigm. As of December 2004, the MPI laboratory features an advanced motion capture system, integrated synchronized assessment of EEG and EMG components, improved conditions for virtual environment rendering, and an advanced treadmill allowing for a wider range of movement.

Figure 5 shows captures of different motions that have been taken in this laboratory. To visualize the participant's movement (e.g., while walking) markers reflecting infrared light are attached to the participant's body. In turn, cameras capture the position of the markers, and the

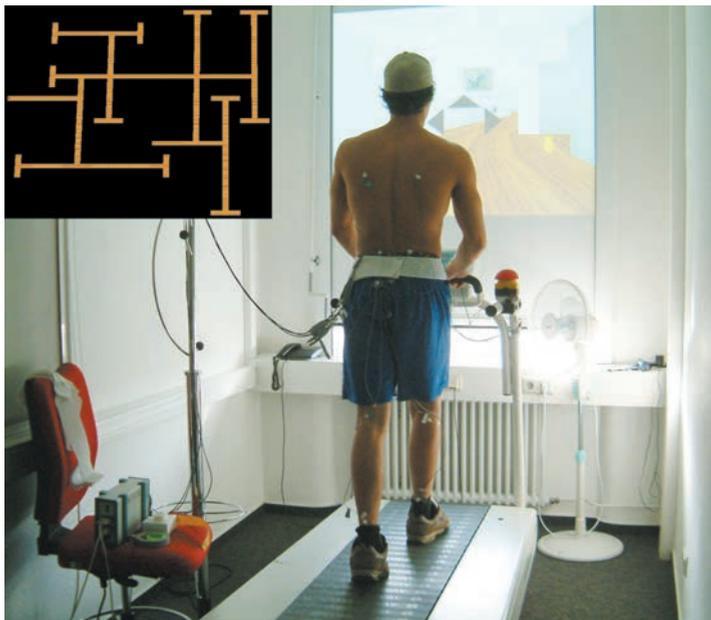
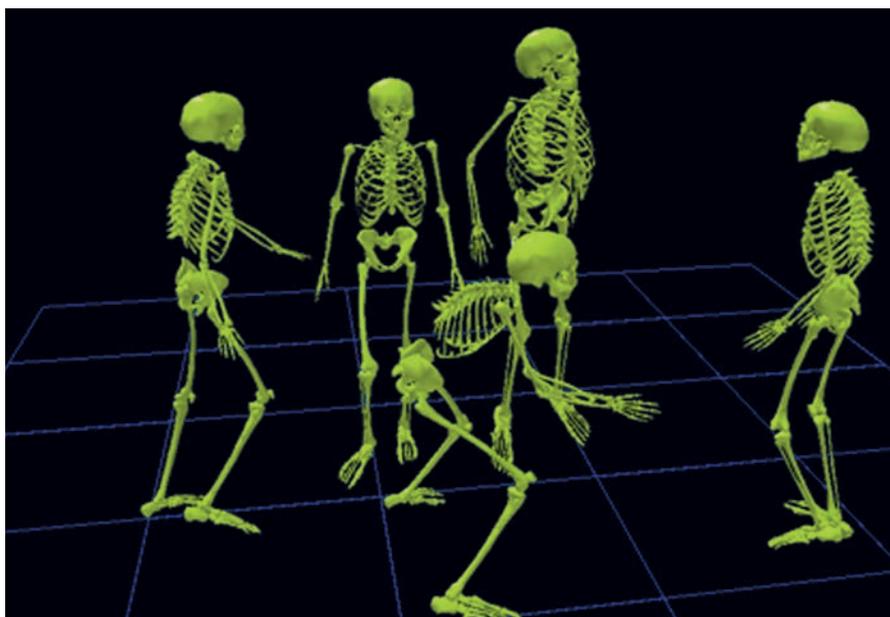


Figure 4. Spatial navigation in a virtual art museum. Participants walk on the treadmill while navigating to goals in the virtual environment. Older adults navigation performance is improved by walking support (holding on to the handrail).

positions of the markers are post-processed offline according to bio-mechanical models. This procedure allows for visualization of the participant's movements and further statistical analyses of important parameters. In Figure 5, a single participant has performed different typical motions (e.g., walking, dancing, playing tennis), and processed motion captures of these movements are displayed simultaneously. This system will play a major role in examining how sensorimotor functions interact with cognition as a function of age.

The first study (Lövdén, Schellenbach, Grossman-Hütter, Krüger, & Lindenberger, 2004), still conducted at Saarland University, tested our fundamental hypothesis that aging-induced cognitive permeation of sensorimotor functions contributes to adult age differences in spatial navigation performance. Sixteen 20- to 30-year-old and sixteen 60- to 70-year-old men were required to

Figure 5. Processed motion captures of an individual performing a variety of different movements. The position of markers attached on the participant's body is captured by cameras and post-processed according to bio-mechanical models to arrive at dynamic visualization of the participant's movements.



find and remember the way to the bistro in museums under conditions of walking with support (holding on to a handrail) or without support until they reached perfect performance. Walking support attenuated age-related decrements in navigational learning, and walking with navigation load increased older adults', but not younger adults', trunk-angle variability. Thus, walking demands influenced the navigation performance of older, but not younger adults.

Future Perspectives

In our future work, we will examine the effects of assistive technology on spatial navigation. For instance, we hypothesize that providing older adults with walking support enhances their ability to find and remember the way to a place in the environment. We will also examine lifespan age differences in gait patterns as a function of cognitive load, and investigate the plasticity of spatial navigation in old age at neuronal and behavioral levels of analysis (Lindenberger & Lövdén, in press).

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Research Project 3 Berlin Aging Study (BASE): Trends and Profiles of Psychological Aging

For lifespan researchers, the period of old and very old age is a new and exciting area of study. During the 20th century, average life expectancy nearly doubled. More and more individuals in current cohorts of older individuals experience additional years of life between the ages of 70 and 100+. What do these added years mean in terms of levels of functioning and life quality for most people? Are there constraints on aging successfully in the last years of life? Compared to early phases of the lifespan, relatively little is known about advanced old age.

Since 1989, members of the Center of Lifespan Psychology have investigated age- and death-related changes in psychological functioning from age 70 to 100+ in the context of the Berlin Aging Study (Mayer & Baltes, 1999; Baltes & Mayer, 1999; 2001; Lövdén, Ghisletta, & Lindenberger, 2004; Smith & Delius, 2003; Smith, Maas, Mayer, Helmchen, Steinhagen-Thiessen, & Baltes, 2002; see textbox for description of BASE). This multidisciplinary study is one of the few projects worldwide that includes extensive data on a heterogeneous sample of old and very old individuals.

At present, longitudinal data in BASE are available over 6 measurement occasions, spanning more than 12 years. The last follow-up of the Psychology Battery was collected in 2004. In addition to documenting the diversity of longitudinal patterns of change, this design feature has served to highlight the complex implications of sample attrition for the interpretation of findings about the oldest old. At the last assessment in 2004, for example, 80 % of the baseline sample of 516 were deceased. In general, participants in the various BASE longitudinal sam-

ples (followed over 4, 6, and 8 years) have been a positive selection of the initial cross-sectional sample in terms of physical and functional health, social status, cognitive functioning, openness to new experiences, outgoingness (extraversion), age, and distance from death (Lindenberger, Singer, & Baltes, 2002).

In the period 2003 to 2004, our research has focused on mapping individual differences and age-related changes in intellectual functioning (e.g., Singer, Verhaeghen, Ghisletta, Lindenberger, & Baltes, 2003), mechanisms underlying differential aging (e.g., Smith & Gerstorf, 2004; Gerstorf, 2004), and predictors of well-being in the young old and oldest old (e.g., Issacowitz & Smith, 2003). In addition, we also examined cross-domain associations in intra-individual change patterns.

Changes in Intellectual Functioning From Age 70 to 100

Lövdén, Ghisletta, and Lindenberger (2004) summarized 10 years of cognitive research in BASE (i.e., 1993-2003), focusing on five related research themes: (a) longitudinal selectivity; (b) cross-sectional and

Overview of the Berlin Aging Study (BASE)

The multidisciplinary Berlin Aging Study (BASE), directed by Paul B. Baltes and Karl Ulrich Mayer, was initiated in 1989 under the sponsorship of the former West Berlin Academy of Sciences and Technology and its Committee on Age and Societal Development. Subsequently, and in connection with the reestablishment of the Prussian Academy, the study came under the auspices of the Berlin-Brandenburg Academy of Sciences.

As of 2004, the study involves six measurement occasions spaced over 14 years. In addition, subsamples have been recruited for intensive study. The distinguishing features of BASE include (1) a focus on the very old (70–100+ years), (2) a locally representative sample, stratified by age and sex, and (3) a broad-based interdisciplinarity (involving two research groups from the Free University of Berlin, Internal Medicine and Psychiatry, and two from this Institute, Sociology and Psychology). In addition to discipline-specific topics, four integrative theoretical orientations guide the study: (1) differential aging, (2) continuity versus discontinuity of aging, (3) range and limits of plasticity and reserve capacity, and (4) aging as a systemic phenomenon.

The initial focus of BASE (1990–1993) was to obtain an age-by-sex stratified heterogeneous sample of 70- to 100+-year-olds who completed a 14-session Intensive Protocol (involving detailed measures from the four disciplines). 516 men and women from the western districts of Berlin participated. Five longitudinal follow-ups of the survivors from this initial sample involving different amounts of assessment have been completed at approximately 2-yearly intervals. A single-session multidisciplinary assessment was collected in 1993–1994 ($N = 361$), reduced versions of the Intensive Protocol (six sessions) were collected in the periods 1995–1996 ($N = 206$) and 1997–1998 ($N = 132$), and a repeat of parts of the Psychology Battery together with multidisciplinary outcome variables (e.g., screening for dementia, assessment of well-being) in 2000 ($N = 82$) and 2004 ($N = 50$). In addition, we also follow the mortality of the entire BASE sample.

The initial sample of 516 individuals formed the basis of the cross-sectional analyses reported in a German monograph first published in 1996 (Mayer & Baltes, 1996, 1999), in a featured section of *Psychology and Aging* (1997), and an English monograph published with Cambridge University Press (Baltes & Mayer, 1999, 2000). Six papers reporting two-wave longitudinal findings were published in November 2002 in a Special Section of the *Journals of Gerontology: Psychological Sciences* (57B, P471–P571). Specific interests of the Psychology Unit of BASE include: issues of sample selectivity and representativeness, cognitive aging, subgroup profiles of psychological functioning, the Fourth Age, gender differences, mortality prediction, self-related change, well-being, and models of successful aging, such as selective optimization with compensation.

Doctoral Training Program (Graduiertenkolleg) in Neuropsychiatry and Psychology of Aging Jointly With the Free University of Berlin

From 1998 to 2004, the research findings and data of BASE provided a primary foundation for a DFG-funded graduate research training program (Graduiertenkolleg). The focus of this program was on the "Neuropsychiatry and Psychology of Old Age." Initiated by the late Margret M. Baltes, the doctoral training program was codirected by Paul B. Baltes. Other psychologists in the Steering Committee were Jacqui Smith and Ralf Schwarzer (Free University of Berlin). In the period 2003–2004, the program included 15 fellows.

See pp. 27–28 for further information.

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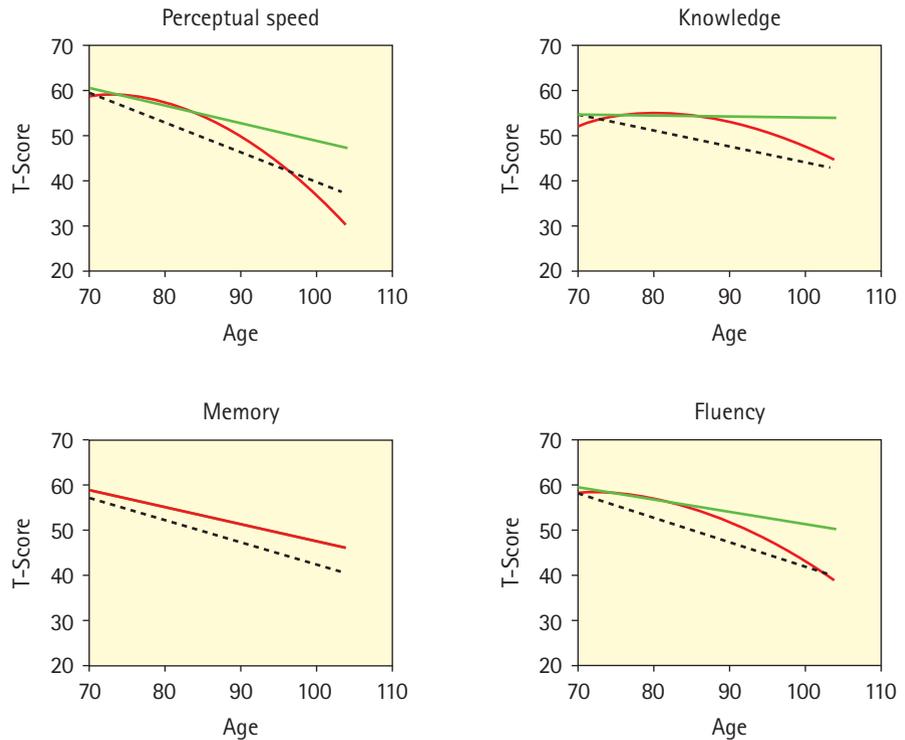
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longitudinal age gradients of intellectual functioning; (c) cognitive ability dedifferentiation in old age; (d) exploring the link between intellectual and sensory domains; and (e) limits to cognitive plasticity in old age. Here, we highlight key findings from the 2002 to 2004 period. The cross-sectional pattern of decline across adulthood for the fluid

mechanics (e.g., processing speed) accompanied by maintenance or increase in the crystallized pragmatics (e.g., verbal knowledge) constitutes a classic aging pattern of adult intellectual development. Initial findings from BASE extended this pattern by revealing negative cross-sectional associations between verbal knowledge and age within, but not before,

Figure 1. Cognitive change in old age (BASE). The short-dashed lines represent the cross-sectional age gradients as observed in the initial assessment of the total sample ($N = 516$). The green lines represent the cross-sectional age gradients as observed in the initial assessment of the 6-year longitudinal sample ($n = 132$). The red lines represent the estimated longitudinal change gradients over the 6-year interval in the longitudinal sample. Individuals up to age 90 show longitudinal stability in tests of knowledge despite declines in measures of perceptual speed, memory, and fluency (adapted from Singer et al., 2003).



old and very old age (Baltes & Lindenberger, 1997). We further extended these findings by reporting longitudinal age gradients while examining aspects of longitudinal selectivity. Specifically, Singer et al. (2003) reported latent growth curve age gradients for processing speed, memory, verbal fluency, and knowledge as a function of three subsamples: cross-sectional age gradients for the total initial sample ($N = 516$) including participants suffering from late-life cognition-associated health disorders; cross-sectional age gradients for the positively selected individuals ($n = 132$) that subsequently survived and participated in the repeated measurement occasions; and combined cross-sectional and longitudinal information for the longitudinal sample. Figure 1 displays these age gradients.

If we initially consider the cross-sectional gradient of the total sample (short-dashed line), it is evident that negative gradients prevail in all four cognitive measures. In contrast, the cross-sectional gradients describing the positively selected longitudinal sample (green line) are more diverse: Knowledge remains stable whereas processing speed, fluency, and memory decreases. In other words, decline in the fluid mechanics may be normatively age-related, whereas decline in the crystallized pragmatics may also be associated with late-life cognition-associated health disorders. The longitudinal gradient (red line) is consistent with this conclusion. In very old age (> 90 years) negative gradients are evident for all the four cognitive abilities. Initial cross-sectional analyses in BASE (Baltes & Lindenberger, 1997)

supported the dedifferentiation hypothesis, asserting that the functional organization of intellectual abilities undergoes compression (dedifferentiation) in old age. Framed in terms of the distinction between the fluid mechanics and crystallized pragmatics of cognition, dedifferentiation is hypothesized to emanate and form old-age decrements in pragmatic abilities that are induced by mechanic decline. To evaluate the validity of this hypothesis, Ghisletta and Lindenberger (2003) applied a lead-lag structural equation modeling method to combined longitudinal and cross-sectional data. Processing speed and knowledge were used to index the mechanics and the pragmatics, respectively. The results showed that processing speed was the leader and knowledge was the lagger within this system of variables; that is, processing speed at $t-1$ time exerted a substantially stronger influence on change in knowledge from $t-1$ to t than knowledge at $t-1$ did on subsequent change in processing speed. Thus, the directional dedifferentiation hypothesis was confirmed.

The potential range of plasticity of functioning in very old age, especially in the capacity to learn and apply new memory strategies, has been addressed by Singer, Lindenberger, and Baltes (2003) on a subsample of the oldest old participating in BASE. Using a cognitive training paradigm and instruction in a memory technique (the Method of Loci), participants aged 70 to 100 years evinced little potential for the new learning of a complex cognitive skill. Thus, the quantity and quality

of cognitive plasticity show a sizeable loss in very old age, compared to younger age groups.

Currently, the role played by health in the maintenance of cognitive functioning in old age constitutes an emerging area of interest within BASE. Analyses of BASE data have related performance to cardiovascular and metabolic disease and various risk factors (e.g., smoking). Verhaeghen, Borchelt, and Smith (2003) found that five diagnoses were negatively correlated with cognition: congestive heart failure, stroke, coronary heart disease, myocardial infarction, and diabetes mellitus. The presence of one or more of these diagnoses was linked to lower performance in general, but there was no differential cognitive decline over 4 years. This suggests that the impact of these diseases on cognitive decline in very old age may be smaller than in younger adults because the disease process adds little to the cumulative changes in brain physiology that have occurred over the course of a very long life.

Another currently important area of investigation in BASE is the relationship between lifestyle factors, such as social participation and cognitive decline. Though the general public have embraced the notion that being socially, mentally, and physically active in old age protects against cognitive decline, several studies have delivered mixed support and underscored that the opposite might also hold: High cognitive functioning in old age might increase the possibility of maintaining an engaged and active lifestyle. Lövdén, Ghisletta, and Lindenberger (in press) approached this conundrum by apply-

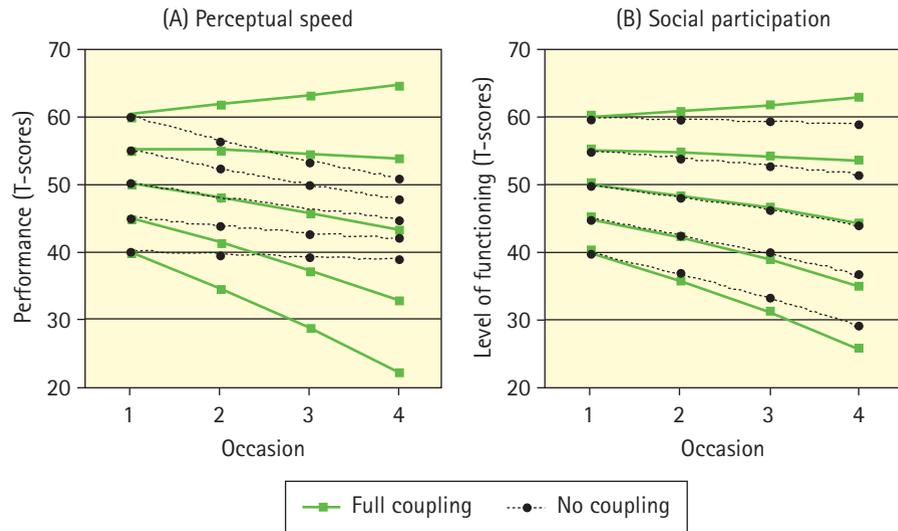


Figure 2. Social participation attenuates decline in perceptual speed in old and very old age. Means for perceptual speed (A) and social participation (B) from a model (full coupling; green lines) allowing dynamic lead-lag relations and from a model not allowing dynamic lead-lag associations (no coupling; dashed lines) between social participation and perceptual speed. The means are plotted as a function of time and varied initial (occasion 1) sample means (40, 45, 50, 55, 60). The figures show that allowing for lead-lag coupling between the two variables dramatically changes the implied developmental pattern for perceptual speed, but that this is not the case for social participation, suggesting that social participation drives decline in perceptual speed in old and very old age.

ing a structural equation model for testing lead-lag hypotheses (see also Ghisletta & Lindenberger, 2003) to three-occasion longitudinal data of social participation and perceptual speed in BASE. Results revealed that, after statistically controlling for age and sociobiographical status, prior scores of social participation influenced subsequent changes in perceptual speed, while the opposite did not hold (see Figure 2). Results support the hypothesis that an engaged and active lifestyle in old and very old age may alleviate cognitive decline.

Change and Stability in Self and Well-Being in Very Old Age

Findings in areas of psychological functioning other than intelligence,

such as motivational aspects of the self (e.g., control beliefs, future-oriented goals) and overall subjective well-being (e.g., life satisfaction, a sense of happiness and contentment), indicate less decline in functionality, at least among the young old and positive selected oldest old individuals (Smith, 2003; Smith & Gerstorf, 2004). Self-related functioning may be more resilient against decline than is true for the cognitive system. It is generally expected that regulatory processes operate to protect or "immunize" the self against a loss of efficacy and well-being, even in conditions of poor health and chronic impairment. For example, individuals adjust their aspiration levels and comparison targets so as to achieve and main-

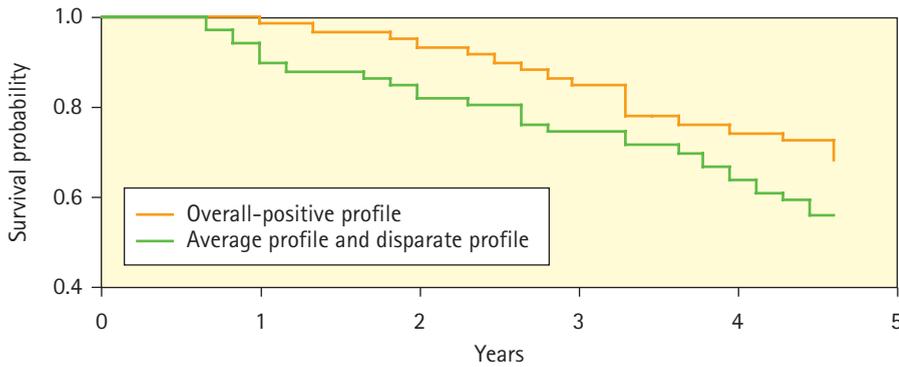


Figure 3. Profile subgroups were identified in the 6-year longitudinal BASE sample by using cluster analysis of baseline scores across 11 psychological dimensions (cognition, personality, and social integration): The desirable profile subgroup (overall-positive profile) lived longer over a 4-year period than both less desirable profiles (average profile and disparate profile) (adapted from Gerstorf, 2004).

tain a sense of control over their life. These psychological processes help to explain the seemingly paradoxical observation that, after a period of adjustment, individuals report satisfaction even in contexts of chronic stress.

To the extent that older individuals become physically dependent on others and experience accumulated chronic health and life strains, their sense of well-being is compromised. In particular, we observed a reduction in the potential to experience the positive side of life (Baltes & Smith, 2003; Smith, 2003). Although the majority of BASE participants were typically satisfied with their present life conditions, those in the Third Age (70 to 84 years) reported significantly higher positive well-being and higher satisfaction with life in general, compared with those in the Fourth Age (85 to 100+ years). A large portion of individual differences in well-being was accounted for by physical illness and functional impairment (e.g., vision, hearing, mobility, strength). On average, re-

ported satisfaction with aging, life satisfaction, and experience of positive emotions decreased after age 80.

Profiles of Psychological Functioning in the Young Old and Oldest Old

Psychologically speaking, the chronic life stressors associated with advanced old age represent a context that appear to “test the limits” of psychological resilience and adaptation and may contribute to systemic breakdown and death (Baltes & Smith, 2003). This proposal was examined in BASE in several ways. On the one hand, we analyzed age-related changes in functional level in different domains, and examine whether different rates and correlates of change characterize the young old and the oldest old (Smith & Gerstorf, 2004). In addition, we used cluster analysis to identify subgroups with functional psychological profiles indicative of distress and systemic breakdown (Gerstorf, 2004; see Figure 3).

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Research Project 4 Selection, Optimization, and Compensation (SOC): Regulation of Goals and Preferences in Lifespan Development

Tra dire e fare
C'e di mezzo il mare.
(Between saying and doing is the sea.)
Italian proverb

Understanding human development requires theories of dynamic self-regulation that place goal-directed action and preference behavior in the context of biological and social constraints and opportunities. How are developmental goals and preferences construed, pursued, coordinated within and between individuals, and reshaped or abandoned in the face of limited internal and external resources? Which behavioral features and regulatory patterns separate positive or subjectively desired from negative or unwanted ontogenetic pathways and outcomes? Do development-enhancing regulatory patterns in childhood differ from those in old age?

This project investigates motivational, cognitive, and affective processes that regulate human development across the lifespan. Its conceptual framework derives from the metamodel of selection, optimization, and compensation (SOC; cf. Baltes & Baltes, 1990). According to the SOC metamodel, successful development requires the regulation of four universal developmental mechanisms: elective selection, loss-based selection, optimization, and compensation (e.g., Baltes & Baltes, 1990, Freund & Baltes, 2000; see Figure 1).

The project is composed into three subprojects. The first, *Goals and Preferences*, focuses on motivational aspects of lifespan development, and attempts to capture the regulatory function of SOC mechanisms in real-life settings. The second, *Lifespan Differences in Selection Dynamics*, seeks to study age differences in selection from a cognitive-experimen-

tal perspective that permits time series analyses of regulatory behavior. The third, *Formal Modeling of Developmental Self-Regulation*, aims at specifying interrelations among SOC mechanisms through nonlinear differential equations and related mathematical tools (Riediger, Li, & Lindenberger, in press). Subprojects II and III were started in Fall 2004. Therefore, this report concentrates on the first subproject.

Subproject I: Goals and Preferences

Life-Management Strategies and Adaptive (Successful) Development
We expect that adults of different ages use different combinations of SOC mechanisms as strategies to regulate their lives, and that use of these strategies fosters developmental success in various life domains. A series of age-comparative studies using self-report measures of SOC mechanisms and developmental out-

A metamodel of adaptive development
The model of selection, optimization, and compensation
(Baltes & Baltes, 1990)

Central proposition

Adaptive development results from the interaction of three universal developmental regulatory processes:

1. Selection (elective and loss-based)

Focusing one's resources on a subset of potentially available options, either in response to new demands or tasks (*elective selection*) or in response to actual or anticipated losses (*loss-based selection*)

→ Directionality aspect of development

2. Optimization

Acquisition, refinement, and coordinated application of resources directed at the achievement of higher functional levels

→ Growth aspects of development

3. Compensation

Efforts to maintain a given level of functioning despite actual or anticipated decline in or loss of previously available resources

→ Regulation of loss in development

Figure 1. The model of selection, optimization, and compensation (Baltes & Baltes, 1990): Central position and definitions of the three processes.

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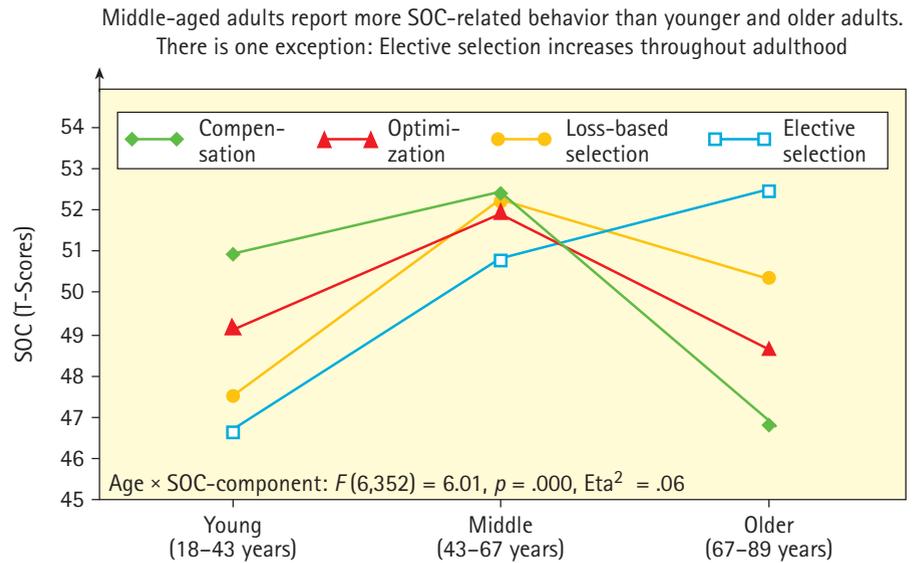
comes generally confirmed this expectation. Across all age groups, higher engagement in SOC-relevant life-management strategies was associated with indicators of concurrent as well as future developmental success, such as facets of positive psychological functioning, emotional well-being, and life satisfaction. At the same time, age-related differences in the extent of self-reported engagement in SOC were observed. Middle-aged adults reported stronger engagement than younger and older adults in loss-based selection, optimization, and compensation. Elective selection showed a linear increase from early to middle and late adulthood (see Figure 2). A likely interpretation of these results

is that younger adults seek to explore different developmental pathways to find their way in life, and also have the prerequisite internal resources to do so. As individuals move into middle adulthood, they acquire and refine resource-efficient life-management strategies. Most middle-aged adults know their goals in life and selectively pursue these choices. Engagement in SOC strategies (i.e., goal selection and pursuit), however, is itself effortful and resource intensive. Therefore, age-associated decline in internal resources (e.g., sensorimotor and cognitive abilities) limits the expression of optimizing goal pursuit and counteracting goal-related losses (i.e., loss-based selection, compensation).

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Figure 2. Adult age-group differences in self-reported engagement in SOC-relevant behaviors: Middle-aged adults report more SOC-related behaviors than younger and older adults. There is one exception: Elective selection increases throughout adulthood (N = 181; adapted from Freund & Baltes, 2002).



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Elective selection may become more pronounced with age for the same reason, reflecting the necessity to focus the remaining resources efficiently on a few important goals (Freund & Baltes, 2002).

Adaptive Goal Selection and Goal Pursuit

Developmental goal orientation. Selection and goal pursuit were also examined at the level of manifest goal-directed action to obtain a more direct picture of action goals and motives that enhance the likelihood of positive (e.g., desired) developmental outcomes during different phases of life. We examined whether basic motivational orientations show differential developmental trends in intensity and adaptive value during adulthood that can be conceptualized as adaptations to decreasing internal resources. Three basic motivational orientations were set apart (cf. Dissertation Natalie Ebner; Freund & Ebner, in press): (a) attaining higher levels of functioning; (b)

maintaining achieved levels of functioning; and (c) preventing from losses in functioning. One series of experiments investigated the effect of framing tasks in terms of optimization (i.e., improving performance) or compensation (i.e., maintaining previous performance in more difficult task conditions) on younger and older adults' persistence (Freund, 2005). Younger adults were more motivated and persistent when trying to achieve higher levels of performance than when trying to counteract a loss. Conversely, older adults showed higher persistence when engaged in compensation than when aiming at maximum performance. Using both self-report and experimental assessments, the same basic pattern was found for adults' motivational orientation regarding self-chosen personal goals (see Figure 3; Dissertation Natalie Ebner). At the same time, these studies again suggested adult age differences in the adaptive value of various motivational preferences. Loss avoidance

was associated with impaired psychological well-being in younger, but not in older adults. Orienting goals toward maintaining functioning was positively associated with psychological well-being in older, but not in younger adults. Thus, resource limitations in action regulation seem to increase in salience and importance with advancing adult age. Shifts in motivational orientation from promoting gains toward maintaining functioning and preventing losses may allow individuals to successfully adapt to changing ratios of resource gains over resource losses.

Developmental goal structures.

People typically pursue several developmental goals at once that are more or less related to each other (Riediger, in press). Specifically, these goals may influence each other in positive (facilitative) and negative (interfering) ways. We propose that intergoal facilitation occurs when the pursuit of one goal simultaneously increases the likelihood of success in reaching another goal. Such facilitation may result from instrumental relations among goals and from overlapping goal-attainment strategies. In contrast, intergoal interference occurs when the pursuit of one goal impairs the likelihood of success in reaching another goal. Intergoal interference may result from resource limitations and from incompatible goal-attainment strategies. In a series of experimental field studies, we found that facilitation and interference among personal goals are indeed associated with indicators of successful development: Intergoal interference is associated with impairments in subjective well-

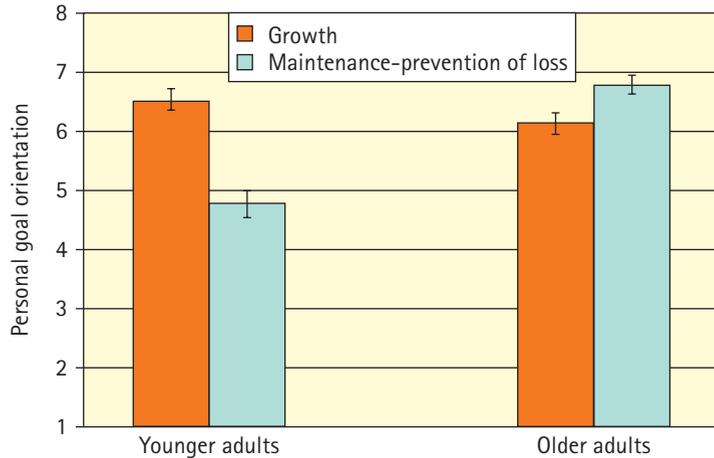


Figure 3. Adult age-group differences in motivational orientation of self-reported personal goals: Goals of younger adults are primarily oriented toward growth, whereas goals of older adults are primarily oriented toward maintenance-prevention of loss ($N = 100$; Study 2 in dissertation Ebner).

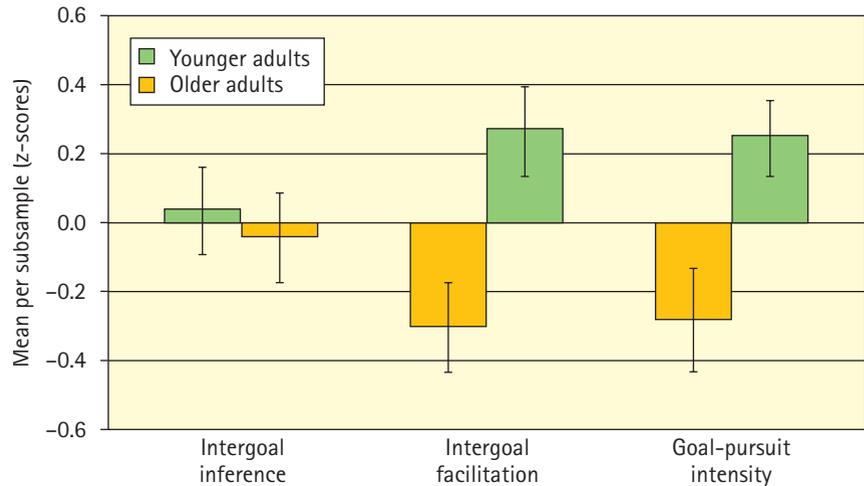
being, and intergoal facilitation is associated with enhanced behavioral involvement in goal pursuit. These associations hold both among younger and older adults (Riediger & Freund, 2004).

From a lifespan perspective, investigating individuals' engagement in goal pursuit is particularly gratifying because many goals remain just that: goals. Wanting to lead a healthy life and exercising regularly are examples of goals many people hold, but do not actually pursue. Active life management, that is, shaping one's life in aspired directions, however, requires goal-directed action. In a multi-method field experiment, we found that older adults pursue their self-selected goals more intensively than younger adults (see Figure 4; Riediger, Freund, & Baltes, 2005). Furthermore, people's self-reported activities as sampled in a diary study showed that more intensive goal pursuit among older adults could not be attributed to age dif-

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Figure 4. Intergoal interference, intergoal facilitation, and intensity of goal pursuit in younger and older adults: Older adults report more mutual facilitation among their goals, and pursue their goals more intensely than younger adults. This higher goal-pursuit intensity is in part a consequence of more mutually facilitative goals in older adulthood. Younger and older adults do not differ in the extent of interference among goals ($N = 111$; Study 1 in Riediger, Freund, & Baltes, 2005).



ferences in available time. Instead, higher goal-pursuit intensity of older adults is, at least in part, a consequence of positive adult age differences in mutual goal facilitation (Riediger et al., 2005). Furthermore, higher intergoal facilitation in later adulthood is also associated with greater goal-related selectivity. Older adults, for example, tend to narrow in on goals in life domains they regard as central to their life satisfaction. Younger adults, in contrast, more often report goals referring to life domains that they regard as unimportant for their life satisfaction. Overall, our findings form part of a recently evolving line of research suggesting that motivational and volitional processes show positive developmental trends from early to later adulthood.

*Beyond the Individual:
An Interpersonal Perspective on Goal Processes*

The fabric formed by developmental goals covers more than the individual. Rather, people co-construct their development as couples, fami-

lies, or in other groups. We have begun to investigate the role of goals for dyadic development in young adult couples. Results from a first study indicate that the extent to which partners mutually know their personal goals is positively associated with partnership quality, and that mutual goal knowledge becomes more important with increasing partnership duration. Another facet of goal processes in couples is reflected in the extent to which both partners agree in their ideas about dyadic goals, which we define as mental representations of the couple's common future. Initial results show that dyadic goal setting is an important characteristic in people's subjective theories of high-quality partnerships. However, young adults do not necessarily know how well their ideas on dyadic goals correspond with those of their partners, and the actual (externally rated) dyadic-goal correspondence appears to be quite independent of subjective evaluations of partnership quality. A one-year follow-up is currently underway to identify prospective asso-

ciations between dyadic-goal processes and partnership development.

Subproject II: Lifespan Differences in Selection Dynamics

According to the SOC theory, selection is particularly important when processing resources are scarce. Everyday cognitive functioning is a continuous stream of simultaneous and sequential multi-tasking (e.g., finding one's way through a mall while memorizing a shopping list, watching one's purse, and talking to a friend), thus requiring flexible resource allocation across functions and task domains on the part of the individual. In this new subproject, we will use a multi-tasking paradigm to investigate lifespan age differences in selection dynamics, with the aim to advance a developmental process model of the selection mechanism in SOC theory.

Ontogenetic changes in selection margins. Given the more positive, the more balanced, and the more negative gain-loss ratio of developmental resources in childhood, adulthood, and old age, respectively, we expect lifespan age differences in mechanisms of selection. In particular, we propose the concept of *selection margins* to study the development of adaptive resource allocation processes in multiple-task situations (see Figure 5).

The *width* of selection margins refers to the extent of the deviation between self-selected and maximally manageable number of simultaneous tasks. We assume that selection width is influenced by the accuracy of people's estimates of the number of tasks they can maximally manage,

which in turn should be a function of performance variability and the accuracy of performance and error monitoring. We expect that older adults and children will show wider selection margins in cognitive tasks than young adults.

The *direction* of selection margins is characterized by whether the individual chooses task numbers in excess or below his or her current ability level. If individuals select to work with a number of subtasks that is smaller than their maximum manageable difficulty, their selection margin is said to be *conservative*. Conversely, if individuals select to work with a number of subtasks in excess of their maximum manageable difficulty, their selection margin is termed *progressive* (see Figure 5). We assume that the direction of selection margins is influenced by people's expectations of the future development of their performance.

Progressive selection margins should result from expected improvement, and conservative selection margins from expected decline. We further assume that such expectations are a function of past experiences of improvement or decline in abilities, of age-normative expectations, and concurrent task performance. Older adults may therefore more likely use conservative selection margins, whereas children may use more progressive selection margins.

Finally, we assume that the *function* or adaptivity of selection margins depends on the actual gradient of performance development, which is a function of biological capacity and contextual opportunities and constraints. Progressive selection margins should be adaptive in childhood,

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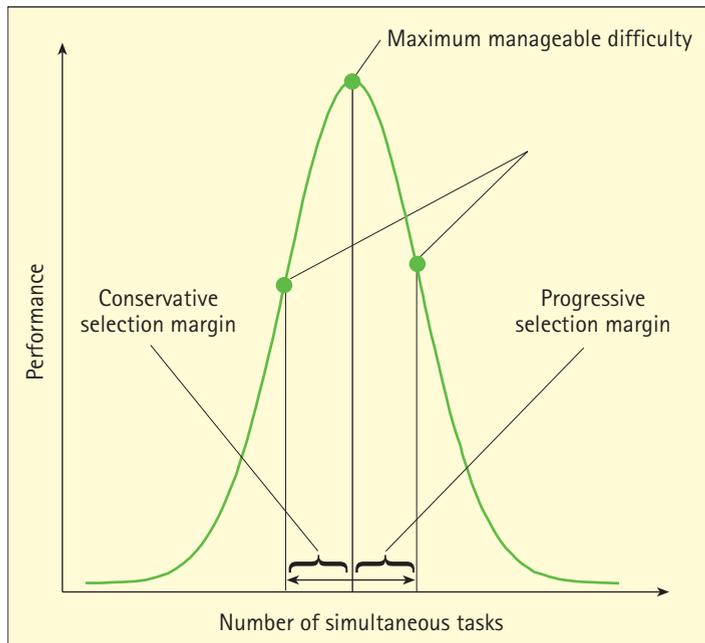


Figure 5. Schematic diagram of selective margins defined as discrepancies between the number of multiple tasks an individual could maximally manage given the available processing resources and the number of tasks he or she actually selects to work on.

when cognitive abilities are on a growth trajectory and when working on a number of tasks that exceeds the child's current ability level should stimulate the full utilization of the developmental potential and thus accelerate the improvement of functioning. Progressive selection margins of moderate width might be most adaptive in this regard. In old age, however, conservative selection margins should be adaptive because they prevent old adults from overtaxing their capacity, which—in contrast to childhood—would not result in rapid improvement of ability levels because cognitive mechanics are on a trajectory of accelerated decline. In this sense, conservative selection margins in older adulthood should function as a mechanism of anticipatory loss-based selection.

Conservative selection margins of small width might be most adaptive in this regard, that is, selection margins that are small enough to keep the individual safely away from their limits without severely constraining the expression of the available capacity. These predictions are currently tested in an experimental paradigm in which participants are continuously asked to select the number of tasks they wish to work on next.

Subproject III: Formal Modeling of Developmental Self-Regulation

As a general set of tools for adaptive resource allocation, SOC mechanisms are intrinsically dynamic. We wish to implement SOC mechanisms in formal models that specify the dynamics of adaptive resource allocation, in general, and of experiential influences on selection, in particular. In collaboration with visiting scientists (e.g., Sy-Miin Chow from University of Notre Dame), special attention will be given to nonlinear dynamical systems models, agent-based models, and recursive attractor models. The long-term goal of this subproject is to transform the SOC metamodel into a formal theory of lifespan development.

Modeling of age differences in resource competition and task prioritization through nonlinear differential equations. Dynamic systems models characterize changes according to specified functional relations and parameters that determine their current states in terms of previous states. One subclass of dynamical models, the predator-prey model, has recently been applied to study adult age differences in dual-task per-

formance. Extending the predator-prey model to characterize dual-task performance, adult age differences in intra- and inter-task resource competition can be specified as mutually related differential equations, thereby permitting the formal description and prediction of task selection behavior and performance levels as a function of resource competition. We will use the predator-prey model to formally describe age differences in task prioritization under conditions of walking while memorizing. Given that tripping over and falling has salient negative functional significance in old age, we predict that older adults allot relatively more processing resources to walking, compared to younger adults, particularly when walking is made difficult (e.g., stepping over obstacles).

Modeling lifespan age differences in experiential selection through neural networks. Another class of dynamic process models that has been commonly applied to study child developmental and aging changes is neu-

ral networks. Neural networks are able to capture dynamic aspects of behavior because their internal representations depend jointly on network parameters, input-output mappings, and learning history. Therefore, neural networks provide a suitable framework for studying age differences in experiential selection. Throughout life, experiences help to shape individuals' habits and preferences. These experiences, in turn, affect goal and task selection, thereby enhancing the likelihood of certain future experiences, and decreasing the likelihood of others. In some cases, experiential selection helps the deliberation of selecting a particular goal or action; in other cases, habits introduce conflict between current task requirement and old behavior and thus hamper current action (see Figure 6). We plan to use neural network models to examine how lifespan age differences in selection mechanisms influence behavior when current task requirements conflict with well-established habitual responses.

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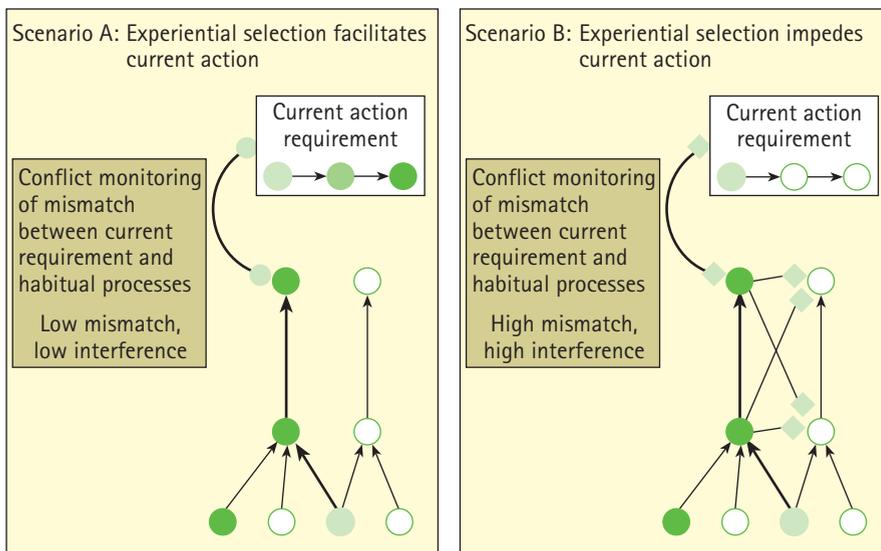


Figure 6. Schematic diagram of two scenarios of possible interactions between experiential selection and current actions: Habituated (experientially selected) processes are linked with thick dark lines. When the conflict between current action requirement and experientially selected processes is low, experiential selection facilitates current action (Scenario A). In contrast, when conflict between current action requirement and experientially selected processes is high, experiential selection hampers current action (Scenario B).

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Research Project 5 Interactive Brains, Social Minds

This new project plans to investigate the development of behavioral and neuronal mechanisms that permit individuals to coordinate their ongoing behavior in time and space. The empirical focus is on temporal aspects of interpersonal action coordination as assessed by simultaneous EEG, EMG, and behavioral recordings. Activities requiring such coordination include performing music, singing, dancing, and collective sports. More importantly, general properties of social behaviors, such as joint gaze, imitation, and turn-taking probably also fall under this category. Therefore, the ability to align one's action in time with the action of another person may play a critical role in social development. Interpersonally coordinated behavior may reflect basic dispositions and needs, and pleasure associated with such behavior may reinforce activities serving important evolutionary functions, such as early mother-child interaction and reproduction.

So far, the dominant research strategy in social cognitive neuroscience has focused on understanding how individualized brains process socially embedded information. Questions about the online dynamics between multiple brains—capturing multiple interactive brains during interpersonal interaction—have yet to be

pursued. A central empirical objective of this project is to identify neuronal mechanisms that allow individuals to coordinate and adjust their individual contributions to a coordinated action with high temporal precision. We conjecture that neural networks supporting social cognition, in general, and theory of mind abilities, in particular, also support interbrain couplings during interpersonally coordinated voluntary action. Preliminary results from pilot studies suggest that this hypothesis can be meaningfully addressed with frequency analyses of standard electrophysiological recordings (EEG and EMG).

Specifically, we conjecture that brain mechanisms permitting interpersonally coordinated behavior have to meet two constraints: (a) They need to be sufficiently fast to permit the degree of interpersonal coordination actually observed; (b) they need to integrate and regulate sensory, motor, and brain activity to generate and sustain action coordination between two or more persons. Coher-



Figure 1. One of the three new EEG cabins of the LIP research unit. The cabin is sufficiently large to allow for simultaneous EEG recording of up to four individuals.

ent oscillatory activity appears to meet both constraints. First, coherent oscillations bind spatially distributed but functionally related information at the level of individual neurons, cell assemblies, and cortical areas. Onset times and frequency ranges of coherent oscillations are sufficiently fast to permit, in principle, the kind of between-person action coordination observed in hu-

mans. Second, coherent oscillations support both perception and motor performance. We have begun to investigate the functional significance of coherent oscillations with a variety of paradigms ranging from highly controlled activities, such as coordinated tapping, to less controlled but behaviorally rich and emotionally salient actions, such as performing music or kissing.

The Center for Lifespan Psychology 2004



Left to right: Viktor Müller, Martin Lövdén, Michael Schellenbach, Jacqui Smith, Florian Schmiedek, Daniel Grünh, Oliver Huxhold, Susanne Scheibe, Julia Delius, Agneta Herlitz, Dennis Gerstorf, Albina Bondar, Natalie Ebner, Yvonne Brehmer, Sabine Schäfer, Christina Röcke, Yee Lee Shing, Anna Kleinspehn, Dana Kotter, Markus Werkle-Bergner, Shu-Chen Li, Ute Kunzmann, Lars Bäckman, Paul B. Baltes, Ulman Lindenberger.

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Research Project 6 Wisdom: The Integration of Mind and Virtue

The search for human strengths has a long history in philosophical writings. Since antiquity, one guide in this search has been the concept of wisdom. At the core of this concept is the notion of a perfect, perhaps utopian, integration of knowledge and character, mind and virtue (e.g., Baltes, 2004; Baltes & Staudinger, 2000; Kunzmann & Baltes, in press). A focus on human strengths and excellence is also a key feature of the recent advent of the movement of positive psychology.

The territory of wisdom can be approached in several ways, for instance, by a person focus (what are the characteristics of “sages”?) or by a conceptual orientation (what is wisdom as an abstract system?). In our work, we prioritized the second approach in order to obtain a golden standard on the utopia of wisdom as a body of outstanding knowledge about the human condition and the conduct of life. In subsequent research, we considered the first line of inquiry, and asked questions about the characteristics and developmental conditions of persons who, relatively speaking, achieve higher or lower standings in the theoretically specified wisdom domain (Baltes & Kunzmann, 2004).

Specifically, and consistent with Western philosophical conceptions, our project has defined wisdom as an expert knowledge system about fundamental problems related to the meaning and conduct of life. These problems are typically complex, ill-defined, and have multiple, yet unknown, solutions. For instance, deciding on a particular career path, accepting the death of loved ones, dealing with human mortality, or solving long-lasting conflicts among family members, are illustrations of the type of prob-

lem that calls for wisdom-related expertise.

Solutions or thinking about possible solutions to these problems can be quantified based on five criteria derived from our theory-based wisdom conception (Baltes & Smith, 1990; Baltes & Staudinger, 2000). Expert knowledge about fundamental problems referring to the meaning and conduct of life is thought to approach wisdom if it meets all five criteria. Two criteria are labeled basic because they are characteristic of all types of expertise or expert knowledge systems; these are: (a) rich factual knowledge about human nature and the life course and (b) rich procedural knowledge about ways of dealing with life problems. The three other criteria are labeled metacriteria because they are thought to be unique to wisdom: (c) lifespan contextualism, that is, an awareness and understanding of the many contexts of life, how they relate to each other and change over the lifespan; (d) value relativism and tolerance, that is, an acknowledgment of individual, social, and cultural differences in values and life priorities; and (e) knowledge about handling uncertainty, including the limits of one's own knowledge and the knowledge of the world at large.

Task: A 15-year-old girl wants to get married right away.
What could one/she consider and do?

Low wisdom score

A 15-year-old girl wants to get married? No, no way, marrying at age 15 would be utterly wrong. One has to tell the girl that marriage is not possible. (After further probing) It would be irresponsible to support such an idea. No, this is just a crazy idea.

High wisdom score

Well, on the surface, this seems like an easy problem. On average, marriage for 15-year-old girls is not a good thing. I guess many girls might think about it, however, when they fall in love for the first time. And, then, there are situations where the average case does not fit. Perhaps in this instance, special life circumstances are involved, such that the girl has a terminal illness. Or the girl has just lost her parents. And also, this girl may not be from this country. Perhaps she lives in another culture and historical period.

Figure 1. Illustration of two extreme responses to wisdom tasks.

To assess wisdom, we present our study participants with short vignettes describing difficult life problems of fictitious people, and ask them to think aloud about these problems. For example, a problem concerning life management reads: "A 15-year-old girl wants to move out right away. What could one/she consider and do?" Trained raters evaluate our participants' responses for wisdom-related knowledge as determined by the five criteria described above. Figure 1 depicts two excerpts of extreme responses to one of our wisdom tasks.

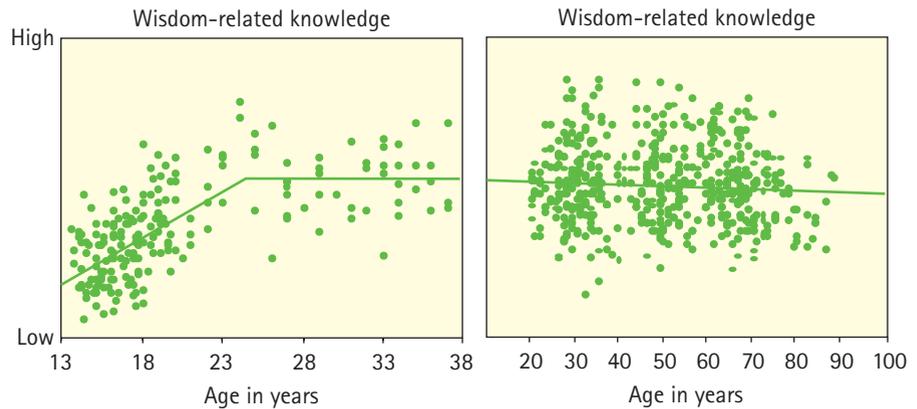
Given that wisdom has been considered an ideal endpoint of human development, a longstanding goal of our research has been to describe and explain age-related differences in wisdom-related knowledge (e.g., Baltes & Kunzmann, in press; Baltes & Smith, 1990; Pasupathi, Staudinger, & Baltes, 2001; Smith & Baltes, 1990; Staudinger, Smith, & Baltes, 1992). A second goal of our work has been to study the factors that promote the activation of wis-

dom-related knowledge in a given situation (Staudinger & Baltes, 1996; Böhmig-Krumhaar, Staudinger, & Baltes, 2002). Finally, during the last couple of years, we have become increasingly interested in understanding the motivational-emotional nexus of wisdom-related knowledge. Thus, we have studied the motivational, social, and emotional characteristics of persons varying in level of wisdom-related knowledge (e.g., Baltes & Kunzmann, 2004; Kunzmann, 2004; Kunzmann & Baltes, 2003a; Stange, 2004).

Evidence for Age-Related Differences in Wisdom-Related Knowledge

As seen in Figure 2, our studies suggest that wisdom-related knowledge increases during adolescence and young adulthood (Pasupathi et al., 2001) and then remains stable, at least up to age 75 (see also Staudinger, 1999). At first sight, the stability of wisdom across most of adulthood is at odds with the idea that wisdom is a positive aspect of aging. However, given that basic

Figure 2. Cross-sectional age gradients and scatter plots for wisdom-related performance. The left panel shows data from Pasupathi, Staudinger, and Baltes (2001) including outcomes of a spline analysis. The right panel summarizes results from several studies with adult samples (see also Baltes & Staudinger, 2000).



cognitive functions lose efficiency relatively early in the lifespan, for most people, the maintenance of wisdom-related knowledge might be the best possible outcome that adulthood and old age can bring about. That many adults do not experience an increase in wisdom-related knowledge during the adult years is also consistent with our theoretical model of the ontogenesis of wisdom. In this model, wisdom-related knowledge is not strictly tied to the aging process; rather, we have argued that the acquisition and optimization of wisdom-related knowledge requires a wide range of supportive conditions and processes related to an individual's personality, cognitive capacities, environment, and life history (e.g., Baltes & Smith, 1990; Baltes & Staudinger, 2000). Correlational evidence from adult samples supports this idea. For example, those who are open to new experiences, who have a certain level of academic intelligence, or who think about the how and why of an event rather than simply whether it is good or bad display higher levels of wisdom-related knowledge (e.g., Staudinger, Lopez, & Baltes, 1997; Staudinger, Maciel, Smith, & Baltes,

1998). There is also evidence that adults who specialize in professions, which provide extensive training and practice in difficult and uncertain life matters (e.g., clinical psychology), show higher wisdom-related performance than professionals from fields in which training and job tasks were not specifically dedicated to dealing with fundamental life problems (Staudinger et al., 1992). Together, this evidence suggests that age itself does not bring higher levels of wisdom-related knowledge, and yet a number of age-associated factors appear to be highly relevant to the further development of wisdom during the adult lifespan.

The Activation of Wisdom-Related Knowledge in the Laboratory

In experimental work, we have shown that the expression of wisdom-related performance can be enhanced by social and cognitive interventions. For example, Boehmig-Krumhaar et al. (2002) demonstrated that a memory strategy, namely, a version of the method of loci, in which participants were instructed to travel on a cloud around the world, can be used to focus people's attention on cultural relativism and

tolerance. As predicted, following this intervention, participants expressed higher levels of wisdom-related knowledge, especially value relativism and tolerance. To explore the social-mind component of wisdom, Staudinger and Baltes (1996) conducted an experiment in which study participants were asked to think aloud about a wisdom problem under several experimental conditions involving imagined and actual social interactions. Specifically, before responding individually, some participants had the opportunity to discuss the problem with a person they brought into the laboratory and with whom they usually discuss difficult life problems; others were asked to engage in an inner dialogue about the problem with a person of their choice, or to think about the problem on their own. The results supported the notion of a strong interactive minds component. Actual social dialogue and the inner-voice dialogue increased performance levels by almost one standard deviation. One important implication of these studies is that many adults may have the capacity to perform better on wisdom tasks than they actually often do. To do so, they need to engage their social context as a facilitator.

The Emotional, Motivational, and Social Dynamics of Wisdom-Related Knowledge

A third focus of our work has been the investigation of emotional, motivational, and social dynamics linked to wisdom-related knowledge. Related to this research focus is our work on the consequences of wisdom-related knowledge for a person's lifestyle and behavior in a given situ-

ation (e.g., Baltes & Freund, 2003; Baltes et al., 2002; Kunzmann, 2004; Kunzmann & Baltes, 2003a; Kunzmann, Stange, & Jordan, in press). As Kunzmann and Baltes (2003b) reported, for example, adults with above-average levels of wisdom-related knowledge evince a complex and more modulated profile of affective feelings, they show a preference for values that consider the welfare of others, and report engaging themselves in the interest of others. Moreover, adults with above-average levels of wisdom-related knowledge reported that they prefer cooperative strategies of conflict management over one-sided strategies that focus on one's own interest (dominance), the opponent's interest (submission), or no interest at all (avoidance; see also Figure 3). We also have conducted laboratory studies to investigate under more standardized conditions the difference that wisdom-related knowledge

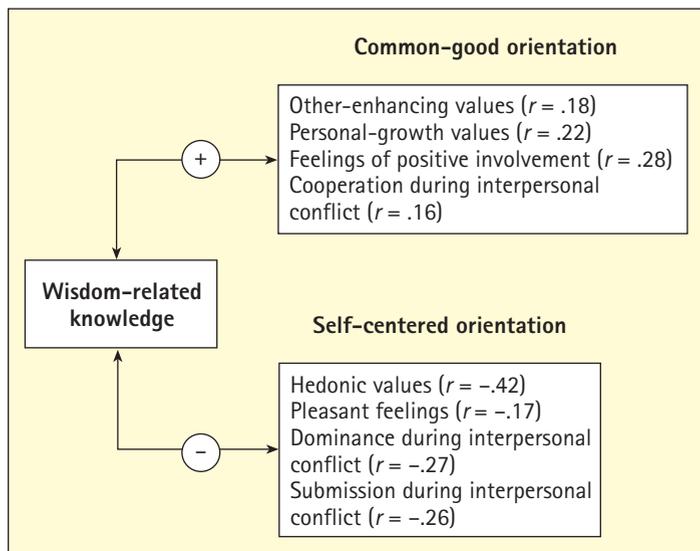


Figure 3. Wisdom-related knowledge and its association with motivational, affective, and social-behavioral dispositions. The evidence suggests that wisdom is incompatible with a self-centered life.

makes for adults' social and emotional behaviors. In one such experiment we presented short film clips about fundamental losses (e.g., death of loved ones, life-threatening diseases) known to elicit strong feelings of sadness (Kunzmann & Grühn, in press). The evidence from this study suggests that people with above-average levels of wisdom-related knowledge react quite differently to such problems than do people with low levels of wisdom-related knowledge. Possibly due to their better understanding of the significance of fundamental losses, persons with higher wisdom-related knowledge spontaneously reacted with greater sadness both on the level of subjective feelings and outer expressions (Kunzmann & Baltes, in press). In another study, we found that adults with above-average levels of wisdom-related knowledge were more likely to express empathic concern with others in need, and they were more accurate in judging other people's inner feelings than people with low levels of wisdom-related knowledge (Kunzmann & Richter, 2004).

Who Is Considered a Wise Person?

Related to this work is an experimental person perception study conducted as a dissertation by Antje Stange. She investigated the degree to which people's social behaviors, verbalized wisdom-related knowledge, and chronological age make them appear to be wise and sought out as an advisor (Stange, 2004). More specifically, participants in her study had to evaluate an advisor's level of wisdom after they observed advisors (varying in age, empathic

listening, and substantive quality of wisdom knowledge) interacting with a young person who talked about a serious problem. The findings suggest that participants' evaluations did not only depend on the advisor's level of wisdom-related knowledge as expressed in his or her verbal advice, but also on the advisor's age and nonverbal listening behavior. In fact, advisors who met all three wisdom criteria (high wisdom-related knowledge, empathic listening behavior, and older age) were most likely to be considered as wise. This evidence supports the idea that wisdom as an attributed person characteristic is a multidimensional concept requiring the simultaneous consideration of experience-based, behavioral, and cognitive qualities. While processing the cues of age and listening behavior was fast, the information about wisdom knowledge took longer to process. Together, our evidence has been systematically extended from wisdom as a theory of knowledge to wisdom as a characteristic of people and behavioral expressions. The results are consistent with our expectations. Together, the findings help us move toward a more comprehensive conceptualization of wisdom that highlights its special strength, namely, the integration of mind and virtue as the optimum of human functioning and as a guidepost for desirable (successful) developmental outcomes involving the self as well as the role of oneself in the positive development of others (Baltes, 2004; Baltes et al., 2002; Baltes & Freund, 2003; Baltes & Kunzmann, 2004; Baltes & Staudinger, 2000; Kunzmann & Baltes, in press).

Research Project 7 Toward a Psychological and Developmental Theory of Lifespan-Longing (Sehnsucht)

One of the exciting events in lifespan psychology is the identification of novel constructs that appear worthwhile of investigation when considering the life course as a whole (Baltes, Lindenberger, & Staudinger, in press). A first construct attracting such attention was wisdom (Baltes & Smith, 1990; Baltes & Staudinger, 2000; Kunzmann & Baltes, in press; see Project 6). Recently, we have added the concept of "Sehnsucht." We assume that "Sehnsucht" is a holistic, domain- and lifespan-integrative concept that may further our understanding of human development in its complexity and richness. It is also a construct that fits a central piece of lifespan theory, namely that a key feature of life in the modern world is a permanent sense of incompleteness, objectively and subjectively (Baltes, 1997). "Sehnsucht" is difficult to translate into English. After much deliberation, we have chosen to characterize the emerging research program as the "Psychology of Lifespan-Longing." We view lifespan longings as emotional and mental representations of personal peaks of life, akin to personal utopias. In principle, however, these personal utopias are unattainable and, therefore, ambivalent in emotional quality.

In German everyday life, the concept of "Sehnsucht" is salient. In fact, "Sehnsucht" was the third most often nominated word in a recent contest of "The most beautiful German word" (*Spiegel Online*, 2004). Such popularity illustrates the importance that German culture allocates to emotional and mental representations of unfulfilled wishes of life, and probably also to individual and collective reflections about the "non-realizability of dreams" and "chronic incompleteness" as part of life. Aside from attending to the core of everyday, dictionary-like definitions of "Sehnsucht," we are applying principles of lifespan psychology (e.g., Baltes, 1987, 1997) to frame our approach on a conceptual level. Our conceptual analysis suggests a family of six characteristics to capture the structure of lifespan-longing (see Figure 1, for an example).

(1) Lifespan-longing involves feelings of incompleteness and imperfection of life. It reflects the notion that development is a lifelong process that never reaches completion. **(2)** We assume that lifespan-longing comprises representations that are rich in symbolism. **(3)** Consistent with the notion that individuals hold subjective beliefs about their own optimal development, we assume that lifespan-longing involves personal utopias of ideal life realities and optimal life courses. **(4)** Lifespan-longing reflects the conception that development always involves both gains and losses: It has an ambivalent, bittersweet emotional quality. **(5)** Lifespan-longing focuses on the life course as a whole, that is, on the personal past, present, and future. It is an "ontogenetic tritime phenomenon." **(6)** Lifespan-longing elicits reflec-

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Prototype example of a lifespan-longing: A house by the sea

I always wanted to have a house and live by the sea. It is the missing piece in my life (*personal utopia, incompleteness*). I enjoy imagining myself walking along the seashore and hearing the sounds of the waves and seagulls. Yet, I know that real life will never be that perfect, and this makes me sad (*nonrealizability of personal utopia, ambivalent emotions*).

The sea has been part of my childhood, and it symbolizes something missing in my life today (*tritime focus*). It has to do with freedom, endless time, and being close to nature (*symbolic nature*). I wonder: how do I want to live (*reflection*)? In a way, I would hope that when I am old, I would be able to buy a house by the sea to fulfill my lifespan-longing (*continuing presence of personal utopia, tritime focus*).

Figure 1. This figure presents a theory-based prototype example of a lifespan-longing. The example has been constructed to illustrate the six structural characteristics that our theoretical analysis assigns to the mental representations of lifespan-longing (Sehnsucht).

tions and evaluations of life and one's standing relative to ideals, or to others who serve as guideposts for optimal development.

The major study conducted so far was dissertation work by Susanne Scheibe, which was cosupervised by Paul B. Baltes and Alexandra M. Freund (Scheibe, 2005; Scheibe, Freund, & Baltes, submitted). Based on the theoretical frame outlined above, in this study, we developed a self-report questionnaire to assess lifespan-longing. We used this new scale to explore age-related changes in, and possible functions of, lifespan-longing for development. In addition, a master's thesis was completed by Sabine Mayser under the supervision of Michaela Riediger and Susanne Scheibe. This study explored similarities and differences between lifespan-longing and goals in an attempt to show that lifespan-longing carries uniqueness, especially in relation to the psychology of goals.

Self-Report Measure of Lifespan-Longing

The outcome of the scale development was rather encouraging. We asked 299 study participants (aged 19 to 81 years) to report on their three most important lifespan-longings. The questionnaire inquired about the six structural characteristics and other important aspects of lifespan-longings. As shown in Figure 2, the measurement structure corresponded to our theory-guided expectations. A two-factor solution with the two factors of intensity/scope and nonrealizability/ambivalence resulted. There was evidence for temporal stability (over 5 weeks), with values between .59 and .85. These data show that reliability is satisfactory, and that lifespan-longing exhibits a tendency toward the dispositional kind. Surprisingly, there were no clear age and gender differences. Thus, adults of different ages and genders reported their lifespan-longings to be equally intense, broad, unrealizable, and ambivalent.

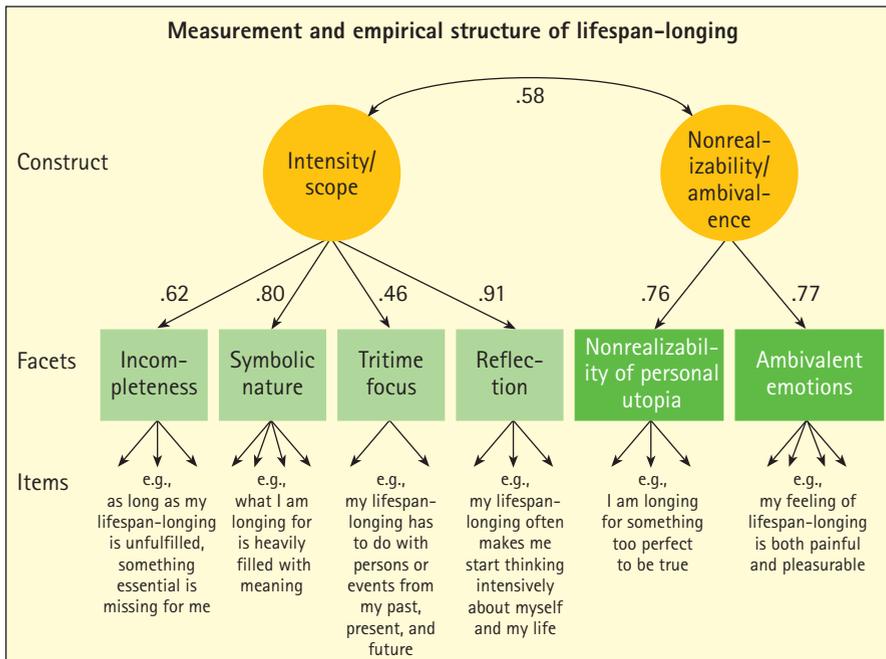


Figure 2. On a general level of analysis, results from a study with 299 adults (aged 19 to 81) showed that lifespan-longing can be described in terms of two structural "factor-analytic" dimensions. Intensity/Scope represents the intensity of incompleteness of life, the amount of associated reflections, and the extension of lifespan-longing across multiple life domains and time periods. Nonrealizability/Ambivalence represents the utopian nature of lifespan-longing representations and the unique bittersweet affect accompanying lifespan-longing. For each facet of lifespan-longing, the figure contains sample items that are part of the questionnaire used in this study.

An interesting by-product was the finding that under conditions of more explicit anonymity (separate questionnaire without identification number), 35 % of participants reported additional lifespan-longings not mentioned under the standard instruction. These included less desirable characteristics, such as infidelity and revenge.

The Regulative Function of Lifespan-Longing in Adult Development and Aging

What is the role of lifespan-longing in planning, managing, and experiencing one's life? Does it give direction? Is it an expression of incompleteness? Is it an indicator of posi-

tive or negative states and outcomes? Answers to such questions require careful analysis of antecedent-consequent relationships, considerations of different outcome measures, and likely also the recognition that such associations and causal connections may be non-linear.

In our first effort, we considered two possible outcomes of lifespan-longing. First, we examined whether lifespan-longings are perceived as functional (facilitative) in development. In this vein, adults in our study reported that their lifespan-longings (1) provided a sense of directionality for development (regarding the past, present, and future life)

and (2) helped in regulating losses and incompleteness. Second, we investigated the relationship between lifespan-longing and overall well-being (e.g., positive emotions, life satisfaction). The correlational relationship was negative, that is, individuals with high-level expressions of lifespan-longing reported lower well-being. It can be speculated that lifespan-longing is linked with critical self-reflection about the developmental progression toward personal ideals of life. Thus, intense lifespan-longing might be an expression of unfulfilled personal utopias. However, this negative association between high levels of lifespan-longing and subjective well-being was subject to modulation. Specifically, when persons also reported a strong sense of control over the experience of lifespan-longing, the negative relationship was less strong approaching zero.

Lifespan-Longing and Goals

In the second study, we asked persons to report on their three most important lifespan-longings and their three most important goals. We found important differences between these two concepts. For example, goals were reported to be more concrete, controllable (i.e., one knows the steps necessary for their achievement), and more closely linked to everyday behavior than is true for lifespan-longings. In addition, lifespan-longings were rated as more emotionally bittersweet (painful and pleasurable at the same time) than goals.

In the future, we will inquire further into the antecedents, correlates, and consequences of lifespan-longings and explore their short-term intra-individual, temporal, and contextual dynamics (e.g., stages of lifespan-longing, such as beginning, experience, and conclusion).

Integrative Project History, Theory, and Method in Lifespan Psychology

Scientific Investigators

All LIP scientists

In order for a developmental approach—especially of the life-span kind—to be empirically powerful, one must have a warehouse full of methods capable of identifying, representing, and explaining complex long-term historical relationships.
Baltes, Reese, and Nesselroade (1977, p. 106)

Since its foundation by Paul Baltes in 1981, the Center for Lifespan Psychology has sought to promote historical reflection, theoretical integration and expansion, and methodological innovation within developmental psychology and in interdisciplinary context (Baltes, Lindenberger, & Staudinger, in press). Over the years, this emphasis on concepts and methods has evolved into a distinct feature of the Center. The Center will continue this line of work, with special attention to formal theory, computational models, statistical methods, and empirical research tools that connect behavioral to neuronal plasticity.

Lifespan Psychology in Dialogue With Other Disciplines: Exploring Biocultural Co-Construction

Human development from childhood into old age results from reciprocal co-constructive interactions between biological factors and experiential/environmental factors (Baltes, Lindenberger, & Staudinger, in press; Li, 2003; Lindenberger et al., in press). Though most scholars in the behavioral neurosciences subscribe to this view, the mechanisms mediating beneficial and deleterious effects of environment and behavior on brain functioning are not yet well understood. Conversely, social scientists often focus on environmental conditions and tend to ignore potential biological influences. To initiate a productive dialogue on biocultural co-construction, and based on contributions resulting from a conference sponsored by the Center for Lifespan Psychology, Paul Baltes, Patti Reuter-Lorenz from the Univer-

sity of Michigan, and Frank Rösler from the University of Marburg asked neuroscientists and behavioral scientists to articulate their divergent perspectives (Baltes, Reuter-Lorenz, & Rösler, in press—see overleaf; see also Li & Baltes, in press; Staudinger & Lindenberger, 2003). In a similar vein, and together with Lars Bäckman (Karolinska Institute, Stockholm, and visiting scientist at the Center in 2004–2005), we addressed methodological advances in the study of brain-behavior dynamics from a multivariate lifespan perspective (Lindenberger, Li, & Bäckman, in press).

Computational Modeling

In earlier work (e.g., Li, Lindenberger, & Frensch, 2000), we proposed neural networks as a computational platform for cross-level integration of lifespan differences in cognitive and neuronal processes. This line of inquiry was extended in two direc-

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tions. First, together with Moshe Naveh-Benjamin (University of Missouri-Columbia), we investigated the relation of age changes in neuromodulation to associative binding deficits in old age. Our results support the conjecture that neuromodulatory processes play a basic role in binding by affecting the efficiency of distributed conjunctive coding (S.-C. Li, Naveh-Benjamin, & Lindenberger, in press). Second, in collaboration with Timo von Oertzen (Saarland University), we studied the effects of aging-related increase in intrinsic neuronal noise on stochastic resonance, a fundamental property of physical and biological systems in which noise acts as an amplifier of weak signals. We showed that systems with greater more intrinsic neuronal noise and less plasticity continue to exhibit stochastic resonance at single-neuron and network levels. However, the stochastic resonance effect is smaller and, somewhat counterintuitively, requires more external noise for its operation (Li, von Oertzen, & Lindenberger, submitted). It is planned to test these predictions in psychophysical experiments, and to investigate its applied implications.

Exploration of Statistical Methods

In part together with Paolo Ghisletta (University of Geneva), Chris Hertzog (Georgia Institute of Technology, Atlanta, USA), and Timo von Oertzen (Saarland University), researchers working at the Center have used mathematical analysis and Monte Carlo simulations to examine formal properties and statistical power of widely used statistical methods in developmental research. By formal analysis, we showed that the contribution of correlated change to cross-sectional correlations is small under most conditions (Lindenberger, von Oertzen, Ghisletta, & Hertzog, in prep.). We also found that the power to detect variances and covariances of change in standard longitudinal panel designs is surprisingly small (Hertzog, Lindenberger, Ghisletta, & von Oertzen, submitted). Related work has examined differences and commonalities between multi-level and latent-growth-curve modeling (Ghisletta & Lindenberger, 2004; Lindenberger & Ghisletta, 2004) as well as the statistical and conceptual status of reliability in multivariate time series (Li, Huxhold, & Schmiedek, 2004; Lindenberger & von Oertzen, in press).

Lifespan Development and the Brain: The Perspective of Biocultural Co-Constructivism

Paul B. Baltes, Patricia Reuter-Lorenz, Frank Rösler (Eds.)
New York: Cambridge University Press (in press)

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| <p>I. Setting the Stage Preface Paul B. Baltes, Patricia Reuter-Lorenz, & Frank Rösler</p> <p>1. Biocultural Co-Construction of Lifespan Development Shu-Chen Li</p> <p>II. Neuronal Plasticity and Co-Construction: Microstructure Meets the Experiential Environment</p> <p>2. Adult Neurogenesis Gerd Kempermann</p> <p>3. Neuronal Plasticity: Potential and Constraints William T. Greenough & James Blake</p> <p>III. Neuronal Plasticity and Co-Construction: Atypical Brain Architectures</p> <p>4. Sensory Input-Based Adaptation and Brain Architecture Maurice Ptito & Sébastien Desgent</p> <p>5. Blindness: A Source and Case of Neuronal Plasticity Brigitte Röder</p> <p>IV. Ontogeny and Co-Construction: Early Development</p> <p>6. Neurobehavioral Development in the Context of Biocultural Co-Constructivism Charles A. Nelson</p> <p>7. Language Acquisition: Biological Versus Cultural Implications for Brain Structure Angela D. Friederici & Shirley-Ann Rüschemeyer</p> <p>V. Ontogeny and Co-Construction: Adulthood</p> <p>8. Co-Constructing Human Engineering Technologies in Old Age: Lifespan Psychology as a Conceptual Foundation Ulman Lindenberger & Martin Lövdén</p> | <p>9. Reading, Writing, and Arithmetic in the Brain: Neural Specialization for Acquired Functions Thad A. Polk & J. Paul Hamilton</p> <p>VI. Plasticity and Functional Compensation in Later Life</p> <p>10. Influences of Biological and Self-Initiated Factors on Brain and Cognition in Adulthood and Aging Lars Nyberg & Lars Bäckman</p> <p>11. The Aging Mind and Brain: Implications of Enduring Plasticity for Behavioral and Cultural Change Patricia A. Reuter-Lorenz & Joseph Mikels</p> <p>VII. Co-Construction in Affective and Aesthetic Domains</p> <p>12. Emotion, Learning and the Brain: From Classical Conditioning to Cultural Bias Elizabeth A. Phelps</p> <p>13. The Musical Mind: Neural Tuning and the Aesthetic Experience Oliver Vitouch</p> <p>VIII. Co-Construction in Larger Cultural Contexts</p> <p>14. Characteristics of Illiterate and Literate Cognitive Processing: Implications of Brain-Behavior Co-Constructivism Karl Magnus Petersson & Alexandra Reis</p> <p>15. The Influence of Work and Occupation on Brain Development Neil Charness</p> <p>IX. Epilogue</p> <p>16. Epilogue: Letters on Nature and Nurture Onur Güntürkün</p> |
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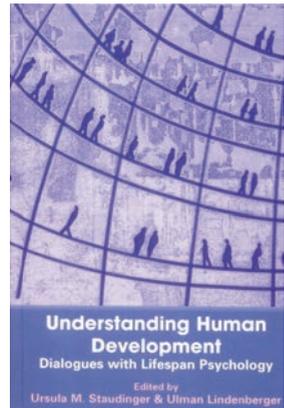
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**Center for
Sociology and the Study
of the Life Course**

Contents

| | |
|--|-----|
| Research Program and Research Projects | 217 |
| Education, Training, and Occupational Careers | 223 |
| Education, Mismatch, and Mother's Employment— In Memory of Felix Büchel | 240 |
| Employment Relationships at Risk | 246 |
| Reinterviewing with "TrueTales"—A New Survey Instrument | 253 |
| Transformation Processes in Poland and East Germany | 258 |
| Further Projects | 268 |
| Publications 2003–2004 | 271 |

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Research Program and Research Projects

Sociological Research at the Max Planck Institute for Human Development

Sociology as a scientific discipline is interested in the formation of institutions and in the social behavior and actions of individuals embedded in institutions. Within the specific context of an interdisciplinary institute for human development, sociology can make two kinds of contributions. First, it examines the roles that the family, the educational and training system, the occupational structure, and the welfare state play in the development and life courses of individuals. Second, it examines the way in which specific life-course patterns express and affect the distribution of life chances.

We share substantive topics, theoretical perspectives, and methodological approaches with other centers of the Institute, for example, the interest in the conditions of attainment in education and training with the Center for Educational Research. We are also interested in both the individual and social consequences of differential educational attainment. The longitudinal surveys of the two centers overlap in the life phase which occurs at the completion of schooling and commencement of early labor market experience. We just recently concluded the new version of the German Education Report. Together with the Center for Lifespan Psychology we share an interest in the full life course from birth to death, particularly the interplay between social environments and individual development. These common interests resulted in the joint Berlin Aging Study and joint research on psychological covariates of employment trajectories in East Germany during the unification process.

Goals of the Research Program

The research program is oriented toward answering three sets of questions:

(1) The first set of questions focuses on the relationships between the macrolevel structure of societies and patterns of the life course. In what manner and with which outcomes do institutions shape the patterns and distributions of individual life courses? We look at life courses generated by social norms, by institutional configurations, and by opportunity structures, all of which vary across social groups as well as specific national and historical contexts. Life courses are a summary concept for the intertwined processes of residential migration, family history, education and training trajectories, employment, and occupational careers as well as the temporal patterns of relationships to the social insurance systems. Therefore, with respect to institutions, we are primarily interested in schools and training institutions, the occupational structure and labor market, the family, and the welfare state. The relevant time dimension, here, is the historical time of socioeconomic change.

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(2) The second set of questions focuses on the levels of individual and group action. How do individuals and families actively construct their lives? How do they experience their individual and collective life histories under the given conditions of their own prior biography, their immediate family and work environments, and the generational contexts of their peer birth cohorts? Here, we are primarily interested in the proximate influences of the mesolevel of informal groups, formal organizations, and local opportunity structures as well as microlevel endogenous processes of the individual life course. The relevant time dimensions, here, are chronological age and the individual aging process, the duration of membership in families, households, and firms as well as the time dimension of cohort and generational succession.

(3) The third set of questions focuses on feedback processes from the microlevel of individual action to the macrolevel of structural and institutional constraints. How do changes in life-course patterns shape distributional and aggregative features of social structure and institutional arrangements? What are the implications of such processes for social policies? Irrespective of how they arise, life-course patterns are powerful contexts for individual and group action. Life courses form the qualitative and quantitative basis for macrosocial change and for collective political decision making. Accordingly, the empirical and descriptive social accounting of life-course patterns is an important research task.

We use **four perspectives** in investigating life courses.

First, we see individual life courses as a part and a product of social and historical processes operating on different levels. Individual life courses are linked to the life courses of other persons (parents, partners, children, colleagues, friends) and are embedded in the dynamics of small groups, especially the family. But, life courses are also subject to the influences of social organization and the macroinstitutions of society, including their development over time.

Second, the life course is a multidimensional process. On the one hand, it unfolds in the different, but mutually related life domains (e.g., family cycle and working life), on the other hand, it is dependent on intraindividual processes of organic and psychological development.

Third, the life course is a self-referential process. The individual behaves and acts self-reflectively on the basis of past experiences and resources, making the life course, to some extent, an endogenous causal process. This is also partially true for the collective life history of birth cohorts. The past and initial conditions and characteristics of a cohort impact both on their later collective life history (e.g., in the relationship between working lives and life in old age) and on the adjacent cohorts. The different age groups live together in the same time period, but they bring to the present their distinctive past histories.

Fourth, through the manner in which persons shape their own life courses, they reproduce and transform the social structure. This can

happen via "simple" processes of aggregation or in the form of institutional feedback.

Research Areas

The Center's research program is currently organized into the following areas:

Education, Training, and Employment

The transition between education, training, and employment is a major topic of investigation in the Center for Sociology and the Study of the Life Course. This life phase is crucial for both intergenerational status allocation and the later life history. In reconstructing the collective transition experiences of successive cohorts, we gain empirical insights in the changing institutional linkages between the school and training systems, on the one hand, and between the labor market and the occupational structure, on the other. Moreover, we can examine controversial hypotheses about the lengthening and fragmentation of this

transition period, and about the increasing polarization of the opportunities for skill acquisition and early occupational careers. Other topics of research interest include the following: What are the consequences of educational expansion for working lives? Is there a crisis in the dual system of vocational training and how can this be accounted for? How widespread and serious are the problems of mismatch between acquired and required skills in the labor market? Our guiding hypothesis in this research area is that despite massive distributional shifts and intense pressure for labor market flexibilization, the close linkage between education, training, and occupation persists.

Research Area 1

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Research Area 2

Life Courses in the Transformation of Former Socialist Countries

The fall of the Berlin Wall and the unification of Germany not only provided a major challenge for the social sciences to understand and guide this transition, it also provided unique opportunities for theory-guided research. On the one hand, the transformation allowed us to examine how the former socialist society functioned and why it failed. On the other hand, it provided ample opportunities for the investigation of life courses under the impact of such a sudden dramatic institutional change. We have collected selected cohort and life-course data on both the German Democratic Republic

and the transformation process. In addition, we have intensified cooperation with Polish social scientists for the purposes of comparative study. Our investigations concentrate on the micromechanisms of individual adjustment, adaptation in the domains of family and work, the life-course consequences of institutional transfer from West to East Germany, and individual-level processes in the transformation of the system of social stratification and class. Our studies have revealed some rather surprising findings: Despite a rapid increase in labor market mobility and considerable breaks in individual careers, we also find remarkable continuities.

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Research Area 3

Welfare State, Life Courses, and Social Inequalities

In this research area we focus on conceptual and empirical studies on the impact of various national institutional configurations on life-course outcomes. The macroinstitutions of the modern welfare state and the specific provisions and rules of the social insurance systems are among the major determining factors in the life course and in the distribution of life opportunities. The

role of the welfare state may prove to be especially important in current societal adaptations to global competition and decreasing public finances. Microanalytic and cross-national studies are required to unravel the mechanisms and consequences of different welfare state regimes. Our guiding hypothesis for Germany holds that life courses are still relatively protected from pressures of flexibility, and that stability and continuity prevail.

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Life-Course Research and Analysis: Theory, Methods, and Synthesis

This research area focuses on overarching topics and tasks: the provision of the empirical database for our studies, methodological problems of measurement, analysis, modeling, issues of general theory, and empirical work on the full set of cohort studies.

The Center's research program is empirically based on a series of eight surveys. These surveys rely on population probability samples and were conducted from the early 1980s up to the present day. They now comprise quantified life histories of about 8,500 West German women and men (the cohorts born 1919–21, 1929–31, 1939–41, 1949–51, 1954–56, 1959–61, 1964, and 1971) and about 2,900 East German women and men (the cohorts born 1929–31, 1939–41, 1951–53, 1959–61, and 1971). Detailed life histories were also obtained for the 516 participants of the Berlin Aging Study, who were born between 1887 and 1922. These surveys are retrospective studies. We also carried out two panel studies. In the first panel we reinterviewed our East German respondents from 1991/92 in 1996/97. In the second panel we are reinterviewing in 2004/05 our East and West German respondents born

1971. The first panel study was also employed to analyze the reliability of retrospective measurement. We incorporated a methods experiment in the second panel in order to improve reliability on the basis of insights from the psychology of autobiographical memory. As a supplement to the second panel, we are also conducting a series of narrative biographical interviews. Data editing, the development and maintenance of the database, and data documentation form an important part of our ongoing research work. Currently we also concentrate on establishing a more user-friendly database containing these cohort studies and putting the data documentation into an electronic format.

The Research Center's own data sets are complemented with other German and non-German longitudinal studies, including the German Socio-Economic Panel (GSOEP), the Microcensus, the 1% sample of the Employment Register, the BIBB/IAB (Federal Institute for Vocational Training and the Institute for Labor Market and Employment Research) Employment Survey, and the British Household Panel Study (BHPS). Our major methodological tools consist of dynamic models of discrete change in continuous time.

Brückner, H., & Mayer, K. U. (forthcoming). The de-standardization of the life course: What it might mean and if it means anything whether it actually took place. *Advances in Life Course Research*.

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Key References

Current Research Projects and Research Associates of the Center for Sociology and the Study of the Life Course

Research Area 1 Education, Training, and Employment

| | |
|--|---|
| Early Careers and Family Formation: Life Courses of the Birth Cohorts 1971 in East and West Germany | Karl Ulrich Mayer Britta Matthes Maïke Reimer Holger Seibert |
| Education and Mismatch in the Labor Market | Felix Büchel + Matthias Pollmann-Schult Laura Romeu (Postdoc) |

Research Area 2 Life Courses in the Transformation of Former Socialist Countries

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| After the Fall of the Berlin Wall: Life Courses in the Transformation of East Germany | Britta Matthes Karl Ulrich Mayer Heike Trappe Martin Diewald (Bielefeld) Anne Goedicke (Essen) |
| <ul style="list-style-type: none"> Dissertation Project Employment Risks and Chances Within Households. Careers of Couples During East Germany's Transformation | Anke Höhne |
| Transformation Processes in Poland and East Germany | Bogdan Mach Britta Matthes Karl Ulrich Mayer |
| Bourgeois and Non-Bourgeois Intelligentsia in the GDR | Erika M. Hoerning |

Research Area 3 Welfare State, Life Courses, and Social Inequalities

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| Employment Relationships at Risk | Antje Mertens Frances McGinnity Vanessa Gash |
| <ul style="list-style-type: none"> Dissertation Project Fixed-Term Contracts Over the Life-Course | Stefanie Gundert |
| Gender Segregation After Reunification in East and West Germany | Heike Trappe |

Research Area 4 Life-Course Research and Analysis: Theory, Methods, and Synthesis

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| Post World War II Social Development as Collective History of Cohorts | Karl Ulrich Mayer Matthias Pollmann-Schult Holger Seibert |
| Cognition and Communication in Longitudinal Data Collection | Maïke Reimer |

Projects and Dissertations Concluded in 2003–2004

Education, Training, and Careers: Life Courses of the 1964 and 1971 Birth Cohorts in West Germany

Karl Ulrich Mayer
Steffen Hillmert
Antje Mertens
Heike Trappe

Political Economy and the Life Course in Advanced Societies (POLIS)

Frances McGinnity
Steffen Hillmert
Karl Ulrich Mayer

Higher Education: Expansion, Institutional Forms, and Equality of Opportunity
(International Comparative Project)

Karl Ulrich Mayer

Higher Education in Germany and the USA

Gero Lenhardt

- Dissertation Project**
Patchwork or Career? Causes and Consequences of Multiple Educational Episodes

Marita Jacob

- Dissertation Project**
Psychology of Autobiographical Memory and the Reliability of Retrospective Measurements

Maïke Reimer

- Dissertation Project**
Overeducation in a Longitudinal Perspective

Matthias Pollmann-Schult

- Dissertation Project**
Occupational Placement of Foreign Apprentices of West German Birth Cohorts 1960 to 1971

Holger Seibert

Education, Training, and Occupational Careers

Born 1964 and 1971: The Collective History of Two Cohorts

What life prospects did young West Germans have in the 1980s and 1990s? What were the conditions under which they went through school and vocational education and entered the labor market? How grave were the consequences of “false starts”? How easy or difficult was it in these two decades for young women and men to overcome the first hurdles of work and family life in the transition to adulthood? To what extent did the accident of birth place young West Germans in a privileged position, compared to their East German peers? Did young East Germans reap greater rewards from reunification than West Germans or did they encounter setbacks in the years immediately following the fall of the Berlin Wall?

Both public and academic debate on these questions in the last two decades has been characterized by a multitude of grim crisis scenarios. The question of whether there would be an adequate number of training positions available to young school leavers cast a long shadow over the end of nearly every school year of the late 1980s and early 1990s. During this period, the constantly increasing unemployment rate also began to affect new entrants to the labor force. Germany's traditionally low rate of youth unemployment steadily approached the level among over-25-year-olds. Although problems of finding a first job after finishing school or higher education were less evident than the overall lack of apprenticeships, the perception was widespread that young people faced ever more acute difficulties in embarking on a career—particularly those without vocational education, but increasingly those with vocational education, and since the 1970s, even university graduates as well. At the same time, “patchwork biography” and “individualization” appeared as catchphrases for a pre-

sumed increasing differentiation of life trajectories and biographies. From the 1970s onward, these ideas were associated with a broadening range of opportunities and options for a self-defined life, but were also linked to a change in values that placed greater emphasis on personal development and individual autonomy than on mere material success. The connotation of these themes changed over time, however. For many young people, the belief that rising prosperity created greater opportunities to actively chart the course of their own lives was slowly replaced by the perception of narrowing prospects, increasing hurdles on their educational and career paths, and disappointed expectations, for example, regarding the value of completed educational degrees.

In 1998 and 1999 we collected nearly 3,000 quantitative life histories of women and men born 1964 and 1971 and living in West Germany using computer-assisted telephone interviews. In the following, we present a summary of main findings. The empirical analyses are published in a monograph (Hillmert &

Key Reference

Hillmert, S., & Mayer, K. U. (Eds.). (2004). *Geboren 1964 und 1971. Neuere Untersuchungen zu Ausbildungs- und Berufschancen in Westdeutschland*. Wiesbaden: VS Verlag für Sozialwissenschaften.





Mayer, 2004). Also available is an extensive documentation of data and methods (Hillmert, Künster, Spengemann, & Mayer, 2004). To enable comparison and to present a more complete picture, we also draw on data from a study we conducted in 1996 on the life courses of men and women born in East Germany in 1971.

The young people born in 1964 and 1971 were shaped by specific generational experiences. On the one hand, the period in which they grew up was the end of a phase of extraordinary prosperity and dramatically increased educational opportunities. In comparison to those born before and after them—and particularly in comparison to their parents—these young people were thus extremely privileged. On the other hand, this was a period of increasing insecurity regarding the actual value of their improved educational attainment for later income, status, and career. An ironic self-portrayal of this generation can be found in Florian Illies' highly popular book "Generation Golf." This image reflects a particular mixture of characteristics and attitudes: high levels of consumption during childhood, a distance from the sociopolitical engagement of the 68-generation, a hedonistic sense of self-entitlement, and disillusionment about their labor market prospects.

The 1980s and 1990s were also a time when institutions were perceived as increasingly rigid and inflexible, and insecurity over career goals and opportunities was rising. By the time of the late-1990s IT revolution at the very latest, tensions had come to a head between

the old educational structures and the demand for new kinds of occupational qualifications.

Our analyses do not attempt to recapitulate these public debates and views in detail, but rather trace the factual developments in the life courses of two specific birth cohorts. We do not rely on the usual cross-sectional data from official statistics, but on representative data on the life courses of the women and men who went through the formative phase of life in the 1990s. This makes it possible not only to follow their educational and occupational development but also to study the way external conditions are reflected in individual life courses, and how positive and negative life circumstances at an early stage of life affect the further experiences of an entire generation.

What Are Our Central Questions?

First of all, how did the specific historical period during which these young people born in 1964 and 1971 went through childhood affect the first part of their collective life history (period effects)? Second, how did the specific conditions at the start of their lives affect later steps in life and the internal dynamics of their educational and professional careers? Thus, this question deals not only with their different experiences at specific points in time under very specific conditions but also with what the members of these two cohorts have in common and how these common experiences affect their further life course (cohort effects). Third, what is the temporal structure of these processes: for example, at what age did those born

in 1964 and 1971 typically reach and cross important thresholds (age effects)? Fourth, what effects did the early phase of the transition from school to career have on other areas of life, for example, personal events related to partnerships, establishing a household, or starting a family (life area interdependencies). Fifth, how do West Germans under relatively stable social conditions differ from East Germans under the turbulent conditions of German reunification? What does the specific "heritage" of East or West Germany bring with it (system effects)? Sixth, how similar or different are women and men? Can we identify trends toward increasing equality of opportunity, or has gender inequality remained constant or even worsened (gender inequality)? Seventh, are there tendencies toward social exclusion (marginalization)? Finally, eighth, do the empirical findings confirm the critical assessments of these issues and prognoses for their outcomes expressed in contemporary public and academic debates?

Surprising Stability and its Price: The Transition From School to the Working World in the 1980s and 1990s

During the 1980s and 1990s, West Germany experienced a dramatic decline in economic growth, two long phases of recession interrupted only by one brief period of upswing (brought about in part by reunification), steadily increasing unemployment, severe shortages of public funds, and concomitant sharp restrictions on the hiring of new public employees. However, this period was also characterized by a steadily increasing rate of participation in education at the secondary level and rapid structural change caused by developments in information technology and an expansion of jobs in the service industry. Government activities under both Kohl and Schröder embraced neither the pro-neoliberalism of 1982 nor the anti-neoliberalism of 1998; rather, they pursued a "best-of-both-worlds" policy combining increased flexibility and social security. German reunifi-

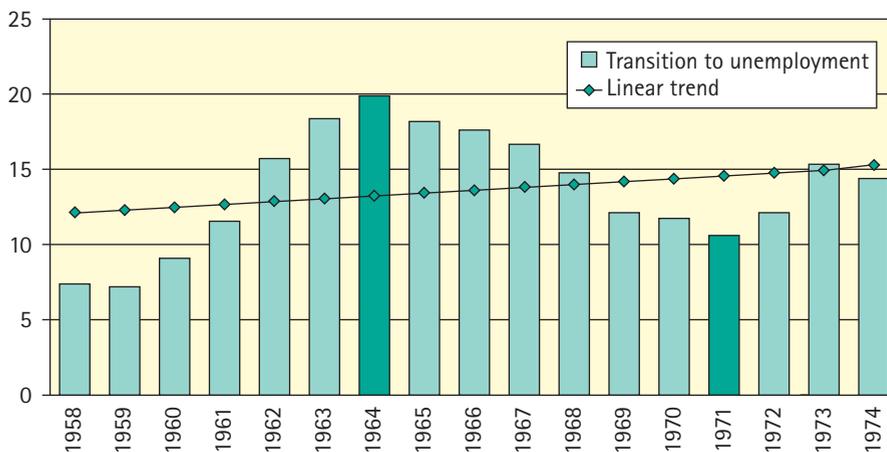


Figure 1. Direct transitions into unemployment after apprenticeship (in % of all transitions).

Source. Hillmert, 2004a, p. 36.

cation was carried out under a similar banner: The promise of a rapid increase in living standards in the East without any sacrifices for the West. What were the negative consequences of this difficult historical situation for the birth cohorts studied here? On the whole, the effects were astonishingly few and minor. We provide evidence both of the strained situation on the educational training market and the difficult transition at the second threshold to the labor market for the 1964 cohort with its 20% unemployment rate (see Figure 1), and of the difficult labor market situation at the point when the 1971 cohort started its vocational education. Nevertheless, for both the 1964 and the 1971 cohort, the rate of apprenticeship training was— with a percentage of two thirds—very high. Furthermore, occupational education ratios (vocational training plus university-level education) were higher than ever before at 86%. For men, medium occupational status at the start of their career was just as high for these birth cohorts as for men born between 1950 and 1960. The attainment of occupational status suggests continuity rather than a decline. Indeed, the highest percentile of the 1964 cohort appears if anything to be rising in status. In the case of women, we see significant improvements in average occupational status but also increases in the lowest and highest groups. This stability has, however, been achieved at a price. The percentage of individuals with multiple education has increased markedly. A small portion thereof represent a reaction to unemployment, a larger portion

of these individuals are attaining higher qualifications. First jobs with limited-term contracts have increased as well, but these appear to generate no further notable adverse effects on employment chances a few years later. For our cohorts, then, the picture that comes into focus is that competition increases, but what is actually achieved remains fairly constant. This situation resembles a football stadium in which everyone is standing on his or her toes to see more: In the end, no one gets a better view.

A Successful Transition to Work Despite Adverse Conditions—But With Detours and Delays

Life courses are defined not only by the particular historical conditions at a specific place and time but also by the collective life history of one's own particular generation (cohort). One aspect of a cohort with potentially serious consequences is the number of its members, both in absolute terms and relative to those immediately preceding and following it. A large cohort means that more people compete for limited resources, for example, for positions on the vocational education or job market. A large cohort also usually means that a family's financial resources are spread more thinly among a larger number of siblings. However, even members of small cohorts following large cohorts can be confronted with a more difficult competitive situation on the job market, especially when members of the larger preceding cohort fill specific positions first. It is especially interesting in our context to see whether relative disadvantages can

really be proven for the very large cohorts of the 1964 generation. While political measures were effective for the most part in compensating for the shortage of apprenticeships, when the 1964 generation arrived at the second threshold after completion of training, they faced major problems in finding a job that fit their qualifications. This may have been due to the fact that a relatively large number of men had only been able to find an apprenticeship in one of the trades. A smaller percentage of this birth cohort completed the *Abitur* (upper secondary school-leaving certificate) or a university education (around one third less than the 1971 and 1960 cohorts). They were also more often overqualified for their first jobs than the other cohorts.

On the Way to a Seven-Threshold Society?

For both of our birth cohorts, the difficult conditions on the educational and labor market—together with the extended educational phases—had the main effect of shifting the transitional phase preceding working life to a later point in time. On average, men and women born in 1964 and 1971 were 20 years old and those born in 1971 were 21 when they started their first job, and approximately one year older when they started their first stable job, that is, one lasting at least six months. A clear trend can also be seen in the rising percentage of individuals undergoing a second period of vocational training or general education. By the age of 27, just under 30% of both cohorts had started a second training program and ap-

proximately 15% had finished one. Although the majority of these individuals were attaining higher qualifications and only a small percentage switched their occupation after a period of unemployment, this aspect demonstrates that starting a career takes longer and is more fraught with difficulties than in the past. The fact that almost 40% of the 1964 generation had started a second period of training by the age of 33 and one third had already finished one provides further evidence that a new structure of educational and occupational life courses is emerging. A further indication of this is the growing average number of different jobs that members of the two cohorts held up to the age of 27, whereas men from the 1964 cohort had held around two jobs, the 1971 men had held nearly five, and women went from holding under two to nearly three jobs. The typical (male) life course traditionally included two thresholds: starting school and making the transition from school to working life. First for men and then gradually for women as well, a third threshold emerged with the increased prevalence of a specific educational phase: The transition to fixed employment after completion of vocational education, including the risk of not being offered a job at the company where training took place. The expansion of secondary schooling led to a further threshold becoming anchored in school life. Almost 40% of our two cohorts successfully completed *Realschule* (intermediate secondary school), while over one fifth of the 1964 and almost one third of the 1971 cohort

completed the *Abitur*. For a very large minority, a second period of training brings with it two further thresholds (entry and completion). Finally, even the first job is ever more rarely a stable one. After the first fixed-term job, another transition takes place—either to a permanent position with the same company or a change to another company. Although we have evidence that after eight years, fixed-term employees do not differ from permanent employees in their employment chances, they also find that these employees' life courses are more complicated and potentially riskier. We therefore appear to be on the way toward what could be called a "seven-threshold society"—an obstacle course with numerous hurdles.

Look Before You Leap? Establishing a Household, Marrying or Living With a Partner, Starting a Family

The decisions young people make about when to move out of their parents' home and into their own apartments, when to move in with a partner, get married, and have children are often expressions of values and social norms. The trend toward an increasing value placed on individual autonomy is indisputable. Decisions like these affecting the private sphere are also frequently influenced by the length of educational phases, difficulties encountered in making the transition to the labor market, and individual perceptions of how promising one's employment and income prospects are. On average, the men in the 1964 cohort started their first household at the age of 24, married at the age of 29, and became fathers at the

age of 33. The men born in 1971 also moved out on their own at the age of 24, but at the age of 27 only 17% of them were married and only 11% were fathers. The women born in 1964 started their first household at over 22 years of age, married at almost 26, and had their first child at 28. The women born in 1971 started their first household at 22 and at the age of 27, only 39% were married and only 27% had children. In a longer-term comparison of the cohorts, for those born in 1964 and 1971 the age at which personal life events occur remains relatively constant rather than showing noticeable deviations from the trend. West German men and women tend to move out of their parents' homes at a relatively early age, live with their partners before marriage, marry relatively late, and become parents late—if at all. The percentage of women without any children has increased dramatically to over 30%. Of women born in 1940, 10% were childless, as were 15% of those born in 1950, and 20% of those born in 1955. Estimates for women born in 1960 and 1965 are between 23% and 31%. For women who have completed a university degree, childlessness has become almost the norm, such that in the year 2000, 44% of women with a university degree still had no child by the age of 39. This means that a pattern is emerging of delaying events associated with family life to later points in time (with the exception of starting one's own household), and that with our two cohorts, these events have been pushed even further into the future. Starting a family increasingly

only takes place in the fourth decade of life, and for one third of the individuals in our cohorts, parenthood is not a part of their life experience at all.

Integration Accompanied by Handicaps: Starting a Career in East and West Germany

The reunification of the two German states and cultures offers social scientists an extraordinarily unusual "natural experiment" that makes it possible to examine the collective life history of one birth cohort in the context of two dramatically different systems. From our life-course studies, we have data on the men and women born in 1971 in both West Germany (including West Berlin) and East Germany. This enables comparison of the two groups from a twofold perspective. On the one hand, we can better estimate how large (or small) the problems and difficulties of West Germans are under "normal" business cycles and structural crises in contrast to the much more dramatic upheavals that East Germans underwent through the system change from socialism to a social market economy. On the other hand, we can look at the life courses of East Germans as a result of disadvantages stemming from exogenously triggered system change. Up to their 18th year of life, the life courses of East and West Germans born in 1970 were fundamentally shaped by their different social contexts. Nevertheless, East and West Germany had in common a strong vocational orientation in their educational systems and a high vocational segmentation of labor markets. The percentage of East

Germans who had not completed vocational education was much lower, though, the number of individuals in training was higher, and the percentage of individuals attending upper secondary school in preparation for the *Abitur* (22% vs. 32%) or the university (17% vs. 23%) was lower. This also meant—mainly because of the less differentiated school system—a much higher standardization in age at the transition from school to working life. As a result, at the beginning of their working lives (and around the time when the Berlin Wall fell), East Germans had higher vocational qualifications than West Germans, while the latter had higher levels of schooling.

But what effects did this upheaval have thereafter? Above all, it created different risks of unemployment: Half of the East Germans and one fifth of the West Germans either lost or did not find a job after finishing school and vocational training. The young people from the two German states also made very different discoveries about the "stability" of the first profession they had trained for. Seven years after the fall of the Berlin Wall (and after they had, on average, completed their first period of vocational training), 42% of the West Germans and 34% of the East Germans still worked in the same occupation they had started in. This means that even under the more "normal" conditions of the West German labor market, a majority of young people still had to reorient themselves, but not the extreme majority of two thirds seen in East Germany. Many people in both East and West undertook major

efforts to get training in a new field, with the surprising result that a similarly large proportion ultimately worked in a field for which they had completed training, although not in their first occupation (approximately 65%). However, not only do East and West Germany differ in terms of the percentages completing training for a second career (26% in the East, 15% in the West), they also differ in terms of the level of the second career relative to the first: In West Germany, almost half of these individuals obtained a higher level of qualification, while in East Germany up to two thirds obtained different qualifications at the same level in order to avoid becoming unemployed or having to take up unskilled work. Astonishingly, East and West Germans from the 1971 cohort—despite their different risks of unemployment—do not show different rates of labor force participation at the end of the observation period (1996). This is due in part to the extensive labor market measures undertaken in East Germany, in part to the marked and much stronger tendency of East German women to participate in the labor market. East Germans broke with the “normal biography” of German Democratic Republic (GDR) times in one other respect: Of those born in 1960, 76% of the women and 50% of the men were married by the age of 25, while 86% were mothers and 70% fathers. This biographical “given” disintegrated under the uncertainties of German reunification: By the age of 25, only 26% of women and 11% of men were married, while 32% had become mothers and 13% fathers.

How should these different experiences be interpreted beyond the individual level? First, with the fall of the Berlin Wall, the East Germans born in 1971 already had an important relative advantage for several reasons: Most had by that time already completed a vocational education (which was shorter than in the West), their East German educational degrees were recognized under the unification treaty of August 1990, and the overall rate of vocational education had been higher in the East. Second, the forced privatization and restructuring of the East German economy and thus of occupational structures compelled East Germans to achieve much more in terms of adjusting and reorienting themselves, although some also received government support through occupational training or retraining measures. Third, East Germans made the transition into working life approximately two years sooner in the beginning (at the age of 19 rather than 21), but the transition later became much more difficult and dramatic. In the final result, they achieved levels of integration into the labor market similar to West Germans, but on a lower level of occupational status—a legacy of the GDR occupational structures.

Ongoing Gender Inequalities Despite Promotion of Occupational Equality and Increasing Similarity of Life-Course Patterns

The life courses of (West German) women have come to resemble those of men in many respects in recent decades. With historical delays, they have caught up in educational participation and university

attendance and have even overtaken men in schooling. Women show a rate of educational participation at the beginning of working life that is as high as men's, and they disrupt their careers less often and for shorter periods after the birth of their first child. Given the difficult overall situation of the 1964 and 1971 cohorts at the beginning of working life, the question arises whether women have suffered more from these difficulties than men and whether their gains in educational and occupational opportunities stagnated or even declined again. In their first jobs, women worked in occupations with a higher average occupational status than men. While the initial occupational status of the men in our cohorts tended to stagnate, the women achieved steady gains. This is no doubt a result of the fact that women profited more from the growth of the service industries. The women in our two cohorts overtook men by a large margin, both in attendance of *Realschule* and completion of the

Abitur. In university attendance as well, men and women are nearly equal (with approximately 17% holding a university degree). In the rate of occupational training, however, men remain ahead. In our cohorts, the percentage of women without any occupational training has dropped significantly, but is still twice as high as the percentage of men.

While the percentage of the men in our two cohorts who took jobs for which they were overqualified was comparatively large in historical comparison (11% and 9% respectively), the percentages were lower among women (8% and 4% respectively). Women also show better results in terms of working in the occupation for which they were last trained: In our cohorts, the percentages of individuals working in an occupation different from the last trained are for the first time lower among women (approximately 17%) than among men (almost 25%). The improved position of women appears less positive, however, when

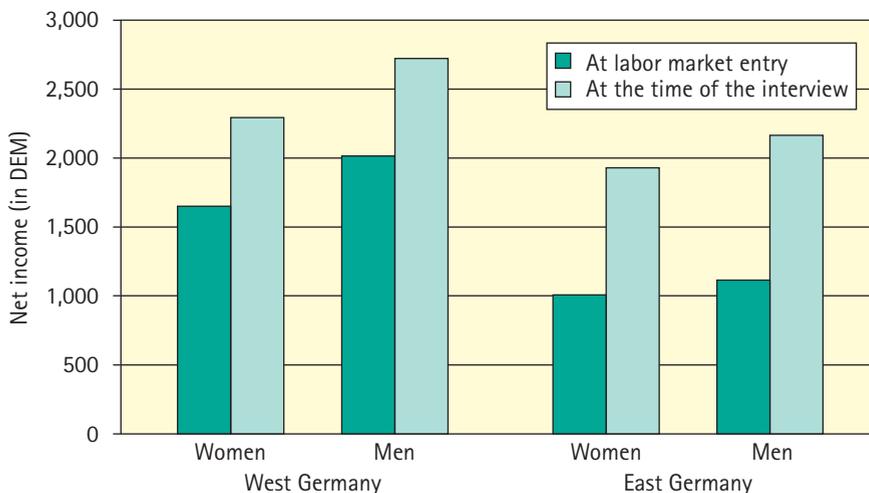


Figure 2. Average net income (in DEM) of full-time employed women and men born in 1971.

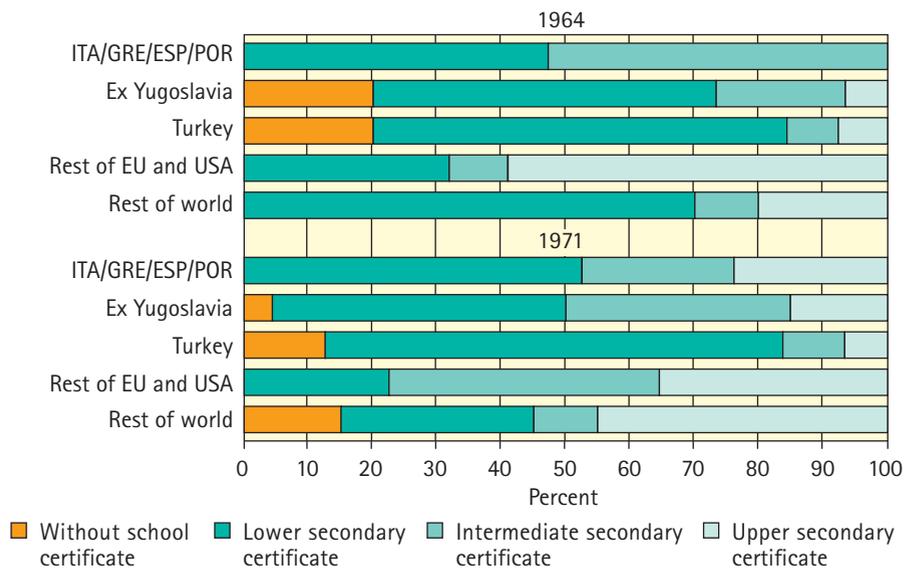
Source: Trappe, 2004, p. 150.

one looks at limited-term first job contracts and occupational training for a second career. The percentage of fixed-term contracts is not higher for women in full-time jobs, but their part-time jobs tend to be fixed-term, and part-time employment is generally concentrated in fields of "women's work." Although women have caught up with and even overtaken men to some extent in their first period of occupational training, the gap widens again with the second. Not only do women go through a second period of training less often than men (25% to 39%); when they do, it is less frequently for the purpose of achieving a higher level of qualification. Women also earn less than men overall, despite equal levels of education and a higher average occupational status: 82% of men's wages at the start of their career and 85% at the point in time of the interview (see Figure 2).

Marginalization Through a Lack of Education and Training?

In the 1980s and 1990s, concerns intensified that the youth growing up at the time were becoming a "lost generation," ever more marginalized and expendable. Our findings fundamentally refute that view. Although the paths to a job and a career have become more difficult and protracted, the life prospects of the young people born in these years in West Germany do not differ markedly from previous generations. In part, and particularly for women, their chances are significantly better. At the same time, it is important to carefully evaluate whether tendencies toward social exclusion exist, how large the groups affected are, and what mechanisms underlie these tendencies. In our study we are looking at three groups for which one could expect social and economic exclusion: young foreigners and young adults with low levels

Figure 3. School degrees of foreign birth cohorts 1964 and 1971 by countries of origin.



Source: Seibert, 2004b, p. 101.

of schooling and occupational training, East Germans, and foreigners. Bringing in additional data on non-Germans is crucial because they correct the otherwise too positive picture that emerges here due to the fact that in our representative sample we have too few cases without German citizenship.

But first, we turn to the lack of education among the West Germans in our birth cohorts: Approximately 6% of the girls and 9% of the boys left school without having completed the *Hauptschule* (lower secondary school) while 4% attend a *Sonderschule* (remedial school). Furthermore, approximately one third of those born in 1964 and 1971 only completed *Hauptschule*.

The low levels of schooling mean above all lower chances of obtaining vocational education. Of those members of our cohorts who had not completed school, almost 40% also did not complete vocational education, and of those who had only completed *Hauptschule*, approximately 10%. A lower level of schooling means also more frequent and longer periods of unemployment. Forty percent of individuals who had not completed *Hauptschule* were unemployed, and almost half of these were long-term unemployed. Many of these young adults ultimately have to take menial jobs: one third of those who had not completed school and one fourth of those who had completed only *Hauptschule*.

Slightly more than 10% of the men and women born in 1964 and almost 20% of those born in 1971 do not have German citizenship. Of these, approximately three fourths

come from what are known as the "recruitment countries" (of them approximately one third from Turkey) and the Balkans. Of the Turkish foreign nationals, who make up the most important problem group, one fifth of those born in 1964 had not completed school at all, and nearly two thirds had only completed *Hauptschule*; among those born in 1971 it was over 10% and 70% respectively (see Figure 3). Less than 30% of Turkish members of the former cohort received occupational training, and approximately 40% of the latter cohort. On the one hand, we can see from this comparison of the two cohorts that the disadvantaging and adverse overall starting conditions are unlikely to continue affecting later cohorts to this same degree if the young people were born and went to school in Germany. On the other hand, however, this will undoubtedly mean that around half of these Turkish members of the cohorts observed here will spend the rest of their lives on the lower margins of society. It is obviously difficult to extrapolate from these figures precisely how large a marginal socioeconomic group may exist in our two birth years. However, we can say with some degree of certainty that between 5% and 15% of these individuals will find themselves in precarious living situations in the relatively long term.

Contrary to Expectations: Evidence of Stability in Change

The men and women born in West Germany in 1964 and 1971 crossed the thresholds crucial for the later course of their lives during two

decades profoundly affected by structural crisis and major problems on the educational and labor market, and by the effects of German reunification. In the assessment of many contemporary observers, these difficult conditions caused a structural break and a dramatic trend reversal, resulting in major upheavals in the relationship between schooling, occupational training, and the initial years of working life, and producing entirely new life-course patterns. The life prospects of these generations were also influenced by two demographic developments: the large birth cohort sizes of the early 1960s and the sharp decline thereafter (with the introduction of the birth control pill) as well as the major inflow of people born outside of Germany into these cohorts. Thus, in addition to assuming a "generational break," critical observers also expected to see dramatically increasing "generational inequality" in the sense of a significant decline in educational and occupational opportunities, and even long-term impoverishment and marginalization. Our findings do not confirm these grim prognoses. Rather, we find first of all overwhelming evidence of a relatively high level of continuity in the basic structures of transition between school and career, and relatively stable payoffs on individual investments in occupational training. Second, these two birth cohorts benefited from long-term improvements in educational participation, opportunities for occupational training and increasing levels of qualification in occupational structures. Third, women's school attendance, occupational training, and earnings

and career opportunities have continued to improve relative to men's despite adverse conditions in the overall environment.

Although the ultimate results of integration into the working world hardly differ between these cohorts and their predecessors, the detailed patterns of transition have changed dramatically and possibly permanently. Today, entering a stable occupational position adequate to one's level of qualification takes longer, and for a growing number of individuals, it means going through a second course of occupational training as well as intermittent phases of unemployment, work for which one is overqualified, or limited-term contracts. Even the "baby boom" of the 1964 cohort was by no means without negative consequences: The resulting increased competition for occupational training and jobs means more limited opportunities for at least some subgroups. There are, however, many indications that the extended phases of transition into adult life observed have more than just structural causes. Although lengthier educational phases and insecure career biographies do render decisions about permanent relationships and starting a family more difficult, they probably cannot entirely explain the observable overall lifetime patterns. Individual expectations regarding lifestyle and consumption standards and personal autonomy in planning one's life also play an important role.

Our findings also do not imply an absence of institutional problems or difficult personal situations, or in other words, of serious challenges

for social policy. The temporal “fraying” of occupational training into individual phases points to a decreasing efficacy of institutional coordination between the lengthened phase of general education and standard training, and a decreasing adequacy of occupational training and its subject matter to the demands of work. An increasing percentage of young men are being trained for occupations—such as industrial manufacturing—which already lack enough jobs for graduates and certainly offer no chances of lifelong employment. Moreover, an increasing percentage of young women are being trained in occupations with low chances of being hired after the apprenticeship has been concluded, for example, legal secretaries or doctors’ assistants. The still considerable power of occupational training—especially in its dual form (classroom instruction combined with on-the-job training)—to foster integration also has its drawbacks. It excludes, in some cases permanently, those who are unable to find an apprenticeship: in particular foreigners, emigrants of German descent primarily from the former Soviet Union, and others who attended *Hauptschule* (lower sec-

ondary school) and either did or did not complete it. Multiple educational degrees and further training create even more advantages for those who are already privileged by virtue of their relatively high levels of education. Furthermore, the increase in childlessness points to a lack of institutional support in providing childcare options for working women.

The findings presented remove any doubt that contemporary observers and social scientist gurus have dramatically and even grotesquely exaggerated the extent of the crisis and the trend changes on the educational and labor market for young people in the Federal Republic of Germany in the 1980s and 1990s. Taking a more distanced view, a retrospective analysis of life-course developments and representative population data presents a picture of both continuity and change. At the same time, there is strong evidence that the stability observed is also an expression of institutional rigidity, which suggests both that essential adjustments still need to be made, and that they will be followed by more far-reaching changes in life-course patterns.

Returns to Skills: Vocational Training in Germany 1935–2000

The institutional setting of the German system of vocational training is supposed to offer young adults a smooth transition to the first job. However, many observers assume that the labor market outcome of vocationally trained youth deteriorated since the 1970s. In Pollmann-

Schult and Mayer (2004), we therefore investigate if, and to what extent, trajectories into the labor market have changed in the past decades. To this end, using worklife history data from the German Life History Study (GLHS), we focus on three major dimensions of transition outcomes for eight birth cohorts born between 1919 and 1971. We

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Pollmann-Schult, M., & Mayer, K. U. (2004). Returns to skills: Vocational training in Germany 1935–2000. *Yale Journal of Sociology*, 4, 73–98.

find that the educational background of vocationally trained people has become more heterogeneous in the past decades. The majority of youth entering vocational training after 1980 held an intermediate or upper secondary school-leaving certificate. Young people who completed upper secondary schooling increasingly take up a vocational training instead of going to college. Further, we observe a shift from apprenticeships in the low status craft sector to those in the commercial sector that comprises jobs of a higher status.

Our results regarding the transition outcomes contradict the widespread assumption of decreasing benefits from vocational training. It has been shown that the overall transition regime into the labor market of vocationally trained workers did not change substantially in terms of overeducation, occupational mismatch, and occupational prestige. However, there is empirical evidence for gender-specific trends after 1980. Labor market outcomes somewhat deteriorated for men and improved for women. Men who entered the labor market in the past two decades faced a significant higher risk of overeducation than previous cohorts, whereas women entering the labor market in the 1990s had better chances of securing a job that matches their qualification level. Moreover, since 1980 the risk of occupational mismatch dropped for female labor market entrants.

Although this is a truly remarkable story of the stability of institutional arrangements and their effects across a large span of time, we would be cautious in extrapolating this as a kind of ultra-stability into the future. In contrast, there are good reasons to assume that we deal here with a case of institutional and behavioral inertia and delayed adaptation. The expansion of secondary and higher education is still in a precarious disequilibrium with participation in vocational training, and the adding on of apprenticeships to longer periods of general education appears neither to be efficient in the usage of life time nor an optimal way of skill formation. In addition, the new cost-consciousness of firms has put some strains on their willingness to invest in training. The very recent reaction of the government to threaten with a levy for firms which do not train might well produce the opposite effect of what is intended. It might act as an incentive for firms to buy themselves out of training obligations. Moreover, the fact that the dual system of vocational training has practically broken down in East Germany due to the lack of training firms might trigger changes in the direction of less firm and more school-based provision of vocational skills. The jury on the viability of the German dual system of vocational training is still out.

Ethnic Differences in the Process of Recruiting Employees Holding a Vocational Degree in Germany

Social and economic integration of ethnic groups in Germany is after decades of neglect more and more to be found on the political agenda. How can integration into the German society be forced? One way obviously is to prepare foreign youth for the German labor market. Especially in school, foreign children are less successful, compared to German peers. As Figure 4 shows, one fifth of the foreign school leaver's population in 2002 do not hold a leaving certificate. Among Germans, only 8% leave school without a leaving certificate. About 60% of foreign school leavers do not reach upper intermediate level (*Realschule*). This comparatively bad performance in school has lasting consequences for the transition from school to training. With lower leaving certificates, it does not only take more time find an apprenticeship for all German and foreign school leavers, foreign school leavers are due to their lower average performance in

school also subject to statistical discrimination (see Seibert, in press). A further step to integration lies in the participation of foreign youth in the vocational training system because it provides good transition chances into the labor market. Thus, we ask whether a successfully completed apprenticeship could dispel, or at least weaken, the disadvantages of young foreigners vis-à-vis natives. Do young foreigners and Germans who have been trained reach the same labor market positions in respect to the quality level of their jobs as well as to the occupational match between job and training?

With occupational registry data from the *Employment Study* of the Federal Institute for Employment Research (IAB) in Nuremberg, we can show that young foreigners holding a vocational degree do indeed reach similar labor market positions as natives do—except for Turkish men (Seibert, in press; Konietzka & Seibert, 2003). They are less able to find appropriate jobs or enter the labor market in the occu-

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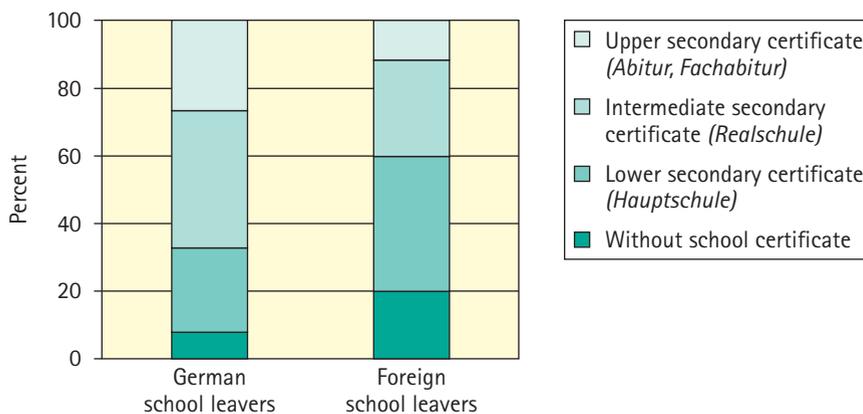


Figure 4. School leavers in 2002 by leaving certificate.

Source. Federal Statistical Office Germany.

pation trained for in comparison with Germans. These findings refer to ethnically differentiated recruitment patterns of the firms who hire graduates of apprenticeship programs. How can different recruitment patterns be shown empirically? Given that employers sort their applicants by qualification only there should be no advantages for any ethnic group. If ethnicity counts negatively—that is, if Turkish nationality is a negative selection criterion—the corresponding group should show weaker labor market outcomes, compared to other ethnic groups. This mechanism however can only be shown under weak labor-market conditions when the number of applicants significantly exceed, the number of vacancies. Given any sorting of applicants, the ethnic group(s) at the end of the queue will show a weaker labor market performance than all the other groups.

This hypothesis will be tested with the Employment Study again. In a logistic regression model, we ask whether foreigners and Germans reach skilled (vs. unskilled) positions when they enter the labor market after finishing their vocational training. We distinguish ethnic groups between Germans, Turks, the group of respondents from Italy, Greece, Spain, Portugal, or former Yugoslavia (the former recruitment countries), and the remaining countries. As a further independent variable we take the corresponding labor market condition into account. As an indicator for the labor market condition, we take the yearly unemployment rate of graduates of apprenticeship programs. Furthermore, we control for the size of the training firm, the occupation trained for, and if the occupation trained for was left at labor market entry. These three variables, however, will not be shown in

Table 1
Determinants of skilled position (vs. unskilled) at labor market entry
(only male blue-collar workers, logistic regression)

| | | Model 1 <i>Exp(B)</i> | Model 2 <i>Exp(B)</i> |
|---|--|--------------------------|--------------------------|
| Nationality | Germany (Reference) | 1 | 1 |
| | Turkey | 0.44*** | n.s. |
| | Italy, Greece, Spain, Portugal, Yugoslavia | n.s. | n.s. |
| | Remaining countries | n.s. | n.s. |
| Labor market condition | Good (Reference) | 1 | 1 |
| | Weak | 0.74*** | 0.75*** |
| Interaction: Nationality × Labor market condition | Germany × weak (Reference) | | 1 |
| | Turkey × weak | | 0.35** |
| | Italy, Greece etc. × weak | | n.s. |
| | Remaining countries × weak | | n.s. |
| Chi ² | | 3,694.13*** | 3,703.33*** |
| Pseudo R ² | | 0.34 | 0.34 |
| Degrees of freedom | | 11 | 14 |
| <i>n</i> | | 19,353 | 19,353 |

Significance levels: *** < .001, ** < .01.

Source. Employment Study 1975–1995 (Federal Institute for Employment Research, Nuremberg).

the analyses as they are regarded as pure control variables.

Due to the data structure, only male blue-collar workers can be analyzed here. Table 1 shows the estimates of the logistic regression model. In Model 1, we only consider nationality and labor market conditions as independent variables. Here, only Turkish men show a significantly lower probability (0.44) of reaching a skilled position after finishing a vocational training. The labor market condition has a significant influence on finding skilled work too. Under weak conditions, the probability values are significantly lower (0.74), compared to times of good labor market conditions.

In Model 2, we introduce an interaction term between nationality and labor market condition. Thus, we analyze the different ethnic groups under good and weak labor market conditions. The results show that there are no significant nationality effects left, whereas the effects of

the labor market condition remain almost constant. The interaction effect shows, however, that Turks have a lower probability to find a skilled position only under weak labor market conditions. In good times, they do not differ from Germans in respect to their labor market positions. Overall, these analyses show the integrational capacity of the German apprenticeship system for foreigners: Labor market outcomes of foreign workers holding a vocational degree are very similar to German workers. On the other hand, the results also identify the limits: Integration through vocational training only works under good economic conditions. If vacancies run short, Turks seem to lose competition. Consequently, a successfully completed apprenticeship can only weaken, but not dispel disadvantages for Turks. The other ethnic groups seem to have overcome the obstacles after finishing a vocational training.

Education, Mismatch, and Mother's Employment— In Memory of Felix Büchel

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Büchel, F., & Mertens, A. (2004). Overeducation, undereducation, and the theory of career mobility. *Applied Economics*, 36, 803–816.

Educational Mismatch in the Labor Market

A major of Felix Büchel's research in the field of educational mismatch focused on the causes and consequences of overeducation. From an economic point of view, overeducation is considered as a waste of skills that has negative effects not only on the individual level but also is costly on the societal level. Overeducated workers earn substantially less than their similarly qualified peers who work in matched jobs. Furthermore, the underutilization of the qualifications gained in the educational system, which is largely publicly funded, can be seen as a waste of public resources. In a series of papers, Felix Büchel analyzed the decision making in the job-matching process in order to scrutinize the motivations of both employees and employers to accept and tolerate this form of apparently suboptimal job match. Büchel and Mertens (2004) test one of the most popular explanations for the existence of overeducation, namely, the career mobility theory. According to this theory, put forward by Sicherman and Galor (1990), a part of the returns to education is in the form of a higher probability to get promoted. Thus, it may be rational for employees to accept jobs for which they are overeducated in the early career phase if wage losses are compensated by better subsequent promotion prospects. Sicherman (1991) was able to confirm this theory for the US labor market, however, using methods which are vulnerable to criticism. Performing a retest for the German labor market by using data from the German Socio-Economic Panel (GSOEP), Büchel and Mertens (2004) find that overeducated workers in Germany have markedly lower wage growth rates than matched workers. The plausibility of this result is supported by the finding that overeducated workers have less access to formal and informal on-the-job training. Büchel's and Mertens' findings cast serious doubt on whether the career mobility theory is able to explain overeducation in Germany.



Felix Büchel passed away on July 12, 2004, at the age of 47 after a long and debilitating illness at his home in Kleinmachnow. With his death, the German educational and labor market research lost one of its most profound and productive scholars. Felix Büchel received a degree in mathematics at the Swiss Federal Institute of Technology and in Political Science at the Free University of Berlin. He obtained a doctoral degree in 1991 at the Technical University of Berlin in Economics on the topic of re-employment quality after continuous and so-called "perforated" long-term unemployment. In 1998, Felix Büchel achieved his Habilitation in Economics from the Technical University of Berlin, writing on overeducation in the labor market. Besides his position as a Senior Researcher at the Center for Sociology and the Study of the Life Course at the Max Planck Institute for Human Development which he took up in 1998, Felix Büchel was an Honorary Professor at the Free University of Berlin, Institute of Sociology and an Adjunct Professor at the Faculty of Economics at the Technical University of Berlin. Further, Felix Büchel held a Research Professorship at both the Institute for the Study of Labor (IZA) and the German Institute for Economic Research (DIW).

Further, Büchel (2002) analyzes the motivation of firms to employ workers whose formal qualifications exceed the job requirement level. Most of the previous research concluded that overeducated workers are less productive than their similarly qualified peers who work in appropriate jobs as a consequence of frustration. This finding raises the question of why firms hire overeducated workers. The results of Büchel (2002) reveal that overeducated workers are less productive only when compared with matched workers of the same skill level, but far more productive than their coworkers, who perform the same type of job but possess lower formal qualifications. Overeducated workers were found to be healthier, more strongly work- and career-minded, more likely to participate in on-the-job training, and had longer periods of tenure with the same firms than their less skilled coworkers. These findings are consistent with the established fact that overeducated workers receive wage premiums for their surplus schooling (Daly, Büchel, & Duncan 2000) and make the hiring of overeducated job seekers understandable.

Felix Büchel also dedicated extensive research to the effect of special restrictions on the risk of not finding a matched job. Access to suitable employment is often restricted by the fact that workers look for jobs in the regional labor market rather than the global one. In their paper, Büchel and van Ham (2003) analyze if regional labor market characteristics and the extent to which job searchers are restricted to the regional labor market explain the phenomenon of overeducation. The re-

sults of their analyses show that the size of the labor market is an important factor in avoiding overeducation: Looking for a job in a large labor market increases the probability of finding a suitable job. Access to a car for personal use and a longer commuting time reduce the risk of working in a job for which one is overeducated. Within this context, Felix Büchel also explored the question of whether the existing gender-specific differences in the magnitude of overeducation are caused by spatial constraints of married women. According to the theory of differential overeducation advanced by Frank (1978), the husband seeks the best possible job for himself in the broader labor market. In doing so, he also determines the local labor market in which both spouses will work. Once his decision has been made, the wife conducts her own individual search to find the best possible job for herself within that market. Since the number of job vacancies in the local market is much smaller than in the broader labor market, the wife may logically be expected to find only a poorer job match. In contradiction to findings for the USA, Büchel (2000) as well as Büchel and Battu (2003) shows that married women in Germany are more prone to over-education due to spatial restrictions than unmarried women and married or unmarried men. In a series of papers, Felix Büchel analyzed the individual dynamics of overeducation using worklife history data from the German Life History Study collected by the Max Planck Institute for Human Development, Berlin. The primary focus of interest was whether overeducation is a per-

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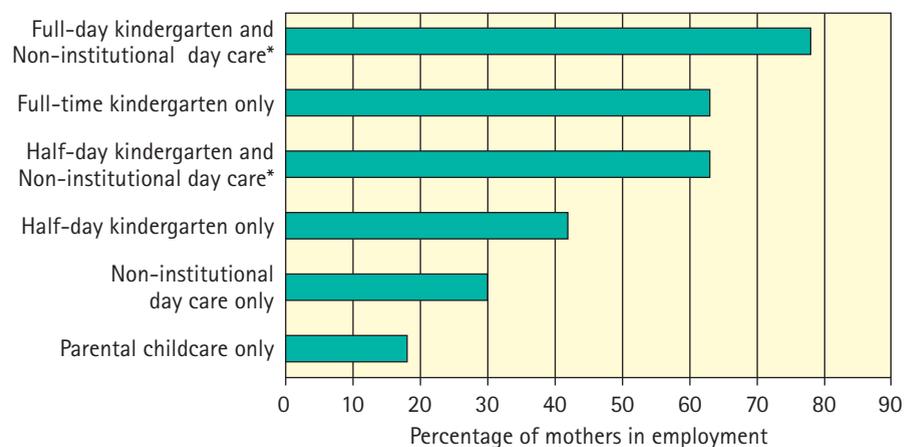
sistent or a temporary phenomenon for the affected workers. Pollmann-Schult and Büchel (2004) show that the chances of upward mobility to a higher skilled job and the risk of downward mobility to unemployment are to a great extent affected by the quality of the initial vocational training. Their results suggest that for workers who had completed initial vocational training of intermediate or high quality, overeducation is not a persistent labor market status. These workers have significantly better career prospects than their unskilled coworkers. In contrast, the career chances of overeducated workers with low-quality initial vocational training and unskilled workers are similar. Thus, for the former, overeducation proves to be a long-run phenomenon.

Female Labor Supply

In several papers and a report on behalf of the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth, Felix Büchel analyzed the effects of the regional

position of day care on the employment behavior of mothers with preschool children. Büchel and Spieß (2002a) find a strong correlation between day-care arrangements of children and the labor market participation of their mothers (see Figure 5). Taking this finding as a starting point, Büchel and Spieß (2002b) analyze the effects of the regional provision of day care on the employment behavior of mothers with preschool children in Germany. According to this study, a better provision with day-care slots for pre-school children of three years and older on the district level increases the probability to work part time. A higher proportion of full-day day care among all day-care slots increases the probability of working part time as well as full time. From a policy perspective, these results are of great importance, as they show that a broader provision of full-day day care is needed to ease the possibility to combine work and the upbringing of children. These findings on the correlation between

Figure 5. Percentage of mothers in employment, by type of day-care arrangements of their children.



* Non-institutional day care = day care provided on a regular basis by family members, friends, or nannies.

institutional child care and mother's employment have substantially influenced the current political discussion on the compatibility of work and family. The positive effects of daycare provision have also been established in another context than in that of female labor supply. The study by Spieß, Büchel, and Wagner (2003) examines the relationship between Kindergarten attendance and children's school performance. The results indicate a significant effect of the Kindergarten attendance on the school performance of children in immigrant households, but not for children of German citizens. This result showed the importance of offering sufficient day-care facilities for immigrant children. Related to this line of research is the question to which extent the willingness to work is affected by the labor market situation and the local childcare provision. Van Ham and Büchel (2003) show that high regional unemployment discourages women from entering the labor market. Further, these findings indicate that women with young children are willing to work, but that those mothers who are discontented with the situation of the regional childcare provision are prone to refrain from job search. These findings indicate that high institutional and spatial barriers discourage mothers from entering employment.

Family Type and Poverty

Families of "atypical" constellations, such as families with three or more children or single parent families, face a disproportionate risk of being poor. As a major reason for this, Felix Büchel identified the restricted

access of mothers to the labor market caused by the higher requirements of mothers taking child-care responsibilities. Using data for East and West Germany for the 1990s, Büchel and Trappe (2001) find for West Germany that the income situation of large German families improved slightly over time and stayed stable for immigrant families. In contrast to these findings, the relative income position of large East German families deteriorated markedly over the years following unification. In both East and West German households, the mother's employment status has a strong impact on the household income position, while in large immigrant families, public transfers, such as child allowance, seem to play a more important role.

In a second study within the research field of family type and poverty, Büchel and Engelhardt (2003) focus on the income situation and labor market participation of single mothers. In West Germany, the relative income position of single mother households is much lower than for married parent families (see Figure 6).

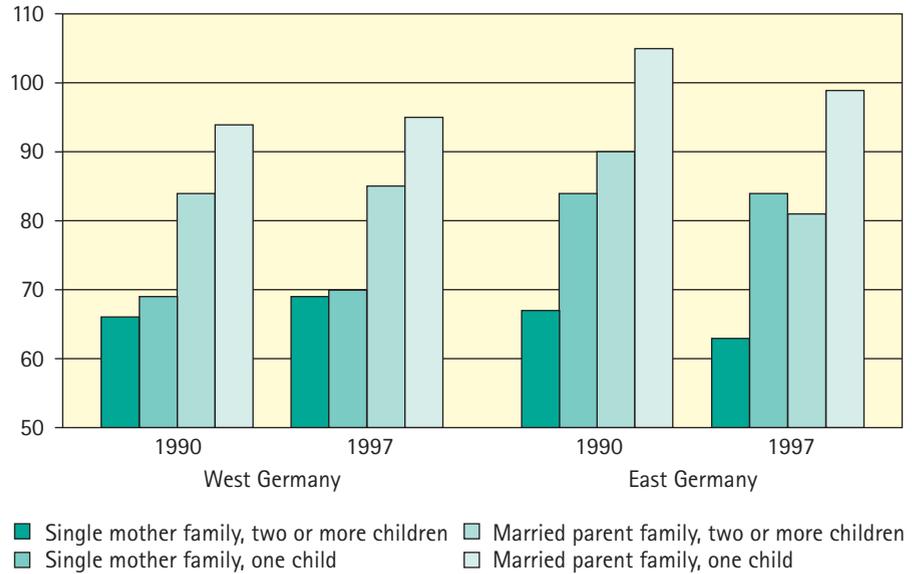
Between 1990 and 1997, there was little change in the income relation between single mothers and married parent family households. Similarly, in East Germany, single mother households are worse off than married parent families. East German single mother households with one child only, however, are much better off than comparable households in West Germany. On the other hand, the relative income position of East German single mother households with two or more children is the

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Figure 6. Median-related relative income position of households with dependent children, by household structure.



worst among all analysed socioeconomic groups: They are among the losers of the growing income distribution gap in East Germany after reunification.

Economic Performance of Immigrants

Based on data from the UK and West Germany, Büchel and Frick (2004) analyze the economic performance of various ethnic groups in these two countries. Taking the indigenous population of each country as the reference category, this study finds that, as a whole, the non-indigenous population in the UK fares much better than the immigrant population in Germany. However, the range of economic performance across different ethnic groups in the UK is much larger than that in Germany. The German corporatist welfare system is characterized by much stronger redistribution effects than the liberal UK system. Consequently, the relatively low-perform-

ing immigrant population in Germany profits more from the redistribution system than immigrants with similar socioeconomic attributes in the UK.

Using a similar approach, the study by Büchel and Frick (in press) compares the economic performance of immigrants in Great Britain, West Germany, Denmark, Luxembourg, Ireland, Italy, Spain, and Austria to that of the respective indigenous population. Economic performance is measured in terms of the country-specific pre-government income position and change in the relative income position due to redistribution processes within the respective tax and social security systems. This work is based on the premise that countries may be categorized—similarly to the categorization concept of welfare regimes—according to the nature of their immigration policy. The basic premise of this study is that a successful and integrative immigration policy should result in a

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nonsignificant differential between the economic performance of immigrants and that of the indigenous population. The results show, however, that this "ideal" is not attained in all of the analyzed countries, particularly in Germany and Denmark, where the economic performance of immigrants is much lower than that of the indigenous population. Substantial cross-country differences in the immigrant/native-born performance differential persist, even when controlling in detail for the social structure and level of integration of

immigrants. This suggests that not only do the conditions of entry to a country impact on immigrants' economic performance but also country-specific institutional aspects, such as restrictions on access to the labor market and parts of the social security system that are related to citizenship or immigrant status. The great extent of heterogeneity across EU member states should be taken into account when working toward the harmonization of national EU immigration policies.

Employment Relationships at Risk

A key concept in current debates on the changing nature of work is flexibility. Many European labor markets are highly regulated in comparison with, for example, the United States or Great Britain. In fact, one major difference between many West European and the Anglo-Saxon countries is high employment protection for those in work. The basic effect of employment protection is that firing is made very expensive, leading to employers refraining from hiring in times of low demand and uncertain expectations about the future business cycle. Those who follow the German debate on a possible reduction of employment protection know that it is a very difficult and emotional topic. It has been on the agenda in Germany since the 1980s. It was then that the Employment Promotion Act (1985) was passed. With that Act, policy makers tried to achieve two goals simultaneously. Without changing overall employment protection, the Act aimed to facilitate hiring by legalizing fixed-term contracts without a specific reason for a maximum period of 18 months (currently 24 months). While welcomed by some commentators, who saw fixed-term contracts as a means of reducing unemployment, others argued that fixed-term contracts would severely erode employment protection. For some, a fixed-term contract is seen as a very disadvantageous labor market situation for the individual, with low wages, bad conditions of employment, and poor prospects, a "trap." For others, a fixed-term contract is seen as a stepping stone to permanent employment, often facilitating the transition into employment from outside the labor market, a "bridge." The central aim of the project "Employment Relationships at Risk" is to investigate the implications of fixed-term contracts and other "nonstandard" employment relationships for the individuals concerned. The opposing perspectives "trap" or "bridge" frame many of our research questions.

So far we have examined a number of key issues in fixed-term employment. First, wages are seen as an important indicator of job quality and productivity. In the first part of the project, we examined the wage penalty associated with fixed-term contracts and how this develops over time (wage growth). Second, fixed-term contracts are often argued to play a key role in the transition from education to work. This is the focus of another part of the project. In a third part, we investigate in more depth whether the consequences of fixed-term contracts vary for men

and women. In the fourth part, we widen the focus to compare fixed-term contracts in a number of other European countries.

The project has a number of strengths. Firstly, we use high-quality longitudinal data for our analysis. This allows us to follow individuals over time and analyze subsequent labor market transitions and wage growth. This is crucial, given that temporary contracts are by nature of short duration. Secondly, this data allows us to apply a number of sophisticated models, such as fixed-effects models, quantile regression,

and propensity score matching to investigate our research questions. Thirdly, while the primary focus is on Germany, we also investigate fixed-term contracts and their consequences in other countries. To what extent do the consequences of fixed-term contracts depend on national institutional configurations? The German example is especially interesting as it is an intermediate case between countries with high employment protection and high rates of fixed-term jobs like Spain, France, Italy, and countries with low employment protection and low fixed-term employment like the UK or the USA. In the latter countries, employment protection is very low and fixed-term contracts consequently do not have the same significance as in high employment protection countries. We compare the characteristics and consequences of fixed-term employment across a number of different countries. Finally, the project is interdisciplinary in nature, combining insights and methods from both sociology and economics.

A Wage Penalty for Fixed-Term Contracts in Germany?

Taking wages as a key indicator of job quality, in this part of the project Antje Mertens and Frances McGinnity investigated wages and wage growth of fixed-term workers in Germany, comparing them to their permanent counterparts. If wages were indeed lower, the introduction and growth of fixed-term contracts could lead to rising wage inequality and polarization of the workforce into those with low-paid insecure jobs and those with secure and well-paid jobs. Is this the case?

In our first paper, we examined the wages of fixed-term employees in East and West Germany using German Socio-Economic Panel (GSOEP) data from the late 1990s. Previous research using Ordinary Least Squares (OLS) regression has found that fixed-term workers earn significantly less than their permanent counterparts. Compared to simple OLS estimates, using a fixed-effects model reduces wage differentials between permanent and fixed-term workers. This suggests that fixed-term workers differ in unobservable ways from permanent workers. Moreover, on average fixed-term employees are found to experience significantly higher wage growth than workers on permanent contracts, indicating that at least some of the fixed-term workers are able to "catch up" (McGinnity & Mertens, in press; Mertens & McGinnity, 2004).

Much recent discussion of fixed-term contracts tends to ignore the considerable variation in the quality of these jobs and wages associated with them (e.g., Booth et al., 2002). In a second paper, we developed the concept of a "two-tier" labor market for fixed-term contracts in Germany and tested this concept using quantile regression. In the standard OLS (or mean) approach regression, coefficients are assumed to be constant across the whole conditional wage distribution. Our two-tier theory suggests, however, that this need not be the case. Indeed, fixed-term workers at different ends of the wage distribution may not face the same risk of receiving lower wages than their permanent counterparts. Therefore, we estimate quantile re-

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Figure 7. Percentages of fixed-term workers found in the different quartiles of the wage distribution.

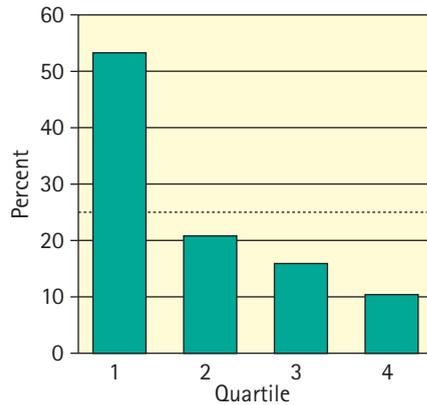
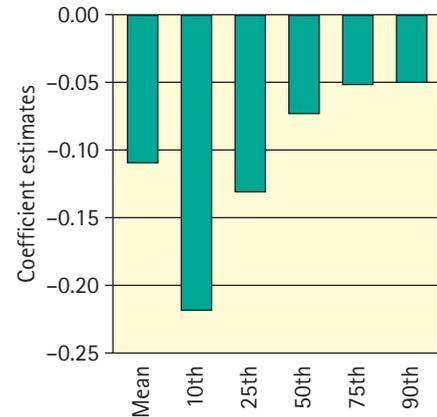


Figure 8. Wage differences between fixed-term and permanent workers with tenure of less than two years: comparing OLS results (mean) and quantiles.



Note. Quartile 1 refers to the lowest quartile and quartile 4 to the highest quartile of the wage level distribution. The dotted line at 25% represents the proportion of fixed-term workers we would expect in each quartile. Source. Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

Note. Coefficients on the dummy for fixed-term contract workers with tenure of less than two years in OLS (mean) and quantile wage regressions. Control group: workers with permanent contract and tenure of less than two years. Source. Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

gression models, as introduced by Koenker and Basset (1978), that fit quantiles to a linear function of covariates. Supplementing the usual estimation of conditional mean functions with conditional median and other conditional quantile functions allows us to look at the complete conditional wage distribution. In fact, "potentially different solutions to distinct quantiles may be interpreted as differences in the response of the dependent variable to changes in the regressors at various points in the conditional distribution of the dependent variable" (Buchinsky, 1998).

Once again using data from the GSOEP, we found that OLS regression misses important aspects of the wage structure of fixed-term workers (Mertens & McGinnity, in press). First, Figure 7 shows that fixed-term contracts are clustered in the lowest quartile of the wage distribution. Second, and most importantly we

were able to show that while those with high-wage fixed-term contracts earn only slightly less than permanent counterparts, those with low-wage temporary jobs earn much less (see Figure 8). The wage penalty for fixed-term contracts is clearly not the same for all workers, but those with low wages are doubly disadvantaged: They have a short-term employment contract and very low wages. But are these findings confined to Germany? We will continue working on this project from a comparative perspective.

A Bad Start? Temporary Contracts and the Transition From Education to Work

In this part of the project, we examine the role of temporary contracts in the transition from education to work. Fixed-term contracts are seen as particularly relevant in this transition (OECD, 1998), they are also concentrated among young people

in Germany. Some commentators argue that fixed-term contracts should have an integrative function in the transition from school to work, providing a "bridge" to the labor market. A contrasting perspective is that they hinder successful integration into the labor market by leading to a repeating cycle of temporary jobs and unemployment. We choose Germany, characterized by a regulated labor market and a "coordinated" education-to-work transition, to investigate this issue. We consider who gets a fixed-term contract at the beginning of work-

ing life in Germany and how this affects their subsequent labor market career using life history data. Our initial findings are summarized in McGinnity and Mertens (2004). One key finding is that fixed-term contracts are found among those for whom the school-to-work transition is not so coordinated, and includes *both* high-skilled and low-skilled labor market entrants. Looking at the majority of job starters in Germany, that is, those with vocational training in Figures 9 and 10, we see that unemployment and nonparticipation rates of those who

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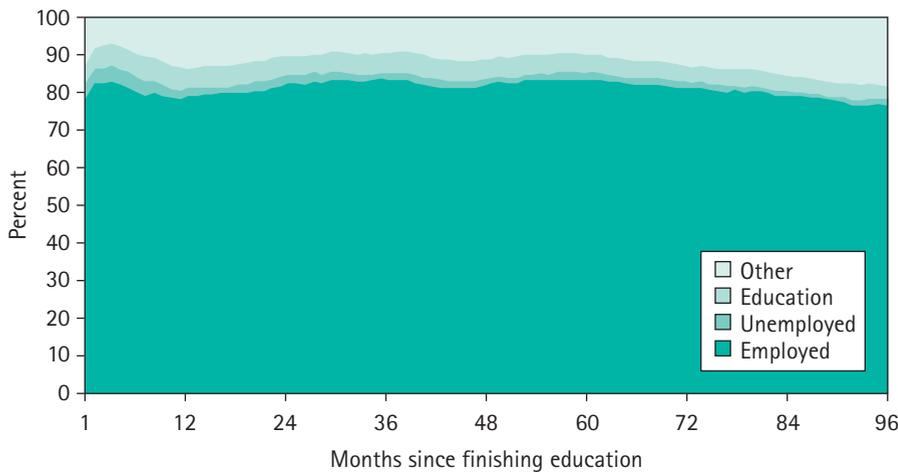


Figure 9. Time budgets for vocationally trained workers, first job permanent.

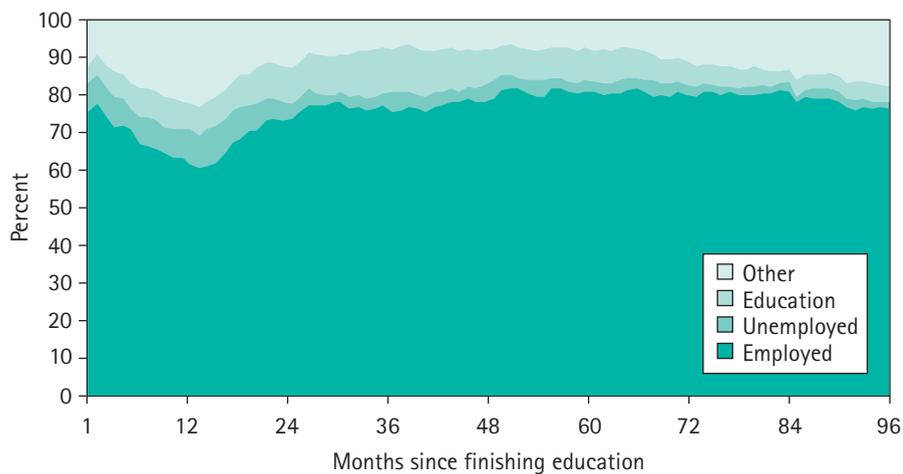


Figure 10. Time budgets for vocationally trained workers, first job fixed-term.

start in a permanent job and those who start in fixed-term employment converge after about two to three years.

Following this introductory work, McGinnity, Mertens, and Gundert have recently investigated subsequent employment chances in more depth using multinomial logistic regressions. One of our key findings here is that after several years formerly fixed-term job starters are no more likely to become unemployed than other labor market entrants. Beginning working life with a fixed-term contract does not clearly signal a "bad start" in Germany.

Fixed-Term Contracts Over the Life Course: A Gender Perspective

Stefanie Gundert's dissertation project is an empirical examination of the role of fixed-term contracts in different points in the life course of men and women in Germany. Focusing separately on labor market entrants, mothers, and older workers, her project will address the question of whether fixed-term contracts serve to integrate women into the labor market or whether they reinforce gender inequalities in occupational chances.

Early results for young labor market entrants suggest that women are not generally disadvantaged compared to men with regard to the risk of beginning working life with a fixed-term contract. On the contrary, whereas in previous studies no particular gender differences concerning temporary employment have been detected, there is evidence of a higher incidence of fixed-term contracts among *male* workers in their first jobs. However, a closer exami-

nation of the educational background reveals important differences between young workers who completed apprenticeships in the dual system of vocational training, and university graduates. An interesting story emerges:

Previous work has shown how workers with a vocational training in Germany are less likely to get a fixed-term contract (McGinnity & Mertens, 2004), but this turns out to be a gender-specific effect. Women benefit from doing an apprenticeship in two ways. First, female workers leaving the dual system are less likely to be hired on a fixed-term contract than men. Second, apprenticeships seem to function as general "safeguards" against temporary employment for women as the probability of getting a fixed-term contract is higher among unskilled women as well as female university graduates. By contrast, for men, vocational training *per se* does not protect against temporary contracts. Only male apprentices who are retained by their employer after their apprenticeship have a higher chance of being offered permanent employment: Men who change employer after their apprenticeship training do not have a lower risk of getting fixed-term jobs than those with no qualifications or a university degree. Further research needs to focus on the subsequent employment of this educational group in order to find out whether the concentration of fixed-term contracts among men has lasting negative consequences in early working life. This finding of gender differences in the protective function of apprentices is important as the majority of young workers in

Germany have been trained in the dual system.

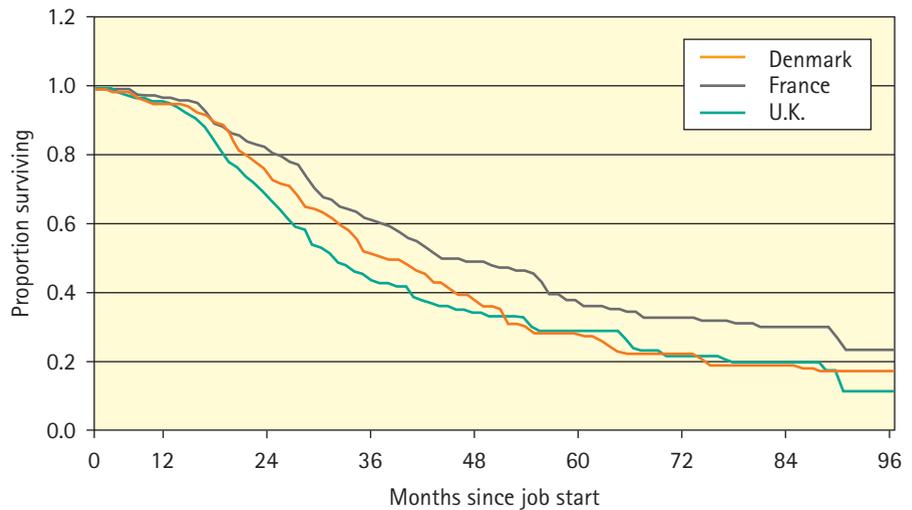
However, the picture looks different for university graduates. Among high-skilled labor market entrants women's risk of getting a fixed-term contract is higher than that of men. The gender difference is partly a result of the higher incidence of education-related fixed-term working periods among women, for example, among prospective doctors, teachers, or lawyers. Nevertheless, highly educated women who work in other occupational fields are also more likely to get a fixed-term contract than men. Overall, the results indicate an ambivalent situation for young women: Whereas for the majority (those with vocational training) the chances of finding permanent employment are good, for highly educated women getting a permanent job seems to be more difficult.

Comparative Perspective

As pointed out above, fixed-term contracts are not equally significant in different countries. Their significance primarily depends on the degree of employment protection and hence the relative flexibility of the labor markets in which they are found. Adopting an institutionalist framework, three countries with different forms of welfare and market flexibility are looked at in a comparative perspective: Denmark, France, and the UK. In her work "Bridge or trap?: To what extent do temporary workers make more transitions to unemployment than to the standard employment contract," Vanessa Gash presents a comparative analysis of the labor market transitions of

temporary workers. The primary expectation of the analysis is that temporary workers will make different labor market transitions as a result of the different institutional configurations in the different countries. Using seven waves of the European Community Household Panel (ECHP) survey, spanning a period from 1995 to 2001, the transitions to and from flexibilized labor are investigated using event history analysis techniques. The research reveals that temporary contract workers make considerable transitions to permanent contract employment, suggesting that temporary employment is more likely to be a bridge than a trap. Moreover, the hypothesis of national divergence is supported, as can be seen in Figure 11 which presents the proportion of temporary contract workers who *do not* make transitions to permanent contract employment by country. In other work in her doctoral thesis, Vanessa Gash examined the quality of atypical employment, in an effort to determine whether support for the generation of temporary and part-time jobs is an effective policy for labor market renewal, or whether it leads to labor market segmentation. This issue is investigated through analyses of the quality of atypical employment, including working conditions, wages, exposure to unemployment and/or labor market drop out as well as the extent to which atypical employment leads to the standard employment contract, termed its "bridging function." The overall conclusion is that strong and consistent variation in the quality of atypical work (relative to standard contract employment) combined

Figure 11. Temporary workers' transitions to permanent employment, by country, using waves 2–8 of the European Community Household Panel (1995–2001).



with evidence of a weak bridging function is taken as an indicator of labor market marginalization for these workers.

In current work, we compare Germany with France and Spain, two countries which also introduced fixed-term contracts in the 1980s. Vanessa Gash and Frances McGinnity seek to challenge the notion that the consequences of fixed-term contracts are similar across European countries in their comparison of France and Germany. Using propensity score matching with panel models, employees are matched on the probability of getting a fixed-term contract. Fixed-term workers are then compared with permanent workers on a number of key outcomes—wages, wage instability, subsequent employment, and unemployment.

Finally, Antje Mertens, Frances McGinnity and Vanessa Gash compare the wage penalty for temporary work in Germany and in Spain. Like in Germany, temporary work was introduced in Spain in the mid-1980s, though since then rates of temporary employment have soared, and temporary employment there has been the source of much political and research attention. In general, the results of Spanish research have highlighted the negative consequences of temporary employment to a much greater extent than in Germany. In the first German-Spanish comparison of temporary employment, we compare the wage penalty associated with these contracts and link these results to policy and labor market differences.

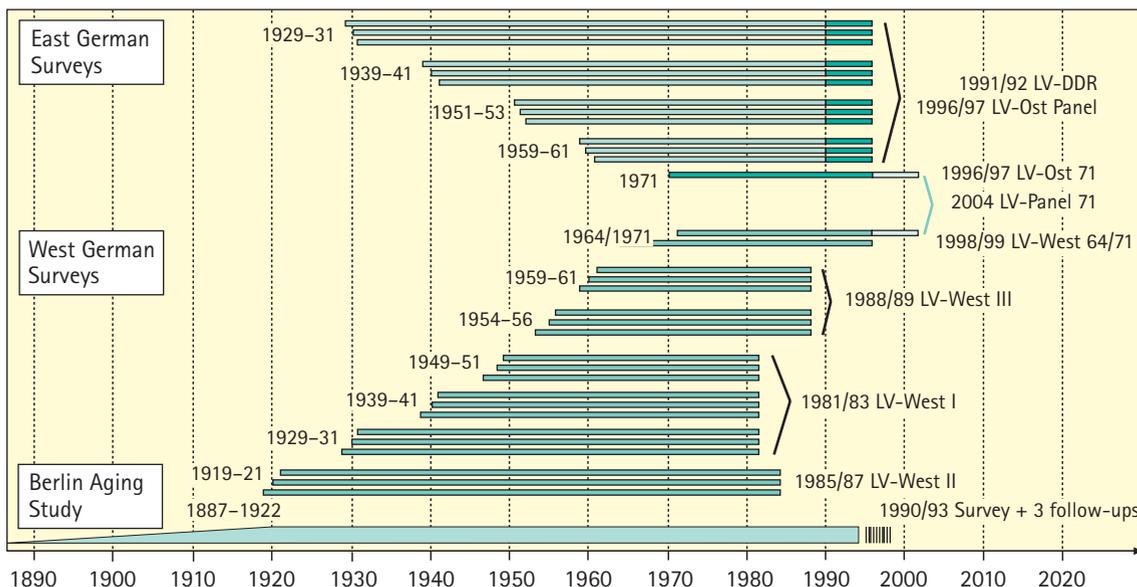
Reinterviewing With "TrueTales"—A New Survey Instrument

One of the important aims of collecting data of the East and West German birth cohort 1971 was to find out how the differences between the life courses of the young East and West Germans can be understood as consequences of earlier life conditions. The first interviews of the 1971 cohort took place in 1996 and 1998, when the East Germans were aged 25 and West Germans were aged 27, respectively. Thus, analyses of labor market entry were restricted to persons who served an apprenticeship. Analyzing labor market entry of academics does not make sense until age 30. In view of the difficulties of getting a job after completing an apprenticeship at the beginning of the East German transformation, this short observation window is similarly problematic. Also in West Germany, labor market entry lagged as a result of extending schooling, increasing waiting time before and between training and multiple training. Furthermore, analyses of family formation were limited to persons who married and had children very early. Since the East German process of family formation was not yet complete at the time of the first survey, it would be impossible to make a conclusive comparison of the East and West German marital and fertility data. We, therefore, decided to reinterview the East and West German respondents of the 1971 cohort in 2004 and 2005 (see Figure 12).

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Figure 12. The German Life History Study: Retrospective surveys and birth cohorts



Source. German Life History Study, Max Planck Institute for Human Development, Berlin.

The main focus of this retrospective life-course panel is to investigate how early careers were embedded in the contexts of regional mobility and family formation. Because of the problems faced in creating continuous and consistent event histories from discontinuous panel waves, we also included a methodological experiment in the project. Building on experiences in previous studies and findings about memory effects in the German History Study (GLHS), we designed and evaluated "TrueTales," a new computer-assisted interview instrument that enables us to connect retrospective life-course panel waves and to moderate memory problems. It maintains the principles of modularization, filter-schemed CATI, and single case edition, but improves them by personalizing cues and probes wherever possible, by making parallel and sequential recall pathways between life domains accessible and by permitting controlled flexibility in dealing with individual biographies and recall strategies.

Connecting Retrospective Life-Course Panel Waves

"TrueTales" deals with the connecting problem by using personalized cues in order to interface the reference period with the past. A module starts with a general lead-in ("Let's now turn to employment ..."). After that, "TrueTales" draws on a database with the reports from the last interview and generates a personalized cue ("In our last interview, we recorded that in June 1998, you were employed as <civil servant, police officer, on patrol>. Until when did you do that [in the same posi-

tion and at the same place]?"). In the brackets, the answer to the open question of their professional activity at the time of the last interview is retrieved by the system and incorporated into a standard text. If a respondent has difficulties reconstructing the end date for the job, the interviewer can display—on their own initiative—the episodes reported in the previous modules, and flexibly on demand generate a personalized parallel or sequential probe ("I recorded here that you moved to Munich in 9/2000, did your job end before that? Or after? Or at the same time?"). This way, respondents can explore the interconnections of their biographical context in order to achieve the correct date.

If a respondent disagrees with the incorporated activity, we assume that respondents report actual episodes more valid than recalled episodes. We accept the activity reported at the last interview to be a fact and put the date finishing the activity to the date of the last interview. Then we ask simply "Did you have any other jobs?"

Consequent Modularization

Modularization means that the interview is divided into modules each assessing all episodes within a given life domain with their start and end dates and other detailed variables. Within each module, the interview starts with the first episode of its kind and then progresses in forward chronological order until the present. This procedure helps interviewers and respondents not to lose orientation in the complexity of the task. Consequent modularization is

necessary because we cannot assume that the life course is a continuous sequence of schooling, training, working, and other activities. Further training often takes place on the job, work during the day is coupled with moonlighting, respondents can work during maternity leave, etc. Therefore—in contrast to the former survey—we ask about training, further training, working, and moonlighting together in one module and survey maternity leave separately for every child when asked about the children. Another extension is that at the end of an episode loop we do not ask "What happened next?" but rather "Did you have any other ...?" If one simply progressed through a life asking questions like "And what happened next?", one would be inviting respondents to leave out peripheral episodes and inconsequential minor transitions. With that kind of procedure we prompt for episodes likely to be forgotten.

Data Check and Revision

Modularization has the disadvantage that recall is lifted out of its

biographical context. Only top-down recall pathways are made accessible. There is little possibility to use parallel across-domain pathways or sequential order of events. Another disadvantage is that gaps or inconsistencies between modules are not easily apparent to interviewers or respondents. Furthermore, retrospective reports rely on the respondents' selective and reconstructive autobiographical memory. This can lead to events being forgotten, incorrectly remembered, or misdated, which threatens data completeness, consistency, and validity.

In order to collect complete and consistent life history data in "True-Tales," we add to *data assessment*, where questions are asked and the responses are recorded, a procedure of *data visualization and revision*, where responses are checked for inconsistencies. These inconsistencies are communicated to, and resolved in, collaboration with the respondent. The data revision starts with the revision screen (see Figure 13) that has three functions:

(a) All reported episodes are displayed in a central episode list and

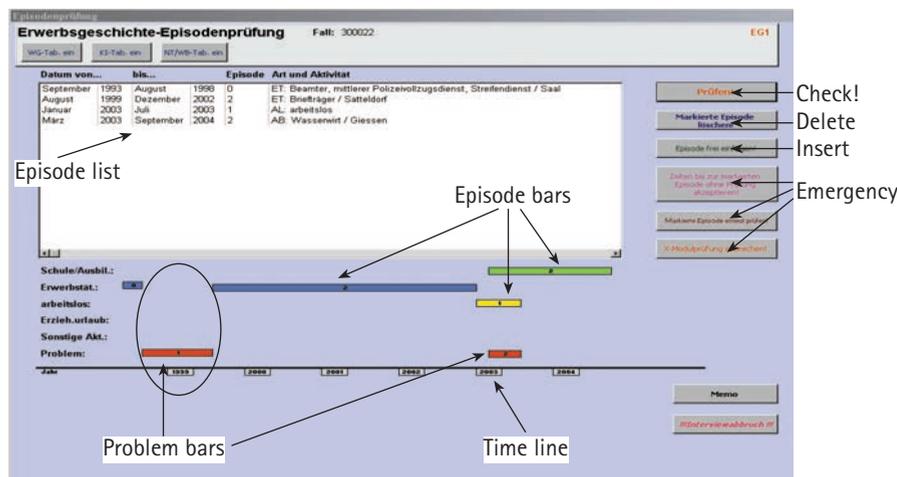


Figure 13. Start of the data revision section.

visualized in their temporal extension and biographical context as colored "episode bars" against a time line. Time periods for which no information is available yet about the respondent's state and overlaps between states or for which starting or ending time is missing are highlighted by red "problem bars."

(b) Interviewers can start a filtered revision routine by activating the "check!" button. A scripted text appears for the interviewer to read out to the respondent—in this case, a time period. It describes the inconsistency by drawing on respondents' free text answers to earlier questions about activity type, place of activity, and dates. For example, for a gap, it reads "As I have recorded here, there's a gap. I have recorded here that you were working as <police officer/Saal> until <August 1998> and from <August 1999> were working as <postman/Sattel-dorf>. There's a gap; did I record the dates correctly and did you do something else in-between?"

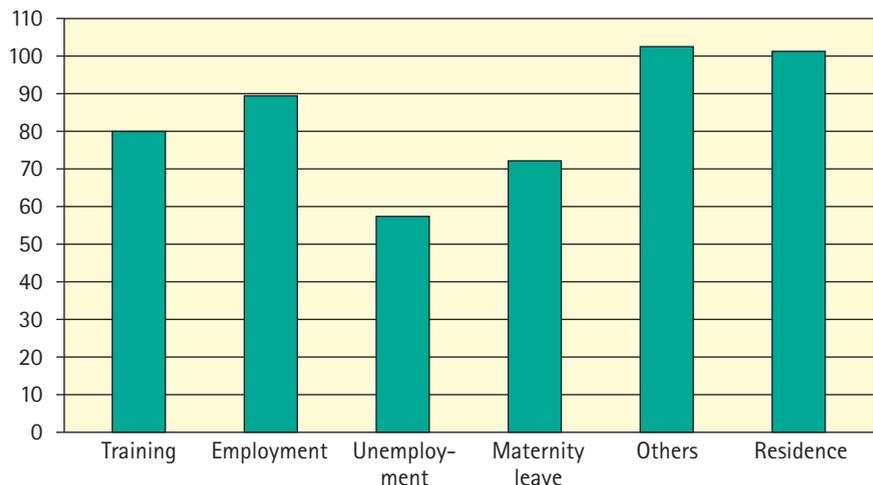
(c) Interviewers can ask about and resolve inconsistencies flexibly. A

number of buttons permit them to delete and insert episodes or change start and end dates by clicking them in the episode list.

In order to employ "TrueTales" opportunities for collaborative interviewing, interviewers need a thorough understanding of the study's concepts, goals and data philosophy, and the cognitive and communicative processes of response generation in standardized retrospective interviews. This necessitates a small staff with little turnover, intense and continuous training, and high levels of motivation. Hence, for the first time in the history of the GLHS, we have not contracted the fieldwork with an external research firm, but rather established our own telephone interview laboratory.

To evaluate "TrueTales," we conducted an experimental field study in which 300 respondents were interviewed with the new instrument and 300 with the standard technique. Figure 14 shows the relative proportion of episodes reported with the old in comparison to the new instrument. With the new instrument,

Figure 14. Proportion of episodes reported with the old in relation to the new instrument (100%).



more episodes were reported than with the old instrument. Forty percent more unemployment episodes and 25% more maternity leave episodes can be traced back to the fact, that we collected unemployment and maternity leave in the new instrument in separate modules. Twenty percent more training and 10% more employment episodes can be traced back to the modified question on the end of a loop ("Did you have any other ...?"). Also to add a data visualization and

revision is advantageous because interviewers clicked the "Check!"-button in the new instrument more than 400 times to modify reported starting or ending times and the "Delete"- or the "Insert"-button each nearly 40 times to delete or insert an episode. This indicates that the respondents could recall their biographies more accurately. Interviewers also reported higher levels of satisfaction and lower levels of effort for "TrueTales."

The Center for Sociology and the Study of the Life Course 2004



Left to right: (front row) Holger Seibert, Vanessa Gash, Laura Romeu, Stefanie Gundert; (middle row) Anke Höhne, Hachiro Iwai, Steffen Hillmert, Antje Mertens, Vered Kraus; (back row) Britta Matthes, Heike Trappe, Bogdan Mach, Karl Ulrich Mayer; not pictured: Alessandra Rusconi, Maike Reimer, Gero Lenhardt, Frances McGinnity, Erika M. Hoerning.

Transformation Processes in Poland and East Germany

Generation of Historic Hope and Everyday Risk: Social Trajectories of Eighteen-Year-Olds From the Year 1989 in East Germany and Poland

For sociology, it is life-course trajectory that gives meaning to even most dramatic individual status changes—it links and integrates different statuses across a time span. It stems from a continuous interplay of society and personality; of social constraints imposed by institutions, and free choices made by individuals. Radical social changes alter the mix of the two, and produce new trajectories. The best sociological way of interpreting all-encompassing, across-the-board changes is, therefore, to investigate the life-course trajectories that these changes bring about—and especially to investigate the role, that the resources, born out of the change, play in life-course transitions, taking place under new emerging systems. The most recent and most provocative examples of truly radical social changes are to be found in the post-1989 transformations of East and Central Europe—irrespective of whether it has taken ten years, ten months, ten weeks, or ten days for them to develop and alter everything in respective countries. The story line sketched above summarizes the basic reasoning behind our embarking on the comparative German-Polish project we have entitled “Generation of Historic Hope and Everyday Risk: Social Trajectories of Eighteen-Year-Olds from the Year 1989 in East Germany and Poland.”

(Comparative research project of the Center for Sociology and the Study of the Life Course and the Institute of Political Studies of the Polish Academy of Sciences in Warsaw.)

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German Uniqueness?

There has been a parallel, yet closely related, motivation for our project. Because of a direct transfer of West German institutions to what used to be the German Democratic Republic, the East German transformation toward market and democracy has generally been depicted as a unique sociopolitical phenomenon. But if radical social changes are best reflected in the development of individual life course, this general claim to uniqueness can not be convincingly substantiated without comparing life-courses trajectories observed in East Germany after 1989 with post-1989 trajectories unfolding in other countries, transforming their politics and economies under differ-

ent institutional conditions. Our comparative project focuses, thus, on post-1989 life course of young people in East Germany and Poland—two countries experiencing transformation under sharply contrasted institutional and macroeconomic conditions. The project elaborates on the discussion of East German uniqueness and interprets different institutional transformation pathways by reflecting on life-course outcomes brought about by them.

As East Germany is not only a single case in the analysis of transformation toward market and democracy, but also a part of the new Federal Republic, we include in our project West Germany (the old Federal

Republic) as well. In this way, we intend to capture the internal German East-West distinction. Without taking this distinction into account, any comparison of Germany to other countries cannot be conceptualized properly.

Litmus Test of Transformation

Historic transformations toward market and democracy in East and Central Europe have impinged on the life course of all age cohorts. But history-making events are most likely to affect persons in their late adolescence and early adulthood. The project has built on this conceptual framework and interprets the post-state-socialist transformation of East Germany and Poland from a special angle of the life course of people born in 1971—those boys and girls who were 18 years old in the year 1989 and began their transition to legal adulthood in tandem with historic changes started in that year in both countries. The main tenet of the project is that these individuals' life-course trajectories represent the most powerful lens for interpretative focusing on the East German and the Polish transformation as transformation processes "hit" the 1971 cohort while they were entering the most vulnerable formative phase of their lives—when people have to make important choices and decisions with long-term, sometimes irreversible, consequences. Facing everyday risks and uncertainties built into the transformation, they were at the same time a model generation with a historic hope for freedom, integrity, and prosperity—which the transformation was expected to bring.

Data Analyzed in the Project

The project uses three nationally representative retrospective life history data sets on persons born in 1971 in East Germany, West Germany, and Poland. The highly comparable data cover full education, job, and unemployment trajectories as well as life-course accounts of other domains of life and a wide range of cross-sectional objective and subjective indicators, relating to the date of interview. In East Germany 610 interviews were collected between May 1996 and January 1998—in West Germany 1,435 interviews between May 1998 and January 1999. In Poland 755 interviews were secured between November 2000 and January 2001. The response rates were 50% in East Germany, 66% in West Germany, and 64% in Poland. All data sets have been translated into spell-oriented files, easy to handle in empirical life-course analyses. As the national data were collected in different years, and cover people of different ages at the time of interview, most of the analyses done in the project do not reach, unfortunately, behind May of 1996—the time the first interviews were done in East Germany. Our respondents were around 25 years old at that time. In 2004, a panel study of the 1971 German cohorts was conducted by a group consisting of Britta Matthes, Maike Reimer, and Michaela Kreyenfeld. With new German data, it will be possible to extend our analyses up the end of the year 2000—the date of the Polish study. The respondents were almost 30 years old at that time.

"Poland ten years,
Hungary ten
months, East Ger-
many ten weeks,
Czechoslovakia ten
days"
*written on a wall in
Prague in the Fall
1989*

East Germany and Poland:

Basic Institutional Profiles

East Germany and Poland stand for two different paths of institutional development over a long period of time. This applies to the pre-state socialist legacies, the nature and functioning of state socialism implemented after the Second World War, the mode of abandoning state socialism in the late 1980s, and later processes of adopting capitalism and making it work. In Table 2 we refrain from presenting the West German profile as we think of it as depicting (at least till 1996) profound institutional continuity and stability fundamentally different to the transformations unfolding in East Germany and Poland.

Sample of Results

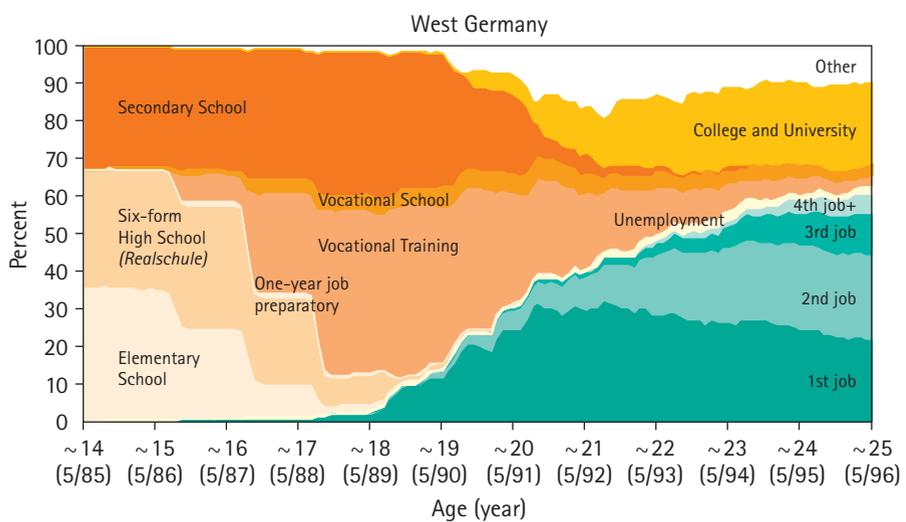
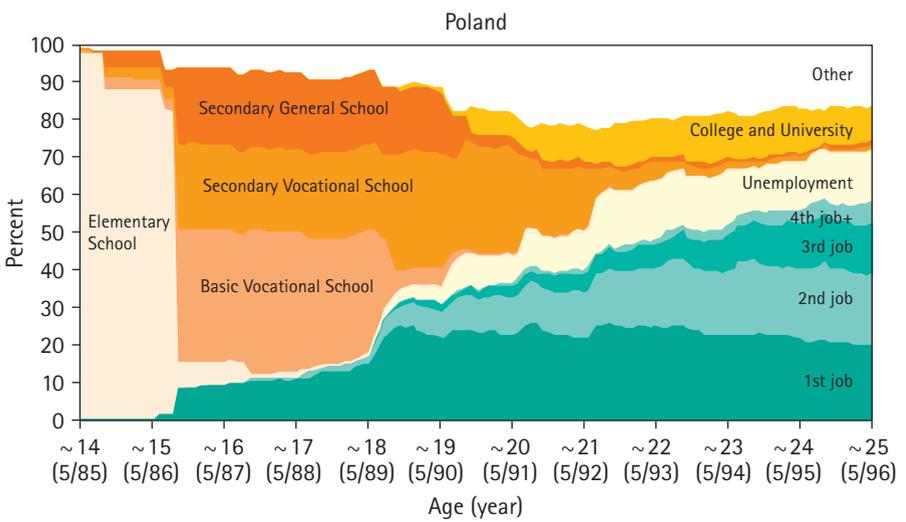
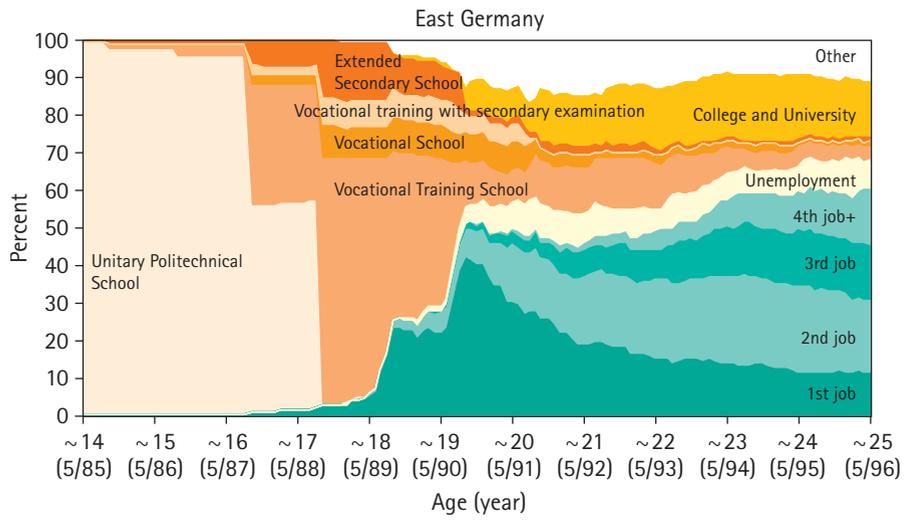
Figures 15–17 aggregate the development of individual life-course trajectories in East Germany, West Germany, and Poland over 11 years—from May 1985 till May 1996. There are tremendous differences in the way these trajectories have developed in the three different institutional contexts.

With respect to early education attained in the 1980s, a clear distinction can be seen between unitary systems of East Germany and Poland and a diversified system of West Germany. In contrast, post-secondary education, the 1971 cohort was attaining only after 1989, differentiates East and West Germany (with the West German lead) from Poland, where less college and university participation has been seen over all transformation years.

Table 2
Characteristics of the transformation paths in East Germany and Poland

| | East Germany | Poland |
|---|---|--|
| Society of origin | | |
| Political regime | "Frozen post-totalitarianism" | "Mature post-totalitarianism" |
| State control over economy | Strong, no market reforms | Inconsistent market reforms, strengthening the power of dominant industries |
| Labor market and school-to-work link | Firm-centered, elaborate system of vocational on-the-job training | Industry-centered, school-based vocational training |
| Society of destination | West German institutional order | Not predetermined, endogenously evolving |
| Rules and conditions of the transformation process | Externally imposed | Internally negotiated |
| | Implemented by West German political and economic elites under conditions of financial transfer from the West | Implemented by local political leaders under conditions of a shortage of locally existing elites, resources, and institutional practices |
| | Marked by a fast pace of economic restructuring and no need for macroeconomic stabilization | Marked by a slow pace of economic restructuring and macroeconomic stabilization by "shock therapy" |

Figures 15–17. Distribution of education and employment in historical time.



Although in May 1996, at the time we close our observation window, employment rates were almost the same in East Germany (61%), West Germany (61%), and Poland (58%), the internal composition of the group of employed persons with respect to the stage they were in the development of their job career varied very much between East Germany and Poland. While only 12% of East Germans were still in their first job at that time, the respective percentage in Poland was nearly twice as high (21%)—and close to the West German level (22%). Percentage of those born in 1971 who were already in their at least fourth job in 1996 was 15% in East Germany, while it was only 5% in Poland (it was 5% in West Germany as well).

Not only the May 1996 snapshot illustrates that transformation-induced changes in job mobility and occupational structure were much more radical in East Germany than in Poland. Starting with the 1990s, the percentage of those still in the first job in East Germany was dramatically declining over first transformation years and moderately declining over subsequent years—it was 43% in September 1990, 19% in September 1992, and 12% in May 1996. In Poland, the respective percentages were 25%, 26%, and 21%. The percentages of those still in the first job were, thus, in Poland unusually stable over all transformation years—young Poles did not experience anything like an instant, forced, and dramatic job mobility induced in East Germany by a radical dismantling of the old state-socialist industrial structure. In this special

respect, Poland was rather like West Germany than East Germany. While the project does not find other similarities between Poland and West Germany, the differences found between East Germany and Poland are abundant and in most cases some similarities among both parts of Germany are visible. Unemployment became a distinctly painful experience of Polish youth under transformation and was, over the whole period studied, significantly higher in Poland than in East Germany (especially after 1991). Even if the East German level was much higher than the West German one (which was very low then), the East German-Polish difference is still remarkable—usually the Polish level is twice the East German one. Already in September 1990, the unemployment was 10% in Poland and 5% in East Germany. In September next year, there was a leveling of both rates (10% in Poland and 8% in Germany), but after the following year, respective rates were 16% and 7% and a similar distance between them could be observed since then. Needless to say, unemployment allowances in Poland were both in absolute and relative terms much lower than in East Germany. Extensive and prolonged stays within the educational system (especially at the college and university level) are characteristic of strategies young Germans (both East and West) use in coping with labor market risks. Both general availability of education at this level and highly institutionalized education-occupation links make a longer staying within the educational system a rational choice to many. When we

close our observation window in May 1996, 22% of West Germans, 16% of East Germans, and only 9% of Poles were attending a college or a university—and the range of respective differences was attained already in 1993 and maintained since then.

Some strategies of coping with labor market situation by young Poles are reflected in a systematically higher Polish proportion of "other" activities (the most upper parts of Figures) in the development of the life course. While in the case of women, most "other" activities are centered around taking care of children and the home, in the case of men, they also stand for a range of nonstandard possible illegal or "gray zone" work situations, occasional working trips abroad, and other sub-self-employment (or rather self-assistance) activities. Although our project has not been designed to deal in a systematic way with this type of "taking care of one's own life," some evidence pointing in the suggested direction can be found in Polish answers to open questions about successes and failures in personal and occupational life which were asked in the project of both Poles and East Germans and are available in our data sets.

We cannot be certain about the extent of "sub-self-employment"—we can, however, precisely document the extent of self-employment in Germany and Poland. Had we differentiated in figures like Figures 15–17 the group of employed, not according to the number of the job persons were in but according to whether they were or were not self-employed, we would have found

that the percentage of self-employed outside agriculture was consistently higher in Poland than in either part of Germany. In September 1992, it was 3.8% in Poland, 1.1% in East Germany, and 0.5% in West Germany. In May 1996, respective percentages were 7.2%, 1.8%, and 2.1%. Taking self-employed farmers into account would increase the percentages to a much greater extent in Poland than in either part of Germany. No doubt that in the 1971 cohort self-employment has been in Poland a more significant element of individual coping strategies than it is in Germany.

Internal Differentiation Within the Three Institutional Contexts

Patterned differences among East Germany, West Germany, and Poland do not imply that these three institutional contexts are homogenous with respect to life-course trajectories they produce. Below we present one extreme example from Poland. Our observation window reaches this time to November 2000—the date the first Polish interviews were done.

Gender and place of residence are the two most important factors differentiating life-course trajectories of young Poles. The two Figures (18–19) present a cumulative distribution of "the state individuals were in" for every month between November 1989 and November 2000, there being five possible states: "work," "work and schooling," "schooling," "unemployment," and "other." Figure 18 presents a distribution for men living in large cities, Figure 19 for women living in rural areas. There is a huge gap between

these two segments of the 1971 cohort in terms of the volume of work and education available to them throughout the transformation years. If we focus on the moment of the study (November 2000) we conclude that only 2% of men in large cities were unemployed, while 92% of them had work (some combining work with schooling). Women in rural areas live, however, in a very different world: Throughout the transformation period, their employment rate has rarely surpassed 50%, it has been very atypical for them to combine work and schooling, and

their unemployment rate has rarely fallen below 20% since the early 1990s. In November 2000, only 54% of them were working, 17% were unemployed, and 28% were out of the labor force.

Reaching the Limits of the Data Sets
In the project we try to study the role which new individual resources—brought about or altered in their meaning by the transformation—might have on structuring life-course transitions. The long list of such resources include being self-employed, experience of unemploy-

Figure 18. Social trajectories of men living in large cities, November 1989–November 2000.

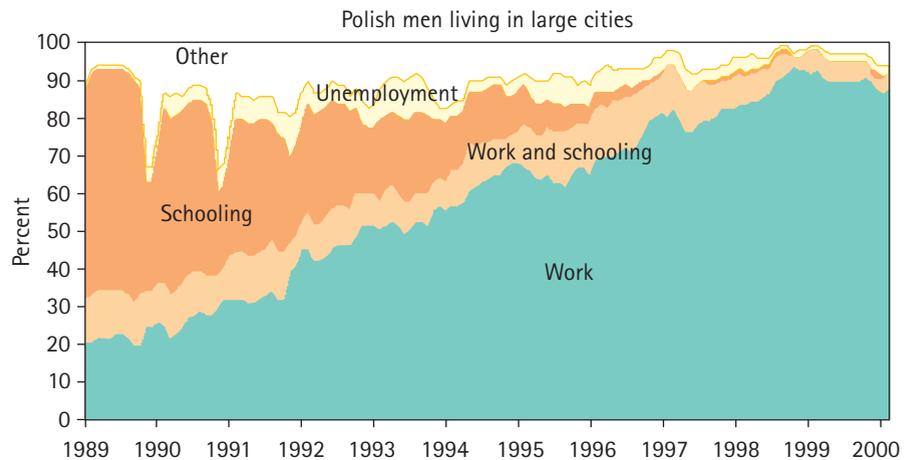
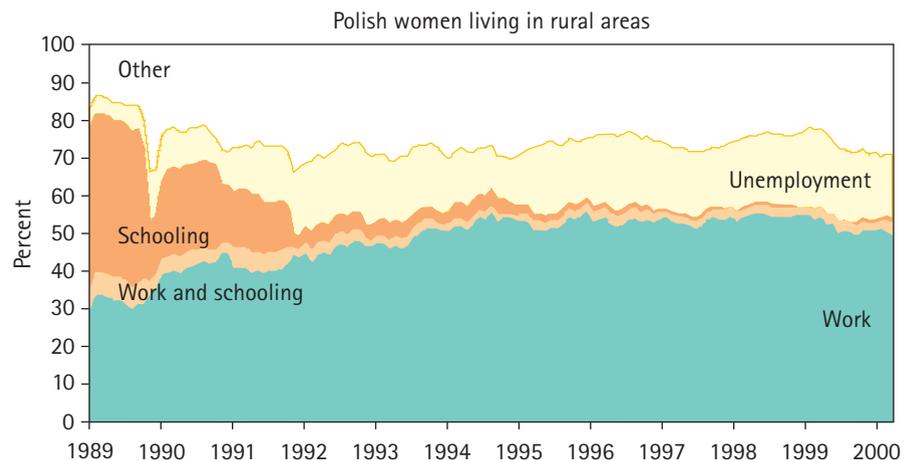


Figure 19. Social trajectories of women living in rural areas, November 1989–November 2000.



ment, working in state versus private sector, having a fixed-term work contract, being over- or under-qualified, working for a foreign firm, and having achievement-related personality traits. One interesting question is if personality facilitates making transitions and achieving goals. Some would argue that under conditions of structural rupture, personality is what counts most. As psychological measures in our project refer to the interview time only, we are unable to be sure about causal effects personality might have. In Poland, we have found, for example, that occupation-centered control beliefs are significantly related to job income, even if one controls for gender, education, prestige of the job, and hours worked. But is it control beliefs which affect income or is it the other way round? Can the finding of no such an effect in either part of Germany be interpreted as an evidence of no casual link between personality and income in Germany? Panel studies of German cohorts undertaken in 2004 will enable answering some of such questions.

Gender Stratification After Reunification in East and West Germany

The German reunification provides the unique opportunity to study the consequences of accelerated social change for gender stratification in both parts of the country. Following reunification, large institutional transfers from the West to the East and substantial financial support occurred and resulted in a comparably rapid and thorough transformation

Toward Basic Conclusion

There are fundamental differences between life-course trajectories of young Poles and East Germans. East German trajectories display more job changes, less unemployment, and more prolonged stays in the educational system. Polish trajectories are characterized by significantly higher levels of self-employment, unemployment, and out-of-the-labor-force activities. The differences found clearly attest to the more radical character of East German occupational restructuring, to the more institutionally regulated East German school-to-work transition, and to the more individualistically oriented coping and adjustment strategies on the part of young Poles. Life courses of young East Germans and Poles reflect two clearly distinct transformation paths, conditioned by differing national institutional contexts and material resources. In most comparisons, East-West German differences in the development of the life are less visible than differences between East Germany and Poland.

of society in East Germany. Basically, this transformation process has left no life domain untouched and has had deep consequences for social stratification in general and gender stratification in particular. The quasi-experimental situation in Germany allows for a detailed investigation of how differences and similarities across institutional contexts and economic conditions shape gender stratification and inequality.

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Aggregate developments across major dimensions of work (labor market attachment, working hours, gender wage gap, employment sector and occupational sex segregation, gender division of unpaid work) suggest that over the course of the 1990s the two parts of the country partially converged toward a dual-earner/female part-time carer arrangement, in which men are employed full-time and their partners hold part-time jobs and retain the majority of care-giving responsibilities. This resulted from a gradual strengthening of women's labor market attachment in the West and, in the East, some voluntary reduction in women's labor supply, compounded by severe demand-side constraints that hit women especially hard (Rosenfeld, Trappe, & Gornick, 2004).

However, this macrolevel account of social change is very general and abstains from continuing differences in the gender division of labor in East and West Germany. Such a cross-sectional approach is unable to reveal the mechanisms that contribute to economic gender inequality. Therefore, a closer look at a birth cohort which came of age when the Wall came down proves to be insightful.

Economic Gender Inequality Between Women and Men Born in 1971

Young women in both parts of Germany have partially surpassed young men in their level of vocational training and higher education, but they continued to achieve different types of occupational credentials. Furthermore, women, and to a larger extent even men, received their training and entered employment in

highly gender-typed occupational fields. However, only women's employment opportunities were differentially affected by the gender type of their occupational preparation. East German women benefited from training for female-typical occupations because of lower unemployment risks and more favorable employment prospects in these fields. In contrast, West German women capitalized on training in integrated or male-dominated occupations for their subsequent employment prospects.

Over the course of their early work histories (largely before family formation), West German women accumulated the same level of employment experience, even in full-time work, as men, whereas women in East Germany acquired considerably less employment experience than men. This was largely due to East German women's higher and longer unemployment (Figure 20). Fifty-six percent of young women and 51% of men were unemployed at least once between 1990 and 1996 in East Germany, but women's unemployment lasted on average twice as long than men's! The barriers for women to reenter employment were noticeably higher than for men even if structural characteristics of prior employment and personal characteristics were taken into account. Obviously, under conditions of an ongoing economic crisis and contraction, gender was a salient selection criterion for employers. So it does not come to a great surprise that more young women than men from East Germany opted for commuting or moving to the West to seek employment.

In both parts of Germany, young full-time employed women earned less than men, with a greater discrepancy in the West than in the East owing to the greater earnings compression in the East. The gender wage gap was partially due to occupational sex segregation because occupations dominated by women were least well paid.

Overall, in both parts of Germany young women were disadvantaged in the labor market, compared to

men. However, economic gender inequality takes on different expressions in East and West Germany and is clearly shaped by economic conditions. In the West, women's disadvantage showed mainly with respect to their employment rewards, whereas in the East gender inequality was more pronounced and blatant, and employment opportunities, particularly for women, were highly constrained by the unfavorable labor-market situation (Trappe, 2004).

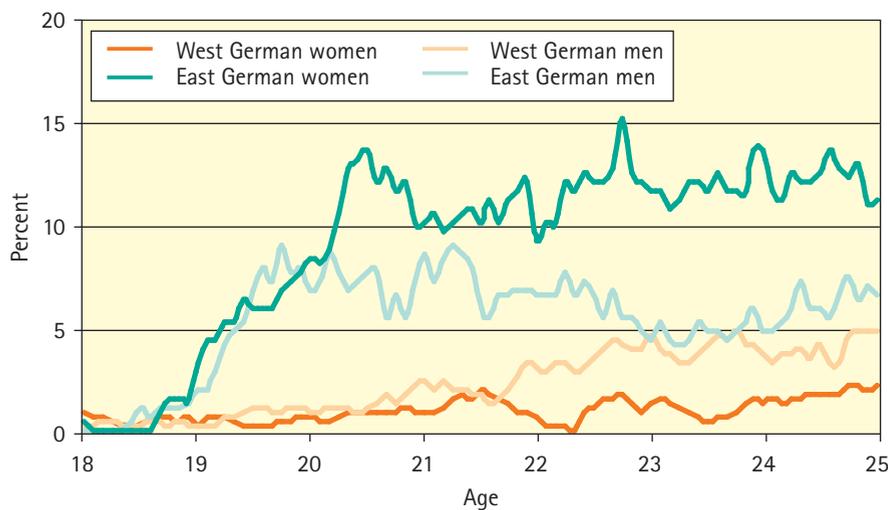


Figure 20. Unemployment over the early life course in East and West Germany—birth cohort 1971.

Further Projects

Gero Lenhardt

Higher Education in Germany and the United States

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The comparative study of higher education in Germany and the USA is completed. It focuses on normative concepts of the individual and the social order, which are manifest in the institutional structure of higher education in both countries. Starting point is the educational reform debate in Germany, in which the American universities are claimed to be the model. The reformers attribute three characteristics to American higher education.

First: More Restrictive Admission

German reformers claim that admission to higher education is more restrictive in the USA, whereas in more liberal Germany a deplorable number of untalented students would stifle the progress of their more talented comrades. Therefore, they demand a more restrictive selection of students. Yet, as the national student ratios indicate, access to higher education in the USA is less restrictive than in Germany. The selectivity of the German educational system is unparalleled in the Western world, as PISA demonstrates.

Second: More Inequality

The American system of higher education, German reformers claim, is more unequal and therefore more productive than its German counterpart. A closer look reveals the following. American higher education includes almost all tertiary education, and its institutions agree on one educational goal: They want to support the development of inde-

pendent citizens, whose personal autonomy includes technical competencies. Their principle homogeneity is manifest in the wide passages from community colleges to PhD programs of research universities. Moreover, the categorization of higher education institutions finds less attention and is less strict than in Germany. German higher education categories are legally institutionalized, and are a matter of serious social conflicts over the demarcation of social estates. German tertiary education differentiates not only between institutions with and without (or limited) academic freedom but also between theoretical and other programs. The apprenticeship system, where the majority of the young people are enrolled, provides above all in-plant training. It can be demanding, yet often it offers only the chance of blind imitation or the experience of unskilled labor for a low compensation. In short, German tertiary education seems more unequal than its American counterpart. Whether the German universities are more equal or unequal than American research universities is an open question.

Third: Market Mechanism and Productivity

German educational reformers maintain that American higher education institutions are more productive because of their market-like structure. Comparative studies do not exist, not even serious definitions of productivity. Yet, there are far more

than 1,000 studies on "How College Affects Students," which shed light on the functioning of higher education. As Pascarella and Terenzini show in their careful summary of 20 years of research, competition between colleges produces only distributional effects. The average college-specific achievement scores of the graduates differ, but the only variable which explains these differences is the college-specific average qualification of their freshmen. Colleges with higher prestige attract better prepared students, but do not have a higher net impact on their education. In college everyday life, this effect is known as "Matthew Effect": "Wer hat, dem wird gegeben."

Americans believe in the potential of the individuals to improve their education and in their moral obligation to do so. This conviction is rooted in Protestantism and stands at the center of the American Dream. It includes the liberal concept of the open society, whose development is determined by the citizens. This perspective results in a general enthusiasm for education which is unparalleled in Germany. German higher education reformers share neither this anthropological optimism nor do they subscribe to the liberal concept of the open society. They rather believe in inborn talents and objective manpower requirements, which both are perceived as insurmountable obstacles to higher education expansion.

This orientation has consequences also for reforms of educational management structures. In Germany, educational management is expected to more precisely allocate given in-

born talents in predetermined quotas to the various categories of higher education according to assumed objective manpower needs. The market-like structure of American higher education management, by contrast, is expected to support the development of an individual and collective definition and understanding of higher education. This is the major function of the separation of higher educational institutions and the state, of the close communication between higher education institutions and the civil society, and of the selection of higher education institutions by students and vice versa. Originally, religious orientations were at stake, today secularized cultural orientations.

Thus, the imagery of American higher education institutions, which is dominating in the German political debate, is distorted. It is a projection of German educational idiosyncrasies, which are alien to American culture. The German belief that nature equips the individuals by birth with unequal talents, educational possibilities, and life chances, looks like a secularized version of the feudal absolutist conviction that God had equipped them by birth with unequal dignity and rank in the order of social estates. As the analysis shows, German higher education emancipates itself from these pre-democratic normative orientations. With democracy becoming more effective in both countries, higher education in Germany and the USA increasingly take on a similar content and form.

Professions as Frames in Times of Biographical Upheaval: Bourgeois and Non-Bourgeois Intelligentsia in the GDR and After 1990

The socialist intelligentsia, or the educated class, appeared with the foundation of the GDR in 1949 and was dissolved along with the state in 1990. The original intention was for the ranks of the intelligentsia to be open to social groups hitherto unconcerned with education (workers and peasantry). But since the children of this first generation of graduates demanded the same level of education as their parents, GDR society shifted increasingly toward stratum-specific differentiation and a reproduction of societal structures. Hoerning looks at case studies of the "socialist intelligentsia" that examined the role of the profession in biographical (re)orientation. The professional and life histories (narratives) of 31 women and men born between 1929 and 1938 (the generation that rebuilt Germany after the Second World War) and between 1950 and 1960 (the children of the "heros") were recorded on repeated occasions, allowing us to describe the social character of the educated class (the new socialist intelligentsia) and the professional cultures of the former GDR as well as the life courses of both bourgeois and non-bourgeois members of the intelligentsia. It was then possible to

observe the reorientation process retrospectively by examining the transition to "new" social, cultural, and political structures, and obtaining information about how retrospective assessments change over the course of time and life. The study shows that success (or failure) in coping with the transformation process is not only a function of the individual biographical capital but is highly dependent on the historical development of the institutions (professions) to which individuals belong. The institutional and biographical transfer to/integration into the "new" Federal Republic is being explored in case studies on a number of professional groups: medical, law, media, and science professionals, university professors, managers in industry and science, and the clergy. A special chapter will be devoted to the professional careers of women in the nomenklatura-cadre/administrative class. In 2003/2004, the case studies of journalists/journalism in the Western states and in the GDR were worked out. These case studies will be discussed within the framework of current theoretical debates on professions in a book in progress: "Intelligenz, Experten, Professionen."

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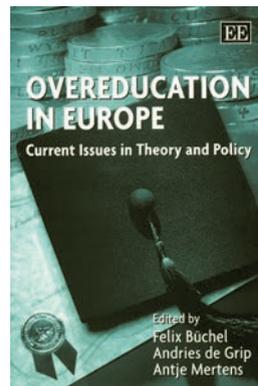
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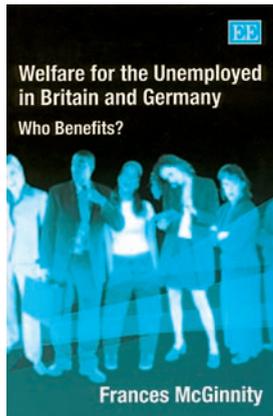
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Independent Research Group

Lack of Training:
Employment and Life Chances
of the Less Educated

Contents

| | |
|----------------------------------|-----|
| Research Agenda | 279 |
| Research Areas and Results | 280 |
| Publications 2003–2004 | 290 |

Duration: January 2000–May 2005

Head of Research Group: Heike Solga

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Research Agenda

We investigate the *causes and consequences of less education* from a life-course perspective and analyze changes over time as well as regionally and cross-nationally. Our joint research questions are: How do less educated persons' disadvantages at multiple status passages cumulate over their life courses? What changes, especially in institutional rules, norms, and processes, have occurred over the postwar period and what consequences have these had?

The Causes of Less Education Among Youth

We investigate how initial inequalities are transformed into exclusion from training and education, focusing on the educational and training systems and their social mechanisms: sorting and selection functions, the learning environments that they provide for children with different characteristics—given initial inequalities—and the recruitment practices of firms for apprenticeships or on-the-job training opportunities.

Social Consequences of Less Education

The group's second research focus are the coping strategies of less educated youth with the stigma of low education, especially during their school-to-work transitions, and less educated youth's often tenuous participation in labor markets. We know that in many Western countries, less educated persons constitute an increasing share of the long-term unemployed. They are less able to enter into even unskilled jobs. The dominant (mainly economic) explanation is the so-called "displacement" argument, which theorizes that, given an oversupply of qualified persons, trained persons out-qualify less educated persons in job

competition. Yet, that explanation does not include the "production process" of less education in its analysis. Our project offers a sociological explanation for the increasing labor market vulnerability of less educated youth, emphasizing the consequences of historically declining proportions of less educated youth. This sociological explanation takes into account changes in group size, group composition, and employers' perceptions over the course of educational expansion—contributing to the phenomenon that less education itself has become a social stigma in education societies.

Data

Much of our research compares different West German birth cohorts, allowing us to investigate the two research questions in changing educational norms and institutional settings in educational and training systems as well as under varying economic circumstances. In our comparison of (Western) Germany with the United States, we examine whether and how the degree of locational "segregation" in educational systems—a highly differentiated and hierarchical school system in contrast to tracking or ability grouping within comprehensive schools—influences the production of differen-

tial educational attainment levels for ascriptive groups. Further, we use the *Life Course Studies* of the Institute's Center for Sociology and the Study of the Life Course and the German Socio-Economic Panel Study (GSOEP, an annual panel study conducted by the German Institute for Economic Research, DIW). We complement our analyses of representative population surveys and collections of aggregate statistics with our own life history database (of 106 school leavers from schools for

"learning disabled" children) derived from a pilot project on "job coaching" based at the University of Cologne in North Rhine-Westphalia. Besides a standardized life history survey, we conducted biographical interviews with a sample of these school leavers from special schools as well as with their job coaches. This data set is particularly valuable because most large-scale educational studies in Germany do not include (representative) samples of special school pupils or graduates.

Research Areas and Results

The Social Production of Less Educated Youth

Project 1 Sandra Wagner

Key Reference

Wagner, S. (in press-b). *Jugendliche ohne Berufsausbildung: Eine Längsschnittstudie zum Einfluss von Schule, Herkunft und Geschlecht auf ihre Bildungschancen*. Aachen: Shaker Verlag.

Research Project 1

Youth Without Vocational Training: A Longitudinal Study of the Influence of School, Social Background, and Gender on Educational Opportunities
This quantitative longitudinal study analyzes an educational group long ignored by educational sociology: youth without vocational training. Although in comparison with other countries, Germany succeeds well in having among the least proportions of youth without any secondary school certificate, the remaining group of youth without training represent a "problem group" increasingly at risk in (vocational) education systems and in labor markets. Changes in this group's size and composition vis-à-vis educational level, social background, ethnic heritage, and gender are key aspects addressed by this project (Figure 1). The goal of the empirical analyses is to show (1) which changes result mainly from quantitative change

due to educational expansion and qualitative reforms and structural transformations, and (2) how these compositional changes contributed to the exacerbation of the problem of less educated youth. The dissertation's contribution lies in the historical investigation of this educational group and the problems its members face in the German schooling and vocational training systems.

Due to the difficult data situation, especially regarding migration experiences and patterns, the study utilized diverse data sources, joining official statistics with analyses based on the GSOEP with the German Life History Survey and the Independent Research Group's own survey of school leavers from special schools (category "learning disability"), among others. Findings showed that this educational group's size has declined since the 1950s and 1960s and it is more than ever com-

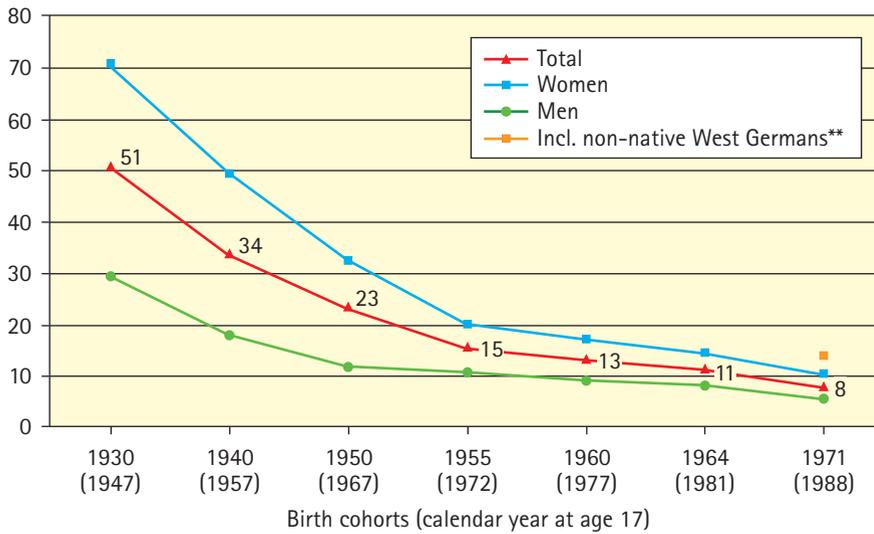


Figure 1. Proportion of persons without completed vocational education at age 25 (in %, only West German origin)*.

* Without persons with an A level; persons still in vocational education at age 25 are not counted as "without" completed vocational education.

** Persons aged 25 to 29 (birth cohorts, source: Survey of the Federal Institute for Vocational Education (BIBB)).

Source. German Life History Study, Max Planck Institute for Human Development, Berlin.

posed of young men and ethnic minorities, who nevertheless spend relatively more time in school and at-

tain more certificates than in the past.

Research Project 2

Institutional Barriers to Inclusion

Despite similar citizenship rights, discourses of equality and merit, and disability paradigms, the German and American special education systems diverged considerably over the 20th century. Resisting a multitude of international, national, and regional reform initiatives, German Länder maintain at least ten types of segregated special schools; less than 15% of disabled students attend general schools. By contrast, 95% of all disabled students in the United States attend general schools, but spend part of their school day separated from their peers in general education classrooms. Nationally, 5%

of all students in Germany, but 12% in the United States are classified as "having special educational needs." Why did these countries institutionalize school integration to such different extents? Justin Powell investigated three major phases in these systems' institutionalization: first, the copying of the general educational system's logic (isomorphism); second, the diffusion and differentiation of special education organizations (expansion); and third, the persistence of segregation and separation (inertia). Empirically, he analyzed (1) students' classification into special education, (2) their allocation to learning opportunity structures (along a continuum from segrega-

Project 2 Justin Powell

Key Reference

Powell, J. (forthcoming). *Barriers to inclusion: Special education in the United States and Germany*. Boulder: Paradigm.

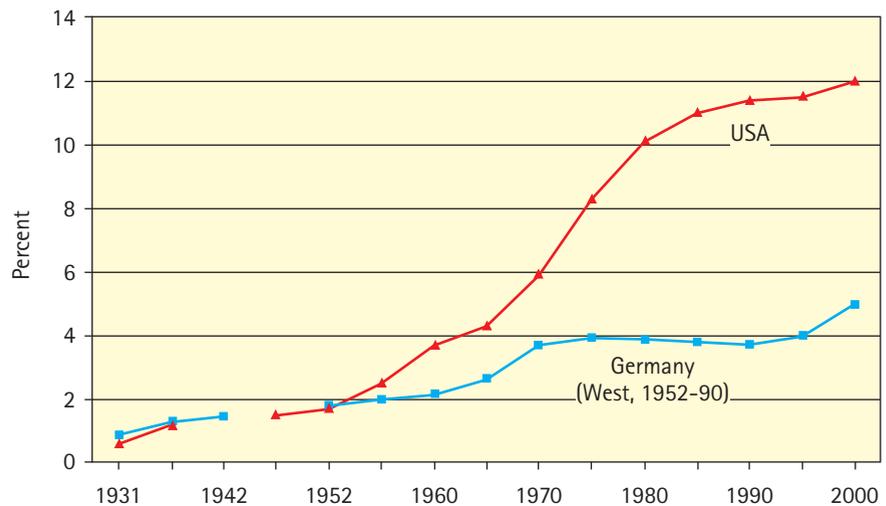
tion to full-time inclusion), and (3) their resulting educational attainments.

With universalized compulsory schooling, general education systems expanded massively, and special education grew apace (Figure 2). The subsidiary organizations of special education experienced exogenous and endogenous growth from two main sources, most rapidly since the mid-1950s: (1) the reduced exclusion of children with perceived impairments, and (2) general education teachers' increasing transfer of "abnormal" or "exceptional" students into special education. The resulting increasingly heterogeneous student bodies challenged the rationalized standardized organizational structures and processes of German and American school systems. Efforts over the past three decades to address and reduce the overrepresentation of male, ethnic minority, and poor children and youth in such pro-

grams have largely failed: They remain the core groups participating in special education.

Education reforms over the last century reflect shifts but also continuities, in ideologies, institutions and organizations, interest group power, as well as political decision-making structures. Both societies gradually eliminated the exclusion of disabled children and youth from public schooling. Yet the persistent ongoing challenge is to similarly reduce interschool segregation or intraschool separation by restructuring schools to educate all children together in the same classes—as education research has demonstrated that inclusive education benefits all students. While a quarter of American special education students drop out or age out of high school, half succeed in graduating from high school with a standard diploma. In contrast, only 2% of German special school leavers earn a diploma (*mittlere Reife* or

Figure 2. Proportion of students classified as having "special educational needs" in Germany and the United States, 1931–2000*.



* For Germany, figures for students "with special educational needs (SEN)" attending general schools (*Integrationschüler*), representing between 10% and 15% of all students with SEN, have only been published by the Kultusministerkonferenz since 2000.

Source: Powell, 2004a.

Abitur); 80% do not even attain the lowest qualified secondary school certificate (*Hauptschulabschluss*). These individuals face extremely limited opportunities for vocational training and employment, and the resulting reduced life chances (Wagner, in press-b; Pfahl, 2003; Solga, 2003a). Considerable disparities remain between, and within, these societies in disabled students' differentiation, their educational experiences, and their probabilities of education attainment (Powell, 2004a). Significant disparities found among the 16 German *Länder* and in the 50 States of the USA demonstrate that political conflicts (not consensus) and professional and parental

choices (not certainty) are responsible for the unequal distribution of learning opportunities to students served in special education organizations, for their stigmatization, and for their low educational attainment rates. The major barrier to inclusion—the institutionalization of *special* education itself—is an ongoing process, not a fixed state. Thus, while neither federal nation has yet achieved inclusive education to the degree called for by advocates or mandated in educational policies and antidiscrimination laws, some *Länder* and states are well on their way of replacing special with inclusive education organizations. In so doing, they provide models for others to follow.

Social Consequences of Less Education

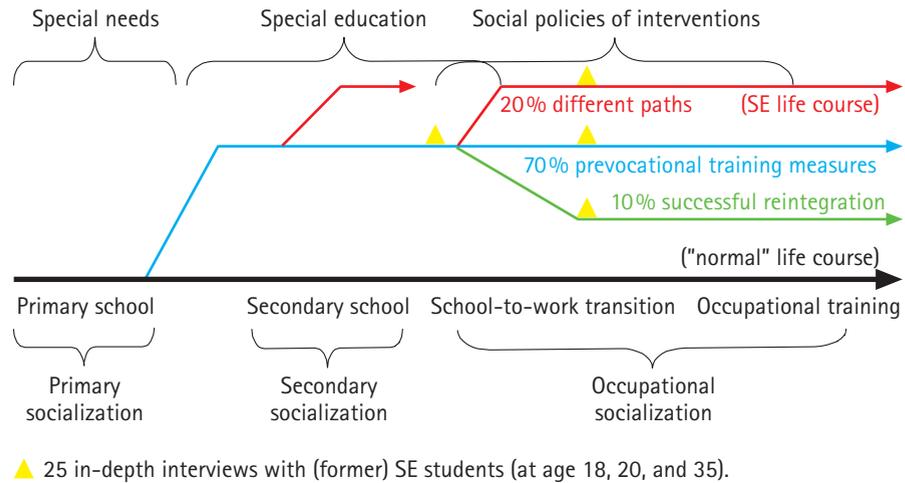
Research Project 3 Consequences of Special Schooling for the Identity Formation of Socially Disadvantaged Youth

Begun in October 2003, this dissertation project inquires into the life courses of young adults with little educational capital. Its main goal is to find out whether, and how, school leavers from special schools (for "learning disabled" students) can yield to the expectations of work organizations and labor markets, and how they attain social recognition via the paths of social integration they choose. The project focuses on the formation of the biographical selves of young leavers of special schools that can be traced back partly to their subjectivation in school. Comparatively, Lisa Pfahl examines if, and how, graduates of

special schools gain social recognition through different socializational contexts. In doing so, the project explores the school leavers' reactions to their situation as well as the consequences of their adaptive behavior. Here, it is important to take the reciprocal interaction between biographies and the opportunity structures, cultural and material resources, recognition, and (lacking) competencies into consideration. The sampling strategy partly follows the explorative style of grounded theory. Yet, with our self-conducted survey of 106 special school leavers (see above), we have the opportunity to select the cases for the biographical studies using the collected information. Several contrasting groups were selected for further investigation that allow us to contrast "suc-

Project 3 Lisa Pfahl

Figure 3. The life courses of youth with "learning disabilities" participating in special education (SE).



successful" with "unsuccessful" careers as well as to explore short-term and long-term coping strategies due to the stigmatizing classification of "learning disability" early in their lives: (1) youth who successfully began an occupational training placement (interviewed in 2002 at the end of their schooling and again in Summer/Fall 2004); (2) youth who follow an "alternative" path of social integration, such as teenage motherhood or delinquent activities; and (3) occupationally established adults who attended a special school. The biographies of school leavers from special schools offer insights into marginalization caused by the contemporary German educational system. Separated early in their school careers, only one fifth of the young people who attended schools for pupils with so-called learning disabilities (most of whom are socially disadvantaged) receives a certificate (*Hauptschulabschluss* or higher). Even less—one tenth—manages to enter vocational training. Instead of entering the training market, these

youth follow different paths, such as pretraining (remedial) programs, unemployment, teenage motherhood, or delinquent activities. These young adults' biographical constructions will be contrasted to those of "more successful" youth. The early educational "careers" of these youth demonstrate some competencies of marginalized young people—namely in managing their stigmatization and keeping an "intact" personal identity (Pfahl, 2003). Examining persons who developed successful occupational orientations, we still find a stance of "withdrawal" from societal expectations and opportunities. First results show gender variations including a prevalent lack of perspective and confidence among females, but an overestimation of status and competence levels among males. Ethnicity also proved to be relevant for processes of stigma management because of their different cultural resources. These aspects will be studied in depth in the next phase of research.

Research Project 4

The Rise of Educational Disadvantage in Germany: Explaining Less Educated Persons' Decreasing Employment Opportunities—Economic and Sociological Insights

Turning to employment chances of less educated persons, Heike Solga has developed four mechanisms that need to be taken into account if historical shifts in opportunities are to be fully understood: (1) displacement, (2) discredit, (3) impoverished resources (especially networks), and (4) stigmatization. Among the factors are changing group size and composition, educational experiences in changing school settings, and employers' recruitment processes. While the less educated group has always been considered a "problem" group, the impoverished network and stigma mechanisms have grown in importance as certification has developed into a "master status." Through increased diffusion, official educational attainment legitimately determines allocation in

labor markets. As the norms of educational attainment have risen, the less educated group's decreasing size and institutionalized segregation ensure its visibility and stigma, with enhanced relevance for foreclosing employment opportunities. Not only individual aspirations and expectations but also skills, cultural and network capital, and certificates are reduced in those who become less educated.

These four mechanisms are derived from a *multidimensional concept of education and educational groups* in which (low) education is considered to be much more than just skills and qualifications. Instead, low education is analyzed here as a social phenomenon that reflects a host of social meanings and social relations. This concept allows us to investigate changes in the individualized processes of skill certification and attribution as well as changes in educational groups' social relationships, available resources, and social identity formation.

Project 4 Heike Solga

Key Reference

Solga, H. (in press-b). *Ohne Abschluss in die Bildungsgesellschaft: Die Erwerbschancen gering qualifizierter Personen aus soziologischer und ökonomischer Perspektive*. Opladen: Barbara Budrich.

Multidimensional Concept of Education and Educational Categories

| | |
|--------------------------------------|---|
| Individual characteristics: | <i>Skill certification</i> |
| Individualized group characteristic: | <i>Skill attribution</i> (connected to social meanings of, or beliefs about, "low education") |
| Actual group membership: | Defining <i>social relationships and networks</i> Defining <i>social identity concepts</i> (social meanings and in-/outgroup-relationships) |

Heike Solga's analyses based on OECD data and policy reports on less educated youth show that these mechanisms do not only apply to Germany with its standardized schooling and vocational training systems. They reveal that in many Western societies, less educated youth are considered a "problem

group"—and that all four processes are dealt with in public discourses, social research as well as social and labor market policies. Nonetheless, these analyses indicate that their relative weight varies between countries. For example, whereas all four mechanisms are crucial to understand the labor market situation of

Table 1. Relative weight of displacement, discredit, impoverished networks, and stigmatization (selected OECD countries).

| Country | Displacement | Discredit | Impoverished networks | Stigmatization |
|---|--------------|-----------|-----------------------|----------------|
| <i>Countries in which the share of less educated young adults (25- to 34-year-olds) is less than 20%</i> | | | | |
| Finland | ◆ | | | |
| Canada | ◆ | | | |
| Norway | | ◆ | | |
| Sweden | | | ◆ | |
| Denmark | ◆ | ◆ | | |
| USA | ◆ | | ◆ | |
| Czech Republic | ◆ | ◆ | ◆ | ◆ |
| Germany | ◆ | ◆ | ◆ | ◆ |
| Austria | ◆ | ◆ | ◆ | ◆ |
| <i>Countries in which the share of less educated young adults (25- to 34-year-olds) is less than 20%</i> | | | | |
| France | ◆ | | | ◆ |
| Australia | ◆ | | ◆ | |
| United Kingdom | ◆ | | ◆ | |
| Belgium | ◆ | | ◆ | ◆ |
| Ireland | ◆ | | ◆ | ◆ |
| The Netherlands | | ◆ | ◆ | ◆ |
| Greece (<i>Less educated young adults do not face relative labor market disadvantages, compared to young adults with completed upper secondary education</i>) | | | | |

Source. Solga, 2003d, Chapter 11.

less educated youth in Germany, in the USA two mechanisms—namely “displacement” and “increasingly de-

prived networks”—seem to be of primary importance.

Concluding Conference

The Independent Research Group’s concluding conference “The Causes and Consequences of Low Education in Contemporary Europe” was held in Granada, Spain, from September 18–23, 2004. As a collaboration with the European Consortium for Sociological Research (ECSR), the conference was financed jointly by the Max Planck Institute for Human Development and the European Science Foundation (European Commission, Research General Directorate, High-Level Scientific Conferences).

Researchers from all parts of Europe came together to discuss the key

themes addressed by members of the Independent Research Group over the past five years. The conference attracted more than 60 participants, from doctoral candidates to senior scholars, in sociology as well as economics, psychology, and education. Alongside the conference organizers Heike Solga, Paul M. de Graaf, and Marlis Buchmann, discussions were initiated or chaired by Hans-Peter Blossfeld, Richard Breen, Robert Erikson, John Goldthorpe, Anthony Heath, Johannes Huinink, Roxane Silberman, Wout Ultee, Michael Wagner, and Christopher Whelan.

Themes covered in ten paper sessions and lively poster presentations included the social production or causes of low education, ethnic minorities and their educational and occupational attainments, school-to-work transitions of less educated youth, low education and its consequences for social exclusion, and the employment careers of less educated persons. Methodologically, longitudinal and cross-sectional quantitative analyses were rounded out by historical-comparative and biographical studies that emphasized the historical contingency of "low education" as a relatively recent phenomenon since postwar education expansion in European societies. Alongside Europe and OECD-wide comparative work on education systems and labor market research, countries specifically examined in conference contributions included Austria, Denmark, Estonia, Finland, France, Germany, Great Britain, Ireland, Italy, Hungary, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Sweden, and Switzerland.

The presented results, divided along the lines of the original research program of our research group—(1) the social production of low education and (2) its consequences for life course outcomes—show the complexity of the individual and contextual dimensions of low education. Individual disadvantages, such as poor language skills, social origins, stigmas such as caste status, immigration experience, and impairment or disability interact with such social and cultural aspects as school structures, tracking/streaming systems, and language and learning difficulties to impact educational trajec-

ries. Family background, religious beliefs, neighborhood characteristics, and truancy were also discussed as factors in educational experiences and attainment. At the level of regions and nations, education and social policies and the school and vocational training systems they influence are clearly implicated in producing, exacerbating, or ameliorating individual dis/advantages. Approaches leading the way forward attend to cross-national measurement problems in their analysis of the effects of educational expansion and continuing inequalities in learning opportunities.

Besides the paper presented by Heike Solga (see above) and Stephen Nickell's paper on labor market participation, other consequences of low education presented included lower wages, continuing disadvantage and even deprivation, ill health and smoking as well as disability. Findings focused on low education's role in difficult school-to-work transitions, its negative effects on fertility, and its consequences for family formation and divorce patterns. Social commitments, neighborhood integration, voting patterns and voluntary participation, and social exclusion more broadly were also analyzed.

In the paper/poster presentations and discussions, the conference participants agreed that in Europe, education is an increasingly valued individual and public good; however, beyond a minimal level, it has not yet been secured as a right for all citizens. Access for specific disadvantaged groups, especially from lower social class backgrounds, immigrants and ethnic minorities, and

disabled children remains tenuous or has been ensured only at the bottom of stratified educational systems. The resulting low educational attain-

ment negatively affects their employment opportunities and life chances in contemporary education societies.

**Collaborative
Project
Heike Solga
Alessandra
Rusconi**

Research Project (in Collaboration With the Young Academy of Science, Germany: Dual Career Couples)

Not only at the lower end of the educational hierarchy but also at the higher end, we find disadvantages in employment opportunities, albeit with different sources and qualities. Due to increasing female participation rates in higher education, the share of "*academic couples*"—in which both partners hold a university degree—has risen over the past decades in many European societies. Nonetheless, in Germany as well as other modern societies, dual careers are still not the norm among these couples, mostly because they cannot be realized due to obstacles for, and restrictions on, women seeking (full-time) professional careers.

In terms of dual careers, the interest of the Independent Research Group has been twofold: (a) What are the institutional obstacles that hinder female academic careers, and (b) what are sources within couples that negatively affect the realization of dual careers in academic couples? In collaboration with the Young Academy, we investigated institutional obstacles by conducting interviews with 181 university representatives (out of 322) (cf. Solga & Rusconi, 2004). One of the major findings is the gender-neutral output orientation of German search committees: In recruiting new associate or full-time professors, chil-

dren are mostly not taken into account when evaluating the publication lists of applicants. With regard to topic (b), we organized a special session on dual career couples in Germany at the 32nd Congress of the German Sociological Association (2004) with Christine Wimbauer (Yale University) to examine the sources of disadvantage within couples (Solga & Wimbauer, in press). Our own contribution to that session and the resulting edited volume examines the influence of the age relationship of couples on their chances of realizing a dual career (Solga, Rusconi, & Krüger, in press). One of the dominant explanations for this "failure" of dual careers is that because of "rational" decision making within couples to prioritize the partner who first achieves a desirable career opportunity, a "primary" and a "secondary" career are defined. Given the age difference between the partners and the differences in career time caused by it, the older partner typically has the "primary" career during a significant proportion of the life course. Moreover, given the typical age relationship in couples, that is, women are mostly younger than their male partners, men will have the "primary" career and women then have the "secondary" one. But this explanation raises the question of

whether women in partnerships with an atypical age relationship, that is, couples where the woman is older than the man, have better career chances than women in age-typical partnerships and whether, therefore, dual careers in these age-atypical partnerships are more common. Following another dominant explanation for the "failure" of dual careers, this may not be the case. Due to (age-neutral) gender ideologies and gendered labor market practices, it could be that women always have poorer career chances than men—independent of the age relationship within such partnerships. Utilizing empirical analyses based on the German Microcensus (1997), we examined these two explanations—the gender-neutral age relationship explanation and the age-neutral gender role explanation—of the chances

of realizing dual careers among academic couples in Germany. Our main finding is that both explanations fall short. Women in age-atypical couples do not have the same career chances as men in couples where they are the older partner (this finding contradicts the gender-neutral age explanation). On the other hand, these women in atypical couples do have higher career chances than women in typical couples (this finding contradicts the age-neutral gender role explanation). We therefore introduced the explanation of gendered age concepts in couples and suggested their further investigation in order to explore the questions: Whether, and why, age-atypical couples have more egalitarian gender identities and divisions of family duties than do age-typical couples?



Left to right: Lisa Pfahl, Justin Powell, Heike Solga (not pictured: Alessandra Rusconi, Sandra Wagner).

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Wagner, S., & Seibert, H. (in press). Internationale Erfahrungen: Erhebungspraxis von Bildungsdaten bei Personen mit Migrationshintergrund in der amtlichen Statistik ausgewählter Einwanderungsländer. In Bundesministerium für Bildung und Forschung (Ed.), *Tagungsband zum Expertenforum "Bildungsdaten und Migrationshintergrund"*. Bonn: BMBF.

Wagner, S., & Visser, K. (2004). Die telefonische und schriftliche Nachrecherche zur Panelstudie "Ostdeutsche Lebensverläufe im Transformationsprozess (LV-Ost Panel)." In A. Goedicke, B. Lichtwardt, & K. U. Mayer (Eds.), *Dokumentationshandbuch Ostdeutsche Lebensverläufe im Transformationsprozess, LV-Ost Panel, Teil II*. Berlin: Max-Planck-Institut für Bildungsforschung (Materialien aus der Bildungsforschung 75).



Service Units

Contents

| | |
|--|-----|
| Library and Research Information | 295 |
| Information Processing Center | 297 |

Scientific and Professional Staff (2003–2004)

Library and Research Information: Nicole Engelhardt, **Ursula Flitner**, Lydia Lange

Information Processing Center: **Wolfgang Assmann**, Peter Grund

Library and Research Information

Rapid access to printed and digital information is an important prerequisite for successful studies and for internationally renowned research.

The Library and Research Information Unit of the Max Planck Institute for Human Development aims to anticipate, determine, and respond to, the Institute's needs for information in the areas of education, sociology, psychology, and neighboring disciplines.

To support the research, teaching, and publishing activities of the Institute's researchers, the Library seeks to provide an environment and facilities conducive to efficient and independent use and dissemination of information.

The Library's collection currently comprises of around 190,000 volumes, 500 printed periodicals, and an extensive selection of electronic resources. It offers easy and fast access to own materials and information worldwide.

Comprehensive intranet services include, among other things, online access to major bibliographic and abstract databases, document delivery services, listings of new acquisitions, and e-journals in full text.

In 2003 and 2004 the range of electronic full texts available as a basic supply was expanded to include a total of well over 5,000 journals on all fields of science, thus providing

a sound basis for interdisciplinary research.

Further licencing contracts with publishers in the fields of social and behavioral sciences are being agreed.

Unfortunately, German publishers are still slow to provide electronic versions even of major scientific journals. Nevertheless, in 2004, document delivery orders declined for the first time since the introduction of e-journals on a large scale in 2000. This seems to indicate that the collection of centrally and locally licenced e-journals, accessible from every office desk in the Institute, is well on its way to attaining the quality needed to satisfy a major



part of our researchers' needs for journal literature.

The interdisciplinary database Online Contents (OLC) was added to the Library's table of contents services. OLC currently offers more than 21 million articles indexed from over 18,000 journals. As it is linked to German document delivery services, OLC is also a convenient tool for the efficient organization of interlibrary loan.

The staff of the Library continue to offer regular training in the use of databases.



With the appointment of Ulman Lindenberger as the new Director of the Center for Lifespan Psychology, new research interests and literature needs arose in 2003. Additional funds were raised, and extensive purchases were made by the Library to satisfy the Center's requirements. To enhance the visibility of the Institute's scientific output, the Library

has taken several initiatives: Our catalog, and thus all institute publications, have been integrated into the online Berlin-Brandenburg Union Catalog (KOBV).

Since 2003, the Library feeds metadata of all researchers' publications into E-Doc. This is a centrally maintained server and portal for all publications of the Max Planck Society that was released in Fall 2002. It can be harvested systematically by search engines.

The aim, however, must be to provide both the scientific community and the public not only with metadata but with full text of articles produced.

Therefore, the Library took up digitalization in 2004.

As a pilot project, the Institute's serials published since 1965, *Studien und Berichte* and *Materialien aus der Bildungsforschung*, with a total of 173 volumes and 42,688 pages were digitized. The formats offered will facilitate smooth access both from within and outside high-performance networks.

A user interface was designed and programmed, and is now being tested; its release is projected for Spring 2005.

While continuing to digitize past publications, the Library intends to gradually include current research output of the Institute.

In this context, and in compliance with the "Berlin Declaration" of the Max Planck Society supporting the idea of Open Access, we have intensified efforts to share with the Institute's authors our knowledge of copyright regulations, of the *dos* and *don'ts* when signing contracts with publishers.

The newly acquired overhead scanner is also employed for electronic document delivery, and can be used by researchers for their own purposes as well.

To speed up electronic cataloguing of approximately 12,000 titles of the Library's collection, contained only in the card catalog of the Library so far—mainly publications of the 1960s and 1970s and grey literature from the former Documentation Unit of the Institute, but also rare titles

reaching back until 1691—, cataloguing of these titles was outsourced. The company, located in Hannover, upgrades our catalog online via remote data transmission and is scheduled to finish its work by the end of March 2005.

Last but not least, an audit of Library accounts was carried out in 2004. It went smoothly, as expected, and yielded good results: Only minor losses were registered and books believed to be lost were found again.

Information Processing Center

The Information Processing Center supports the projects and other service units at the Institute through its central facilities. Central servers are installed with Windows 2000/2003 or LINUX for dedicated purposes: internet/intranet servers, software server, etc. Five Windows 2000-cluster systems with big RAID storage installations provide the capacity (more than 10 Tbyte) for the central data management. Several powerful terminal servers establish a CITRIX server farm. They allow the user to run programs (SPSS, SAS, MAT-Lab, EQS, etc.) on the server CPUs from their own workstations (Windows or Apple PC) or the Internet. "Server-based computing" helps to overcome the constraints of the different workstations concerning CPU power and local storage.

The decentralized personal computing capacity comprises of about 300 Intel PCs and 150 Apple computers. Apple computers are running MacOS, Intel PCs are operating on Microsoft's Windows 2000 or Windows XP. A central backup service is provided for all data on cluster disks. A wide array of software is available for the desktop systems.

To provide the necessary security, a Cisco-PIX firewall system was installed which allows the failure of certain modules without a complete breakdown. Central virus scanner software—continuously updated via the internet—monitor all Intel and

Apple workstations to avoid data loss caused by viruses. The Local Area Network (LAN) integration of all desktop computers



provides access to central resources and cluster capacity. In 1998 the traditional standard- and thin-wire Ethernet was substituted by a new network based on fiber optic cable. At the end of 2004 the previous "fiber-to-desktop" solution of 10 Mbit/s was replaced by the "fiber-to-office" concept. Each office is now connected with 1,000 Mbit/s and here the change-over from fiber to four copper ports takes place by using a small Gigabit Ethernet Switch.

Since the Institute has installed a Funk-LAN, notebook users can connect to the internet wireless.

The Institute's connectivity to Wide Area Networks (internet, etc.) is provided via the Research Network (WIN) of German Telekom and the German Research Network Association (Deutsches Forschungsnetz [DFN]). Late in the year 2000, the GIGA-WIN (1 Gbit/s) was installed allowing the Institute to increase the use of high-speed connectivity.

The Center's services include:

- operating, optimizing, and developing the devices of the central cluster and network equipment;



- mending and updating Windows 2000 and XP operating systems;
- centralized printing capacity, including high-speed and color printers;
- LAN integration of desktop computers and the continuous enhancement of LAN facilities;
- national and international connectivity (Wide Area Network);
- internet services: E-mail, WWW, NEWS, FTP, and Telnet;
- maintenance and webmaster tasks of the Institute's internet and intranet servers;
- security measures;
- management of the central telephone system, including the voice-mail server;
- user support and trouble-shooting for Intel PCs and Apple computers;
- coordination and technical support for desktop computers and software;
- software acquisition.

The Center provides:

- general design and coordination of the Institute's information technology equipment;
- the documentation of data concerning the existing computer and network equipment;
- an overview of market developments;
- advice for the Institute's boards and departments;
- the promotion of new concepts for state-of-the-art computer equipment.



Appendix





Contents

- 1. Research Colloquia 2003-2004 303
- 2. Visiting Scientists 2003-2004 305
- 3. Other Professional Activities 2003-2004 306
- 4. Academic Degrees 2003-2004 310
- 5. Scientific and Professional Staff 2003-2004 312

1. Research Colloquia 2003–2004

Phillip L. Ackerman

Georgia Institute of Technology:
Adult intellectual development: Trait complexes
and knowledge structures, March 9

Andrey P. Anokhin

Washington University School of Medicine:
Genetics, brain, and human behavior: Experi-
mental approaches, May 25

Matthias Baer, Sonja Bischoff, &

Titus Guldemann

Pädagogische Hochschulen St. Gallen/
Rorschach und Zürich:
Adaptive Lehrkompetenz – Analyse von Struktur,
Veränderbarkeit und Wirkung handlungs-
steuernden Lehrerwissens, September 14

Fergus I. M. Craik

The Rotman Research Institute, Toronto:
Age-related decrements in memory and execu-
tive control: Locating the loss and lightening
the load, September 20

Lloyd Demetrius

Max Planck Institute for Molecular Genetics,
Berlin:
Mortality plateau and evolutionary entropy
January 13

Andrew J. Elliot

University of Rochester:
Approach and avoidance motivation in achieve-
ment situations, March 8

Christopher D. Frith

University College of London:
Neural hermeneutics: The biological basis of so-
cial interactions, February 10

David C. Geary

University of Missouri-Columbia:
The origin of mind: Evolution of brain, cogni-
tion, and general intelligence, November 1

Jarkko Hautamäki, Sirkku Kupiainen, &

Pekka Arinen

University of Helsinki:
The mastery of thinking and the perspective of
hope: The framework for assessing the learning-
to-learn in Finland, December 2

David A. Jaeger

College of William and Mary & IZA Bonn:
An empirical analysis of violence in the Pales-
tinian-Israeli conflict, March 19

Wolfgang Klimesch

Universität Salzburg:
Event-related EEG-Oscillations: Their meaning
for memory and cognitive performance,
November 16

Torkel Klingberg

Karolinska Institute, Stockholm: Computerized
training of working memory in children,
December 7

Avraham Kluger

The Hebrew University of Jerusalem:
Feedforward first, feedback later, September 7

Kai Konrad

Wissenschaftszentrum Berlin:
Education, preference on redistributive taxation
and confidence, December 17

Arthur F. Kramer

Beckman Institute and Department of Psychol-
ogy, University of Illinois:
Healthy body, healthy mind? The relationship
among fitness, cognition, brain structure and
function, February 17

Frauke Kreuter

University of California at Los Angeles:
Design effects in face-to-face surveys, August 2

Kevin F. Miller

University of Michigan:
Symbolic development in China and the U.S.:
Disentangling influences of culture, language,
and educational practices, November 10

Aljoscha Neubauer

Karl-Franzens-Universität Graz:
Die Biopsychologie der menschlichen Intelli-
genz, March 18

Marcel V. J. Veenman

Leiden University:
The nature of metacognitive skills: Their general
vs. domain-specific nature, their relation with
intelligence, and a developmental perspective,
March 4

Michael Waldmann

Universität Göttingen:
Causal models in learning, reasoning, and act-
ing, June 28

Brian Wansink

University of Illinois:
Mindless eating: Ubiquitous consumption cues
that unknowingly drive consumption intake,
July 19

Regina Werum

Emory University Atlanta:
Sectionalism and economic interests: Access to
vocational training in the U.S. South, 1920-
1937, March 25

2004

David P. Baker

Pennsylvania State University:
Are we getting smarter? Neuro-development,
institutionalization of schooling, and the demo-
graphy of fluid IQ 1900-2000, December 17

Eva L. Baker

National Center for Research on Evaluation,
Standards, and Student Testing (CREST), UCLA:
Policy and science in standard-based assess-
ment systems, March 20

Fredda Blanchard-Fields

Georgia Institute of Technology:
Social judgement biases: Developmental
dynamics, July 15

Lynn Prince Cooke

Nuffield College, Oxford:
The gendered division of domestic labor and
family outcomes, March 28

Helmut Fend

Universität Zürich:
Die LIFE-STUDIE: Lebensverläufe von der späten
Kindheit ins frühe Erwachsenenalter.
Probleme der Kontaktaufnahme mit Adoles-
zenten nach 20 Jahren—Methoden und erste
Ergebnisse, June 17

Vanessa Gash

Nuffield College, Oxford:
Bridge or trap? The transitions of atypical work-
ers to the standard employment contract in
Denmark, France and the United Kingdom,
December 12

Paul van Geert

University of Groningen:
Wobbles, humps and sudden jumps: A dynamic
systems view on transitions, variability and am-
biguity in development, October 7

Alexander Grob

Universität Bern:
Life markers and subjective well-being of people
from three generations—Indicators for the loose
coupling of individuals and socio-historical con-
text, October 28

Hendrik Jürges

Universität Mannheim:
The effect of central exit examinations on stu-
dent achievement: Quasi-experimental evidence
from TIMSS Germany, January 16

Michaela Kreyenfeld

Max Planck Institute for Demographic Research,
Rostock:
Family formation in times of social and eco-
nomic change: An analysis of the East German
cohort 1971, December 5

Peter Leathwood

Centre de Recherche NESTLE, Lausanne:
Optimising consumer appreciation of foods: An
industry view, January 20

Tanja van der Lippe

University of Utrecht:
Work-family balance in European countries,
June 20

Herbert W. Marsh

University of Western Sydney:
Self-concept: Theory, measurement, research
and practice, May 20

John W. Meyer

Stanford University:
Globalization: The expansion of higher educa-
tion, November 14

Harry O'Neil

University of Southern California:
Improving performance on high stakes tests:
Cognitive and motivational interventions,
March 20

Götz Rohwer

Ruhr-Universität Bochum:
Verweildauern und Übergangsraten bei
mehreren Folgezuständen, June 13

Richard Ryan

University of Rochester:
Basic psychological needs and their significance
across time, persons and cultures: A self-deter-
mination perspective, September 30

Carmi Schooler

National Institute of Mental Health, Bethesda,
MD:
Psychological effects on the elderly of environ-
mental complexity in work and leisure,
October 6

Paul M. Sniderman

Stanford University:
Muslims and multiculturalism in Western Eu-
rope: A clash of values, December 15

Viktor Steiner

German Institute for Economic Research, Berlin:
Cohort effects and the returns to education in
West Germany, May 9

Carola Suárez-Orozco &**Marcelo M. Suárez-Orozco**

Harvard University:
Immigration and education: The best of
times/the worst of times? June 23

2. Visiting Scientists 2003–2004

Lars Bäckman

Stockholm Gerontology Research Center, June 2004–August 2005

Matthias Baer-Heikkilä

Pädagogische Hochschule Zürich, March–April 2004

Nathan Berg

University of Texas at Dallas, June–July 2004

Gary Brase

University of Missouri–Columbia, July 2004

Gayle Christensen

Stanford University, October 2004–September 2005

Kai S. Cortina

University of Michigan, June, December 2004

Agneta Herlitz

Stockholm University, Juni 2004–August 2005

Hachiro Iwai

Kyoto University, March 2004–January 2005

Vered Kraus

University of Haifa, September 2004–June 2005

Jutta Kray

Universität des Saarlandes, August–September 2004

Frauke Kreuter

University of California at Los Angeles, July–August 2004

Bogdan Mach

Polish Academy of Sciences, February–July 2004

Herbert Marsh

University of Western Sidney, July 2004

Kevin Miller

University of Michigan, November 2004

Leo Montada

Universität Trier, September 2004

Sam Nelson

Yale University, June–August 2004

Simona Sacchi

Università degli Studi di Milano-Bicocca, June–August 2004

António Teiga Zilhão

Faculdade de Letras de Lisboa, October–December 2004

Helen Watt

University of Michigan, October 2004

Hans N. Weiler

Stanford University, August–October 2004

2004

David P. Baker

Pennsylvania State University, August 2003–May 2004

Rolf Becker

Technische Universität Dresden, August–October 2003

Fredda Blanchard-Fields

Georgia Institute of Technology, April–July 2003

Pavlo Blavatsky

CERGE-EI, Prague, February–March 2003

Maria Auxiliadora da Silva Campos Dessen

University of Brasilia, January–April 2003

Ed Elbers

University of Utrecht, January–August 2003

Helmut Fend

Universität Zürich, May–June 2003

Maarten van Ham

University of Amsterdam, July–August 2003

Joe Johnson

Indiana University, May–July 2003

Mary Luszcz

Flinders University, Australia, April–June 2003

Bogdan Mach

Polish Academy of Sciences, February–July 2003

Edouard Machery

Université de Paris-Sorbonne, October 2003–June 2004

Herbert W. Marsh

University of Western Sidney, May 2003

Patricia McManus

Indiana University, July 2003–July 2004

John Meyer

Stanford University, October–November 2003

Juan Rafael Morillas

Fundación Centro de Estudios Andaluces, Granada, August 2003

John R. Nesselroade

University of Virginia, January–May 2003

Manuel Miguel Ramos Álvarez

Universidad de Jaén, February 2003

Olga Rodríguez-Sierra

Universidas Nacional Autónoma de México
October 2002–January 2003

Paul M. Sniderman

Stanford University, December 2003

Denny Vågerö

Stockholm University, August 2003–August 2004

Szymon Wichary

Jagiellonian University, Cracow, March–May 2003

2003

3. Other Professional Activities 2003–2004

Claudia Artelt

- Expertise commissioned by the Federal Ministry of Education and Research "Fostering text and reading comprehension" (Editor).

Paul B. Baltes

- Academia Europaea (Election Committee, Section on Psychology and Behavioral Sciences; Member of Trust).
- Berlin-Brandenburgische Akademie der Wissenschaften (Vice-Chair, Working Group on Science History and Psychology History).
- US National Academy of Sciences and National Research Council (Member of Committee on Future Research in Cognitive Aging, 2002–2003, and of Committee on Assessing Behavioral and Social Science Research on Aging, 2004–).
- International University of Bremen (Member of Board of Governors).
- Jacobs Foundation (Member of Board of Trustees and Jacobs Family Council).
- Deutsche Akademie der Naturforscher Leopoldina (Vice-President).
- IPSEN Foundation, IPSEN Longevity Award (Member of Jury Selection).
- University of Konstanz, Center for Junior Research Fellows (Member of Kuratorium)

Jürgen Baumert

- German Children and Youth Foundation, Berlin (Member of Board of Trustees).
- (Member of Board of Trustees) Jacobs Foundation, Zurich, Switzerland (Member of Board of Trustees).
- Institute for Quality Development in the Education System of the *Laender* of the Federal Republic of Germany, Humboldt University, Berlin (Member of Board of Trustees).
- German Research Foundation (Member of Nomination Committee for the Gottfried Wilhelm Leibniz Award).
- Research Program "Professional Minds of Teachers. On the Development of Standards for Vocational Teachers", University of Fribourg, Switzerland (Member of Advisory Board).
- Quality Agency of the State Institute of School Education and Educational Research (ISB), Munich (Member of Board of Scientific Advisers).
- Interuniversity Center for Educational Research (ICO), Netherlands (Member of Review Committee).
- University of Twente, Institute for Behavioral Research (IBR) (Member of Board of Trustees).
- Action Program "New Paths in Teacher Training", Founders' Association of German Science, Bonn (Member of Board of Scientific Advisers).
- Educational Sciences at the Universities and Teacher Colleges of Baden-Wuerttemberg (Member and Vice-Chair of International Review Committee).
- Elite Network Bavaria (Chair of Review Committee).
- Educational Sciences at the Universities of Bavaria (Member of International Review Committee).
- German Research Foundation (Member and Chair of Advisory Board for the research funding initiative "Research groups in the field of empirical research on education").
- Leibniz Association (Member of Senate and Evaluation Committee).
- Internationale Grundschul-Lese-Untersuchung (IGLU)/Progress in International Reading Literacy Study (PIRLS) (Member of Advisory Board).
- Center for Research on Learning and Instruction, University of Erfurt (Member of Advisory Board).
- Psychologie in Erziehung und Unterricht (Member of Advisory Board).
- Schweizerische Zeitschrift für Bildungswissenschaften (Member of Advisory Board).
- BLK Pilot Program "Increasing Efficiency in Mathematics and Science Education" (SINUS) (Member of Advisory Board).

- Zeitschrift für Erziehungswissenschaft (Coeditor).
 - German Research Foundation (Member of Senate and Grants Committee).
 - Zeitschrift für Pädagogische Psychologie (Member of Advisory Board).
 - Center for School Research and Questions of Teacher Education, Martin Luther University of Halle-Wittenberg (Member of Advisory Board).
 - Waxmann Verlag, Reihe Pädagogische Psychologie und Entwicklungspsychologie (Member of Advisory Board).
 - Zeitschrift für Unterrichtswissenschaft (Coeditor).
- Felix Büchel**
- Economics of Education Review (Member of Editorial Board).
 - Verein für Socialpolitik, Sozialpolitischer Ausschuss (Member).
 - Verein für Socialpolitik, Bildungsökonomischer Ausschuss (Member).
 - Swiss National Science Foundation, National Research Programme No. 52: "Childhood, Youth and Intergenerational Relationships in a Changing Society" (Member of Steering Committee).
 - The Berlin-Brandenburg Economics Forum BBEF (Active Member).
 - Institute for the Study of Labor IZA, Bonn (Research Fellow).
 - Swiss Household Panel SHP (Member of Scientific Advisory Board).
- Wolfgang Edelstein**
- Institut für angewandte Familien-, Kindheits- und Jugendforschung e.V., Potsdam (Member of Board of Scientific Advisers).
 - Stiftung "Brandenburger Tor der Bankgesellschaft Berlin" (Member of Board of Scientific Advisers, responsible for Program "Youth Takes Responsibility").
 - Heinrich-Böll-Stiftung (Member of Commission for the Future of Education).
 - BLK Program "Demokratie lernen & leben" (Member of Steering Committee).
 - Irmgard-Coninx-Stiftung (Member of Advisory Council).
 - Beiträge zur Soziogenese der Handlungsfähigkeit, Series with Suhrkamp Verlag, Frankfurt a.M. (Editor).
 - Social Justice Research, New York (Member of Editorial Board).
 - New Directions for Youth Development, New York (Member of Editorial Board).
 - Kulturstiftung der Länder, Program "Kinder zum Olymp" (Member of Board of Trustees).
- Gerd Gigerenzer**
- Berlin-Brandenburgische Akademie der Wissenschaften (Member).
 - Deutsche Akademie der Naturforscher Leopoldina (Fellow).
 - Theory and Psychology (Coeditor).
 - Journal of Behavioral Decision Making (Editorial Board).
 - Evolution and Human Behavior (Editorial Board).
 - Summer Institute on Bounded Rationality in Psychology and Economics (Codirector).
 - Annual Conference of the Cognitive Science Society (Program Committee).
 - Winter Institute on Bounded Rationality in Psychology and Management, Indian Institute of Management, Bangalore, India (Coorganizer)
 - British Medical Journal (Advisory Committee Member)
 - Organizational Behavior and Human Decision Process (Editorial Board)
- Erika M. Hoerning**
- International Yearbook of Oral History and Life Stories (Coeditor).
 - Oral History Association, USA (Corresponding Member).
 - BIOS, Zeitschrift für Biographieforschung und Oral History (Coeditor).
- Ulrich Hoffrage**
- Memory, Special Issue "Hindsight Bias" (Coeditor).
 - Zeitschrift für ärztliche Fortbildung und Qualitätssicherung (Advisory Board).
- John M. C. Hutchinson**
- Animal Behavior (Consulting Editor).
 - Folia Malacologica (Advisory Board).

- Konstantinos Katsikopoulos** – IEEE Transactions on Systems, Man, and Cybernetics (Associate Editor).
- Monika Keller**
- Jean Piaget Society for the Development of Knowledge (Member of Board of Directors).
 - Zeitschrift für Ethik und Sozialwissenschaften (Editorial Board).
 - Child Development (Consulting Editor).
- Gero Lenhardt**
- Educação & Sociedade (Editorial Board).
- Shu-Chen Li**
- Neuroscience and Biobehavioral Reviews (Consulting Editor).
- Karl Ulrich Mayer**
- American Association for the Advancement of Science (AAAS) Fellow.
 - Jacobs Center for Productive Youth Development, Universität Zürich (Member of Advisory Board).
 - Graduate School of Social Sciences (GSSS) Bremen (Member of Advisory Board).
 - American Academy of Arts and Sciences (Member).
 - Austrian Academy of Sciences (Chair of Review Committee of the Social Science Institute).
 - Berlin-Brandenburgische Akademie der Wissenschaften (Member).
 - Berliner Journal für Sozialforschung (Editorial Board).
 - British Academy of Sciences (Corresponding Fellow).
 - Center for Research on Inequalities and the Life Course-CIQLE, Yale University.
 - Deutsche Akademie der Naturforscher Leopoldina (Member).
 - Deutsche Gesellschaft für Soziologie (Member of the Board).
 - Deutsches Institut für Wirtschaftsforschung (Member of Advisory Board).
 - European Academy of Sociology (Founding Member).
 - European Academy of Sciences (Member).
 - Kölner Zeitschrift für Soziologie und Sozialpsychologie (Coeditor).
 - Max-Planck-Institut für demografische Forschung (Member of Board of Scientific Advisers).
 - Sozio-ökonomisches Panel (Member of Advisory Board).
 - Stiftung Hanse-Wissenschaftskolleg, Delmenhorst (Member of Advisory Board).
 - Swedish Level of Living Survey (Member of Review Committee).
- Antje Mertens**
- Hans-Böckler-Stiftung, Project "Temporary work and fixed-term contracts" (Member of Advisory Board).
 - Network on Low Wage Employment (LoWER) (Member).
- Jacqui Smith**
- Academia Europaea (Member).
 - Journal of Gerontology: Psychological Sciences (Member of Editorial Board).
 - Berlin Aging Study (BASE) (Steering Committee).
 - Graduate Program Free University of Berlin "Neuropsychiatry and Psychology of Aging" (Steering Committee).
 - English Longitudinal Study (ELSA) (Member of Advisory Board).
 - Survey of Older Adults in Germany (Member of Advisory Board).
 - China Healthy Longevity Study (Research Consultant).
 - Norwegian Longitudinal and Cohort Study of Aging (Research Consultant).
 - Max Planck International Research Network on Aging (Deputy Director)
 - Max Planck Society (Institute Scientific Staff Representative in the Human Sciences Section)
 - Max Planck Society (Scientific Staff Representative of the Human Sciences Section in the Inter-Sectional Committee)

- Heike Solga**
- "Die Junge Akademie" an der Berlin-Brandenburgischen Akademie der Wissenschaften und der Deutschen Akademie der Naturforscher Leopoldina (Member).
 - ALLBUS (Member of Scientific Advisory Board).
 - Council of Social and Economic Data (Vice-Chairperson).
 - Koelner Zeitschrift fuer Soziologie und Sozialpsychologie (Editor).
 - Deutsche Gesellschaft für Soziologie (Member of Council).
- Elsbeth Stern**
- Academy of Finland (Board of Reviewers for Educational Research).
 - Zeitschrift für Pädagogische Psychologie (Member of Editorial Board).
 - Deutsches Institut für Internationale Pädagogische Forschung (Member of Evaluation Group).
 - Microsoft-Stiftung "Wissenswert" (Member of Scientific Board).
 - Max Planck Society, Working Committee for the Advancement of Women in Science (Vice-Chair).
- Masanori Takezawa**
- 16th Annual Meeting of the Human Behavior and Evolution Society (HBES) 2004 (Member of Program Committee).
- Peter M. Todd**
- Adaptive Behavior, MIT Press (Editor-in-Chief).
 - Winter Institute on Bounded Rationality in Psychology and Management, Indian Institute of Management, Bangalore, India (Coorganizer).
 - 16th Annual Meeting of the Human Behavior and Evolution Society (HBES) 2004 (Head of Program Committee).
- Andreas Wilke**
- 16th Annual Meeting of the Human Behavior and Evolution Society (HBES) 2004 (Member of Program Committee).

4. Academic Degrees 2003–2004

Habilitations

Hertwig, R. (2003). Unbinding bounded rationality: Theoretical, empirical, and methodological investigations. Freie Universität Berlin.

Krampe, R. (2003). Die Rolle persönlicher Ziele für die Entwicklung. Universität Potsdam.

Solga, H. (2003). Ohne Abschluss in die Bildungsgesellschaft. Die Erwerbschancen gering qualifizierter Personen aus soziologischer und ökonomischer Perspektive. Freie Universität Berlin.

Doctoral Dissertations

Bondar, A. (2003). Balance and cognition: Resource allocation and its control in young and older adults. Freie Universität Berlin.

Chang, P.-H. (2004). Transformation of vocational secondary schools: A study of the vocational Gymnasium in Germany. Freie Universität Berlin.

Gerstorff, D. (2004). Heterogeneity and differential development in old age: A systemic-wholistic approach. Freie Universität Berlin.

Hanoch, Y. (2003). Emotions and bounded rationality: The role of emotions in the decision-making process. University of Haifa.

Hoppmann, C. (2004). Interpersonal contributions to the pursuit of work- and family-related goals in middle adulthood. Freie Universität Berlin.

Jacob, M. (2003). Ausmaß, Strukturen und Ursachen von Mehrfachausbildungen. Eine Analyse von Ausbildungsverläufen in den achtziger und neunziger Jahren in Westdeutschland. Freie Universität Berlin.

Jopp, D. (2003). Erfolgreiches Altern: Zum funktionalen Zusammenspiel von personalen Ressourcen und adaptiven Strategien des Lebensmanagements. Freie Universität Berlin.

Kunter, M. (2004). Multiple Ziele im Mathematikunterricht. Freie Universität Berlin.

Kurzenhäuser, S. (2003). Natural frequencies in medical risk communication: Applications of a simple mental tool to improve statistical thinking in physicians and patients. Freie Universität Berlin.

LiBmann, I. (2003). Intraindividuelle Veränderungen von Extraversion und Neurotizismus im hohen Alter: Die Bedeutung sensorischer Beeinträchtigung. Freie Universität Berlin.

Lüdtke, O. (2004). Persönliche Ziele im frühen Erwachsenenalter. Freie Universität Berlin

Pollmann-Schult, M. (2003). Unterwertige Beschäftigung im Berufsverlauf. Eine Längsschnitt-

untersuchung für Nicht-Akademiker in Westdeutschland. Freie Universität Berlin.

Powell, J. (2004). Barriers to inclusion: The institutionalization of special education in Germany and the United States. Freie Universität Berlin.

Rapp, M. (2003). Dual-task performance in memory and balance: The role of aging and Alzheimer's disease. Freie Universität Berlin.

Reimer, M. (2004). Autobiografisches Gedächtnis und retrospektive Datenerhebung: Die Rekonstruktion und Validität von Lebensverläufen. Freie Universität Berlin.

Rusconi, A. (2003). Leaving the parental home in Italy and West Germany: Opportunities and constraints. Freie Universität Berlin.

Schmiedek, F. (2003). The structure of cognitive abilities in old and very old age: On the importance of specific group factors in a dedifferentiated factor space. Freie Universität Berlin.

Seibert, H. (2004). Integration durch Ausbildung? Berufliche Platzierung ausländischer Ausbildungsabsolventen der Geburtsjahrgänge 1960 bis 1971. Freie Universität Berlin.

Wagner, S. J. (2004). Jugendliche ohne Berufsausbildung. Konsequenzen der Bildungsexpansion für die sozialstrukturelle Zusammensetzung der Gruppe ausbildungsloser Jugendlicher in der Bundesrepublik Deutschland nach 1949. Freie Universität Berlin.

Wallin, A. (2003). Explaining everyday problem solving, Lund University (Sweden).

Wirth, J. (2003). Selbstreguliertes Lernen in dynamischen Systemen. Humboldt-Universität zu Berlin.

Wolf, R. (2003). Soziale Vergleiche beim Übergang von der Schule in den Beruf. Freie Universität Berlin.

Master's and Diploma Theses

- Aschenberger, D.** (2003). Anwendung der Theorie des geplanten Verhaltens auf die Studierneigung – Eine Untersuchung bei Abiturientinnen und Abiturienten an allgemein bildenden und beruflichen Gymnasien. Freie Universität Berlin.
- Becker, M.** (2003). Bildungsexpansion und ihre Folgen: Intelligenz- und mathematische Schulleistungsentwicklung in Nordrhein-Westfalen und Hessen zwischen 1964 und 1997. Freie Universität Berlin.
- Burkett, S.** (2003). Planungsprozesse bei körperlicher Aktivität: Ausführungs- und Bewältigungsplanung und das Alter. Freie Universität Berlin.
- Fleischer, J.** (2003). Bildungsentscheidungen und Kompetenzerwerb—Der Einfluss familiärer Umwelten. Freie Universität Berlin.
- Fleischhauer, C.** (2004). Altersunterschiede in Metakognition: Effekt von Training auf subjektive Gedächtnis- und Gleichgewichtsleistung. Freie Universität Berlin.
- Gleibs, I. H.** (2003). Nationale Identität 14-jähriger Jugendlicher in Deutschland und Italien. Ergebnisse aus dem Civic-Education-Projekt der IEA. Freie Universität Berlin.
- Guzmán, C.** (2004). Testcoaching für eine Schulleistungstudie: Motivationale Effekte. Freie Universität Berlin.
- Klusmann, U.** (2003). Lebensziele junger Erwachsener und ihre Bedeutung für das subjektive Wohlbefinden: Validierung einer deutschen Version des Aspiration Index. Freie Universität Berlin.
- Kotter, D.** (2004). Alterszufriedenheit: Altersbedingte Unterschiede, zeitbedingte Veränderungen und prädiktive Variablen bei 70+Jährigen. Technische Universität Dresden.
- Kuppe, F.** (2004). Subjektives Altersbild: Altersbezogene Unterschiede und Veränderungen im hohen Alter. Universität Leipzig.
- Leucht, M.** (2003). Validierung eines Instrumentes zur Erfassung von Englischleistungen in Schulleistungsstudien. Freie Universität Berlin.
- Liebeskind, U.** (2003). Einkommen von Männern und Frauen in Deutschland: Zum Zusammenhang von Arbeitsmarktsegregation und Einkommensungleichheit. Universität Leipzig.
- Mayser, S.** (2004). (Un)Erreichbar fern: Ein Vergleich persönlicher Ziele und Sehnsüchte. Humboldt-Universität zu Berlin.
- Pfahl, L.** (2003). Stigma-Management im Job-Coaching—Berufsorientierungen benachteiligter Jugendlicher. Freie Universität Berlin.
- Rauers, A.** (2004). Dyadische Ziele in Partnerschaften: Die Adaptivität koordinierter Selektion. Freie Universität Berlin.
- Schepers, A.** (2004). Die Bedeutung von Kontextfaktoren bei der Wahrnehmung von Studiengängen: Eine Untersuchung an allgemein bildenden und beruflichen Gymnasien in Baden-Württemberg. Humboldt-Universität zu Berlin.
- Stadelhofer, B.** (2003). Concept Maps als Unterstützung beim Lernen aus Texten: Der Einfluss der Eigenaktivität. Technische Universität Berlin.
- Winkelmann, H.** (2004). Prädiktoren differenziellen Teilnahmeverhaltens in Längsschnittstudien—Eine Untersuchung der Panelmortalität in der TOSCA-Studie. Freie Universität Berlin.
- Wittig, J.** (2004). To give or not to give: Group negotiations about sharing from a developmental perspective. Humboldt-Universität zu Berlin

5. Scientific and Professional Staff 2003–2004

Artelt, Cordula (Dr. phil. in Psychology, 1999, Universität Potsdam): Research in learning (learning strategies and metacognition); reading; cognitive development.

Assmann, Wolfgang (Head of Information Processing Center): Service management in research institutions; information technology in the social and behavioral sciences.

Baltes, Paul B. (Dr. phil. in Psychology, 1967, Universität des Saarlandes; Fellow of the Max Planck Society; Co-director of the Institute; as of July 2004: Director, MaxnetAging; Professor of Psychology, Freie Universität Berlin; as of November 2004: Distinguished Professor of Psychology, and Permanent Fellow at the Shannon Center for Advanced Study, University of Virginia [part-time]): Lifespan human development: Evolution and ontogenesis; aging of the mind (intelligence, memory, personality, wisdom); theory of successful development; science policy: interdisciplinarity, history, and internationality.

Baumert, Jürgen (State Examination for Teachers, 1968, Hamburg; Dr. phil., 1968, Universität Tübingen; Habilitation in Educational Science, 1982, Freie Universität Berlin; Fellow of the Max Planck Society; Co-director of the Institute; Professor of Educational Sciences, Freie Universität Berlin and Humboldt-Universität zu Berlin): Research on learning and instruction; development of cognition and motivation during adolescence; large-scale assessment and international comparison; dynamics of institutional change.

Baumgarten, Jürgen (Dr. phil. in German Language and Literature, 1973, Freie Universität Berlin; Head of the Editorial and Publications Unit): Prehistory of the Middle East; neolithization; nomadic cultures.

Büchel, Felix (Dr. rer. pol. in Political Science, 1991, Freie Universität Berlin; Habilitation in Economics, 1998, Technische Universität Berlin; Honorary Professor of Sociology, Freie Universität Berlin; Senior Lecturer of Economics, Technische Universität Berlin; Research Professor, DIW Berlin; Senior Research Scientist): Economics of education; labor-market research; social policy research (deceased July 2004).

Czienskowski, Uwe (Dr. phil. in Psychology, 1995, Freie Universität Berlin): Scientific software development (resource distribution in social networks; feature-pattern analysis; computer-based scientific research); modeling and simulation; self-

reference effect; meta-analysis; experimental design and analysis; philosophy of psychology (mind and consciousness).

Delius, Julia (Dr. med. in Medicine, 1993, Universität Frankfurt a.M.): Coordination of the International Max Planck Research School (LIFE); interdisciplinary gerontology in the context of the Berlin Aging Study (BASE); BASE Website design and management; coordination of conferences and meetings; editorial projects.

Dieckmann, Anja (Dipl.-Psych., 1999, Universität Würzburg): Medical decision making; food choice; experimental investigation of people's use of simple heuristics; animal numerical competence.

Engelhardt, Nicole (MA in Cultural Anthropology, 2001, Universität zu Köln; Wissenschaftliche Dokumentarin/Information Specialist, Fachhochschule Potsdam, 2003; Subject Librarian): Scientific electronic information systems, classification, bibliometrics.

Flitner, Ursula (MA in American Studies and German Literature, 1991, Freie Universität Berlin; State Examination in Library and Information Science, 1995, Senatsverwaltung für Kulturelle Angelegenheiten Berlin/Köln; Head of the Library and Information Research Unit): Information management; electronic resources and networked information systems; human resources development.

Gigerenzer, Gerd (Dr. phil. in Psychology, 1977, Universität München; Habilitation in Psychology, 1982, Universität München; Fellow of the Max Planck Society; Co-director of the Institute; Professor of Psychology, Freie Universität Berlin): Models of bounded rationality; social intelligence; ecological rationality; heuristics of scientific discovery; philosophy, history, and methodology of social sciences.

Goedicke, Anne (Dipl.-Soz., 1996, Humboldt-Universität zu Berlin; Dr. phil. in Sociology, 2001, Freie Universität Berlin): Social stratification and formal organizations; transformation of former socialist countries; life course; social mobility; labor markets, firms, and occupations (as of 2003: Universität Duisburg).

Grund, Peter (Dipl.-Inform., 1981, Technische Universität Berlin): Statistical software and database management systems.

Hardy, Ilonca (PhD in Educational Psychology, 1998, University of Iowa): Learning environments

incorporating the social character of cognition (emphasis: collaborative learning); the role of language in problem solving; effects and uses of external representations.

Hartung, Dirk (Dr. rer. pol. in Sociology, 1973, Universität Bremen): Educational training and employment; Chairperson of the Works Council of the Max Planck Society (on leave from the Center for Sociology and the Study of the Life Course).

Hertwig, Ralph (Dr. rer. soc. in Psychology, 1995, Universität Konstanz): Decision making under risk; simple heuristics for resource allocation (parental investment), estimation, and judgments of risk (e.g., health risks); methodology of social science (as of 2003: Universität Basel).

Hillmert, Steffen (Dipl.-Soz., 1996, Universität Bamberg; Dr. phil. in Sociology, 2000, Freie Universität Berlin): Life courses and institutional change; comparative studies; education and training; occupational careers; research methods.

Hoernig, Erika M. (Dr. rer. pol. in Sociology, 1977, Freie Universität Berlin; Habilitation in Sociology of Education, 1994, Universität Bremen; Venia Legendi in Sociology of Education, 1995, Freie Universität Berlin): Biographical and life-course research; qualitative methods; historical generations and social change; professions, intelligentsia, and intellectuals.

Hoffrage, Ulrich (Dr. phil. in Psychology, 1995, Universität Salzburg; Habilitation in Psychology, 2001, Freie Universität Berlin): Risk communication, in particular, Bayesian inference and the impact of external representations of information; models of cognitive processes underlying choices and probability judgments; analytical study of simple heuristics; models of cognitive processes in hindsight bias and the reiteration effect, and the co-occurrence of both effects (as of 2004: University of Lausanne).

Hutchinson, John M. C. (DPhil in Biology, 1990, University of York): Behavioral ecology and optimality modeling; rules of thumb in animals and plants (e.g., weather prediction); spatial decisions in biology and the social sciences; daily routines: the dawn chorus of birds; skylark behavior and morphology; sexual selection of slug genitalia; theoretical morphology.

Katsikopoulos, Konstantinos (PhD in Human Factors, 1999, University of Massachusetts): Mathematical analyses of the ecological rationality of simple heuristics; simple descriptive models of human choice and their relation to normative models.

Keller, Monika (Dr. phil. in Psychology, 1974, Universität Heidelberg; Habilitation in Psychology, 1994, Freie Universität Berlin): Development in cultural context; social and moral development and emotions in cultural context; social perspective taking, theory of mind, and domains of social and moral reasoning; social rationality: contracts and emotions in cheating detection; social and moral education in nursery school and in school.

Köhler, Helmut (Dr. phil. in Educational Economics, 1975, Technische Universität Berlin): Statistical analysis of educational development; social background and educational careers; national and international education indicators; research on school statistics of the GDR.

Körner, Nina (Second State Examination in Law, 1973, Universität Hamburg; Head Administrator of the Institute).

Krampe, Ralf T. (Dr. phil. in Psychology, 1992, Freie Universität Berlin): Sensorimotor functions and aging; acquisition and maintenance of expertise; movement, timing, and coordination; cognitive aging; interindividual differences in learning and motivation (as of 2004: University of Leuven).

Krauss, Stefan (First State Examination in Mathematics and Physics, 1995, Universität Erlangen-Nürnberg; Dr. phil. in Psychology, 2001, Freie Universität Berlin): Research on teaching and learning; didactics of mathematics, especially didactics of statistics; probabilistic reasoning (Bayesian inferences).

Kunter, Mareike (Dipl.-Psych., 1999, Julius-Maximilians-Universität Würzburg); Dr. phil. in Psychology, 2004, Freie Universität Berlin): Research in instruction and learning; multiple educational objectives; motivational processes in the classroom; assessment of instructional processes; mathematics education.

Kunzmann, Ute (Dr. phil. in Psychology, 1998, Freie Universität Berlin): Wisdom and other pragmatic forms of cognition; emotional competencies (emotional reactivity, regulation, and understanding); lifespan developmental psychology (as of 2004: Internationale Universität Bremen).

Lange, Lydia (Dr. phil. in Social Psychology, 1966, Universität Jena; Dr. sc. phil. [habil.] in Methods of Empirical Social Research, 1986, Humboldt-Universität zu Berlin): Bibliometrics; history of psychology.

Lenhardt, Gero (Dr. rer. soc. in Sociology, 1974, Universität Konstanz; Habilitation in Sociology, 1983, Universität Frankfurt a.M.): Sociology of education, work, and development; sociology of higher education; sociology of minority groups.

Li, Shu-Chen (PhD in Psychology, 1994, University of Oklahoma): Cognitive and neurocognitive development through the lifespan; behavioral and neurocognitive dynamics of intraindividual processes and between-person interactions; neurocomputational and cognitive models of lifespan cognitive development; mechanisms and processes for reciprocal interactive biocultural influences on lifespan development; theoretical studies of computational complexity.

Lindenberger, Ulman (Dr. phil. in Psychology, 1990, Freie Universität Berlin; Habilitation in Psychology, 1998, Freie Universität Berlin; Fellow of the Max Planck Society; Co-director of the Institute; Honorary Professor of Psychology, Universität des Saarlandes, Freie Universität Berlin, and Humboldt-Universität zu Berlin): Lifespan psychology; Theories and methods; behavioral plasticity and its neural correlates in childhood and old age; sensorimotor and cognitive development; multivariate measurement of change and variability.

Lövdén, Martin (BA in Psychology, 1998, Lund University, Sweden; PhD in Psychology, 2002, Stockholm University, Sweden): Cognitive aging; the sensorimotor-cognition interaction; the lifestyle-cognition interaction; the episodic memory-knowledge interaction; spatial navigation; methodological interests: Methods for analyzing longitudinal data; structural equation modeling; pattern-oriented analyses.

Lüdtke, Oliver (Dipl.-Psych., 2000, Freie Universität Berlin; Dr. phil. in Psychology, 2004, Freie Universität Berlin): Research in teaching and learning; quantitative methods in empirical research; personal goals.

McGinnity, Frances (MSc in Sociology, 1995, London School of Economics; DPhil in Sociology, 2001, Oxford University): Unemployment: Financial and psychological consequences; active labor-market policy; comparative social research; labor-market transitions; temporary employment (as of 2004: Economic and Social Research Institute, Dublin).

Martignon, Laura (Dr. rer. nat. in Mathematics, 1978, Universität Tübingen; Habilitation in Neuroinformatics, 1998, Universität Ulm): Simple heuristics vs. complex decision machines; analysis of lexicographic algorithms for comparison, estimation, and categorization tasks; detection and meas-

urement of higher-order correlations in non-linear environments; Bayesian strategies for statistical inference and machine learning, compared to fast and frugal algorithms for human adaptive behavior; model search in the Bayesian framework; the didactics of Bayesian reasoning based on adequate information formats; stochastics and probability in general (as of 2003: Pädagogische Hochschule Ludwigsburg).

Matthes, Britta (Dipl.-Soz., 1995, Universität Leipzig; Dr. phil. in Sociology, 2002, Freie Universität Berlin): Life courses in transformation processes; labor-market entry in international comparisons; methods of life-course research.

Mayer, Karl Ulrich (Dr. rer. soc., 1973, Universität Konstanz; Habilitation in Sociology, 1977, Universität Mannheim; Fellow of the Max Planck Society; Co-director of the Institute; Honorary Professor of Sociology, Freie Universität Berlin; Professor of Sociology, Yale University): Social stratification and mobility; comparative analysis of social structure; sociology of the life course; occupational structures and labor-market processes.

Mertens, Antje (Dr. rer. pol. in Economics, 1998, Humboldt-Universität zu Berlin): Empirical labor economics, especially labor mobility, training, and wages.

Müller, Viktor (Dr. rer. soc., 1996, Universität Tübingen): Lifespan psychology and aging mechanisms; psychophysiology of social interactions; complexity and brain dynamics; cortical synchronization: local and global networks.

Oesterreich, Detlef (Dipl.-Psych., 1968, Freie Universität Berlin; Dr. phil. in Psychology, 1975, Freie Universität Berlin): Theory of authoritarianism, authoritarianism and political consciousness; civic education of adolescents.

Pollmann-Schult, Matthias (Dipl.-Soz., 2000, Freie Universität Berlin; Dr. phil. in Sociology, 2003, Freie Universität Berlin): Labor-market research; social inequality; social stratification (as of 2004: Universität Bielefeld).

Reimer, Maïke (Dipl.-Psych., 2000, Freie Universität Berlin; Dr. phil., 2004, Freie Universität Berlin): Autobiographical memory; cognitive aspects of survey methodology; individual biographies in institutional contexts (as of 2005: Bavarian State Institute for Research in Higher Education).

Riediger, Michaela (Dipl.-Psych., 1997, Humboldt-Universität zu Berlin; Dr. phil. in Psychology, 2001, Freie Universität Berlin): Lifespan developmental

psychology; future-orientation, motivation, and volition: functions and development; social aspects of motivational processes.

Rieskamp, Jörg (Dipl.-Psych., 1998, Technische Universität Berlin; Dr. phil. in Psychology, 2001, Freie Universität Berlin): Cognitive modeling of judgment and decision making; the role of learning in decision making; experimental examinations and evolutionary simulations of simple strategies for social interactions.

Rochow, Thomas (Dipl.-Kfm., 1986, in Betriebswirtschaftslehre, Technische Universität Berlin): Statistics (descriptive statistics, time series analysis, longitudinal analyses); school statistics (indicators, developments); mathematics (understanding and comprehension).

Rötger, Antonia (Dipl.-Phys., 1989, Universität Karlsruhe; Docteur ès Sciences de l'Université Joseph Fourier de Grenoble, 1993; science communication): Behavioral sciences; neuroscience and mathematical modeling of complex systems.

Rusconi, Alessandra (Dipl.-Pol., 1997, Università degli studi di Firenze; Dr. phil. in Sociology, 2003, Freie Universität Berlin): Demographic transformation in East Germany; German-Italian comparison in the life courses of young adults (as of 2004: Universität Bremen).

Schmiedek, Florian (Dipl.-Psych., 2000, Universität Mannheim; Dr. phil. in Psychology, 2003, Freie Universität Berlin): Cognitive lifespan psychology; intraindividual variability; model-based analyses of reaction time distributions; multivariate modeling of cognitive developmental processes; typical intellectual engagement; structural equation modeling, latent growth modeling, time series analysis; item response theory.

Schooler, Lael (PhD in Cognitive Psychology, 1993, Carnegie Mellon University): Adaptation of human memory to the statistical structure of the environment; computational models of human memory; memory's role in judgment and decision making.

Schümer, Gundel (First and Second State Examination for Teachers, 1962, Stuttgart; 1970, Tübingen; Dr. phil. in Educational Science, 1977, Universität Hamburg): School systems and instruction; theories of instruction and methods of instructional research; comparative research on schools and instruction; the language of the classroom.

Seibert, Holger (MA in Sociology, 2000, Universität Rostock; Dr. phil. in Sociology, 2004, Freie Universität Berlin): Education, training, and labor-market entry; unemployment in early adulthood;

ethnic minorities and migration (as of 2005: Institute for Labor Market and Employment Research, Berlin-Brandenburg).

Singer, Tania (Dr. phil. in Psychology, 2000, Freie Universität Berlin): Lifespan psychology; cognition and aging; longitudinal research (as of 2003: Wellcome Dept. of Imaging Neuroscience, London).

Smith, Jacqui (PhD in Psychology, 1984, Macquarie University, Sydney; Habilitation in Psychology, 1999, Freie Universität Berlin; Honorary Professor of Psychology, 2003, Freie Universität Berlin; Deputy Director, MaxnetAging; Senior Research Scientist): Profiles of psychological functioning in the old and oldest-old; psychological predictors of longevity; potentials and risks for development and successful aging; application of intelligence and life knowledge during adulthood.

Solga, Heike (Dr. phil. in Sociology, 1994, Freie Universität Berlin; Head of the Independent Research Group Lack of Training: Employment and Life Chances of the Less Educated): Social stratification; social mobility; life course; labor-market research (as of 2004: Universität Leipzig).

Stanat, Petra (Dipl.-Psych., 1992, Freie Universität Berlin; PhD in Psychology, 1998, University of Massachusetts at Amherst): Conditions of immigrant students' school success; international and comparative educational research; gender differences in school performance; social competence.

Stern, Elsbeth (Dipl.-Psych., 1982, Universität Hamburg; Dr. phil. in Psychology, 1986, Universität Hamburg; Habilitation in Psychology, 1994, Universität München; Univ.-Prof. 1994, Universität Leipzig; Senior Research Scientist): Cognitive development; intelligence and knowledge; research in teaching and learning.

Todd, Peter M. (PhD in Psychology, 1992, Stanford University; Senior Research Scientist): Evolution of behavior (computer simulations of populations of simple organisms adapting to different environmental structures, both physical and social); simple heuristics for sequential search (including mate choice), categorization (including intention-from-motion), and multi-step processes (including parental investment); psychological selection; rhythmic and time-based behavior (including music, sequence learning/production, and evolution of song); connectionist models of cognition.

Trappe, Heike (Dr. phil. in Sociology, 1994, Freie Universität Berlin): Gender and social inequality; life-course and labor-market research; life courses and institutional change; work-family research.

Trautwein, Ulrich (Dipl.-Psych., 1999, Universität Göttingen; Dr. phil. in Psychology, 2002, Freie Universität Berlin): Development of self-related cognitions in educational settings; school development and management; effects of homework assignment on academic achievement.

Watermann, Rainer (Dipl.-Päd., 1996, Universität Münster; Dr. phil. in Educational Science, 2002, Freie Universität Berlin): International and comparative educational research; quantitative methods of social research; political socialization.

Emeritus Members of the Max Planck Society

Edelstein, Wolfgang (Dr. phil. in Medieval Studies, 1962, Universität Heidelberg; Fellow of the Max Planck Society; until 1997 Co-director of the Institute; Honorary Doctorate in Social Science, University of Iceland; Honorary Professor of Educational Science, Freie Universität Berlin and Universität Potsdam): Development and socialization; social-cognitive and moral development; developmental and structural aspects of curriculum and instruction; developmental and school-related

conditions of successful learning; conditions of successful school transformation.

Roeder, Peter M. (Dr. phil., 1960, Universität Marburg; Habilitation in Educational Science, 1966, Universität Marburg; Fellow of the Max Planck Society; until 1995 Co-director of the Institute; Special Professor of Educational Science, Freie Universität Berlin): Educational science; school research; history of educational science.

Postdoctoral Research Fellows

Bennis, Will (PhD in Psychology, 2004, University of Chicago): Cultural, subcultural, & environmental relationship to decision processes and their evaluation; gamblers' judgment and decision making processes.

Bondar, Albina (Dipl.-Psych., 1999, Freie Universität Berlin; Dr. phil. in Psychology, 2003, Freie Universität Berlin): Balance and cognition: resource allocation and dual-task costs in young and old adults.

Brighton, Henry J. (PhD in Cognitive Science, 2003, The University of Edinburgh): Machine learning and AI; complex systems and the modeling of culture; foundations and philosophy of cognitive science; computational modeling of the evolution of language; language as an evolutionary system.

Ebner, Natalie C. (Dipl.-Psych., 2001, Freie Universität Berlin): Processes of developmental regulation; future-oriented motivation across the lifespan; multi-method approach to personal goals; physical activity as lifestyle over the lifespan.

Fasolo, Barbara (PhD in Social Psychology, 2002, University of Colorado, Boulder): Judgment and decision making (as of 2004: London School of Economics).

Gash, Vanessa (MSc in Sociology, 1997, University College Dublin; DPhil in Sociology, 2004, Nuffield

College, Oxford University): Temporary employment; part-time employment and female labor-market integration; comparative labor-market research.

Gerstorff, Denis (Dipl.-Psych., 2001, Freie Universität Berlin; Dr. phil. in Psychology, 2004, Freie Universität Berlin): Psychological predictors of longevity; profiles of psychological functioning in the old and oldest-old; cohort differences in levels of functioning; examine intraindividual fluctuations in psychological functioning as a tool to better understand lifespan development.

Kurzenhäuser, Stephanie (Dipl.-Psych., 1999, Universität Heidelberg; Dr. phil. in Psychology, 2003, Freie Universität Berlin): The impact of external representations on statistical thinking, especially Bayesian reasoning; legal and political implications of bounded rationality; communication of uncertainty and risk in medicine (as of 2004: Universität Basel).

Luan, Shenghua (PhD in Psychology, 2004, University of Florida): Applied signal detection theory; information integration and advice-taking behaviors; group decision processes; simple heuristics for individual and group decision making.

Morillas Martínéz, Juan Rafael (DPhil in Sociology, 2002, Nuffield College, Oxford University; PhD in Social Sciences, 2002, Center for the Advanced Study in the Social Sciences, Juan March Institute,

Madrid): Social and economic stratification and mobility.

Persson, Magnus (PhD in Psychology, 2004, Uppsala University): Decision making under uncertainty; bounded rationality; exemplar models; computer go.

Powell, Justin (BA, 1992, Swarthmore College; MA, 1999, Humboldt-Universität zu Berlin; Dr. phil. in Sociology, 2004, Freie Universität Berlin): Sociology of education; social stratification; social policy; disability studies; life course.

Raab, Markus (Dr. phil. in Sport Psychology, 2000, Universität Heidelberg): Decision making in sports; decision making under time pressure; motor control and motor learning; cognitive neuroscience; simple heuristics in sports; search, stop, and decision rules in individual decision making; hot-hand phenomenon in sports; predicting sport results; judgment of players and team performance (as of 2003: Universität Flensburg).

Reimer, Torsten (Dr. phil. in Psychology, 1996, Freie Universität Berlin): Cognitive aspects of group decision making and problem solving (as of 2003: Universität Basel).

Romeu Gordo, Laura (MSc in Public Economics, 1999, University of York, UK; Dr. in Economics, 2004, Technische Universität Berlin): Aging; economy of health; economy of labor.

Scheibe, Susanne (Dipl.-Psych., 2001, Humboldt-Universität zu Berlin): The psychology of longing; longing and successful development over the life course; lifespan development of interindividual differences; the role of interindividual differences for psychopathology.

Schooler, Julia (PhD in Psychology, 1996, University of Pittsburgh): Cues determining portion size; memory for enjoyed food; understanding and remembering health claims on packages.

Takezawa, Masanori (MA in Social Psychology, 1997, Hokkaido University, Japan; PhD in Social Psychology, 2001, Hokkaido University, Japan): Adaptive heuristic approach in distributive bargaining under incomplete information; development and emergence of social preferences—altruism, reciprocity, egalitarianism and moral punishment; social intelligence in cooperative/competitive situations; human experiments and computer simulations.

Wagner, Sandra (Dipl.-Soz., 1997, Humboldt-Universität zu Berlin; Dr. phil. in Sociology, 2004, Freie Universität Berlin): Social stratification; sociology of education; life-course research; migration and ethnic minorities (as of 2004: Federal Ministry of Education and Science).

Wallin, Annika (PhD candidate, Lund University): How people structure their decision environment; the use of social information in decision making and problem solving (as of 2004: University of Lund).

Predocctoral Research Fellows

Brehmer, Yvonne (Dipl.-Psych., 2003, Universität des Saarlandes): Dynamic and plasticity of cognitive development and aging; computational modeling of cognitive processes; neural correlates of age-related changes.

Biele, Guido (Dipl.-Psych., 1999, Freie Universität Berlin): Modeling social heuristics for cooperation in groups; ecological rationality of (social) heuristics.

Bothe, Tobias (Dipl.-Psych., 2003, Universität Mannheim): Economic reasoning and behavior; judgment and decision making; knowledge assessment; lifespan psychology; generalizability theory; measurement theory; quasi-experiments of nature (LIFE).

Brunner, Martin (Dipl.-Psych., 2002, Universität Mannheim): Research in instruction and learning; structural equation modeling and item response theory; mathematics achievement; cognitive abilities.

Chang, Ping-Huang (Master of Education, 1998, National Taiwan Normal University; Dr. phil. in Educational Science, 2004, Freie Universität Berlin): Comparative research of school systems; educational policy (as of 2004: National Taiwan Normal University).

Demmrich, Anke (Dipl.-Psych., 1999, Universität Potsdam): Research in instruction and learning; cooperative learning; working memory (as of 2003: Universität Jena).

- Denissen, Jaap** (MA in Psychology, 2001, Radboud University Nijmegen): Personality; interpersonal communication; identity and life narratives; online research; evolutionary psychology (LIFE).
- Dudey, Thomas** (Dipl. in Economics, 1998, Universität Bonn): Game theory; experimental economics; bounded rationality; sequential search (as of 2004: itelligence AG).
- Ehrhorn, Susanne** (Dipl.-Psych., 1999, Technische Universität Braunschweig): Social relationships and loneliness in old age (as of 2003: Hospital Liebenburg).
- Felbrich, Anja** (Dipl.-Psych., 2000, Universität Potsdam): Research in teaching and learning; development of graphing competencies (as of 2004: Humboldt-Universität zu Berlin).
- Gaissmaier, Wolfgang** (Dipl.-Psych., 2002, Freie Universität Berlin): Adaptive memory; perception of statistical parameters; changes in the environment.
- Grühn, Daniel** (Dipl.-Psych., 2002, Freie Universität Berlin): Emotion and emotion regulation across the lifespan; cognitive functioning in the old and the oldest-old; cognitive and emotional mechanisms of successful aging.
- Gummerum, Michaela** (Dipl.-Psych., 2002, Freie Universität Berlin): Development of prosocial behavior (integration of psychological, economic, and evolutionary research); ontogenetic development of social norms and the psychological mechanisms underlying their expression and maintenance; social rationality; intergroup behavior; cross-cultural psychology; moral development.
- Gundert, Stefanie** (Dipl.-Soz., 2003, Universität Duisburg-Essen): Life-course and labor-market research; temporary employment and fixed-term contracts; women's employment.
- Hanoch, Yaniv** (PhD in Philosophy, 2004, University of Haifa, Israel): Emotion theory; bounded rationality; rational decision making (MINERVA Fellowship; as of 2004: University of California at Los Angeles).
- Helversen, Bettina von** (Dipl.Psych., 2004, Universität Erlangen-Nürnberg): Categorization and estimation strategies; ontogenetic development of heuristic strategies; adaptiveness of basic cognitive capacities to environmental structures.
- Hess, Nicole** (MA in Biosocial Anthropology, 1999, University of California at Santa Barbara): Evolutionary psychology; female coalitions; female competition; reputation and gossip (LIFE).
- Höhne, Anke** (Dipl.-Soz., 2000, Humboldt-Universität zu Berlin): Gender-segregated labor market; coupled careers; political and social transformation in East Germany.
- Husemann, Nicole** (Dipl.-Psych., 2004, Universität Bielefeld): Research in teaching and education; personal goals; academic cheating.
- Huxhold, Oliver** (Dipl.-Psych., 2002, Freie Universität Berlin): Lifespan cognitive development and cognitive aging; intra-individual and inter-individual variability in cognitive performance; cognitive processes contributing to balance control (LIFE).
- Jacob, Marita** (Dipl.-Soz., 2000, Universität Gießen; Dr. phil. in Sociology, 2003, Freie Universität Berlin): Education and training in Germany in the 1990s; rational choice theory and educational inequality; research methods (as of 2003: Institute for Labor Market and Employment Research, Nürnberg).
- Johnson, Timothy** (BA, 2004, R.D. Clark Honors College, University of Oregon): Experimental economics; cooperation; political science methodology; voting behavior; institutions.
- Kleinspehn, Anna** (Dipl.-Psych., 2004, Freie Universität Berlin): Development of emotional and self-related processes across the lifespan; age differences in cooperative behavior; individual differences and context covariates underlying interpersonal interactions; subjective experience of own aging.
- Kotter, Dana** (Dipl.-Psych., 2004, Technische Universität Dresden): The psychology of longing (Sehnsucht); psychological development in old age; changes in subjective well-being and domain-specific satisfaction (e.g., aging satisfaction) over the lifespan; aging stereotypes.
- Limbird, Christina** (Dipl.-Psych., MA in Psychology, 2002, Technische Universität Braunschweig): Literacy acquisition and disorders; education in multi-ethnic contexts; multilingualism; migration and educational systems (LIFE).
- Maaz, Kai** (Dipl.-Soz.-Päd. (FH), 1998, Katholische Fachhochschule Berlin; Dipl.-Soz., 2002, Humboldt-Universität zu Berlin): Transition from school to university and work; social background and educational and vocational chances.
- Mata, Rui** (Dipl.-Psych., 2002, FPCE University of Lisbon): Adaptation of human memory to the sta-

tistical structure of the environment; social cognition (the discipline, not ToM) (LIFE).

McElvany, Nele (Dipl.-Psych., 2001, Freie Universität Berlin): Research in instruction and learning; reading literacy; self-regulated learning; socialization in the family.

Müller, Andrea G. (MA in Sociology, 2000, University of Iowa; MA in Educational Science/Sociology, 2002, Martin-Luther-Universität Halle-Wittenberg): Conditions of immigrant students' school success; bilingual education and second language acquisition; everyday school-related communication skills (LIFE).

Nagy, Gabriel (Dipl.-Psych., 2002, Freie Universität Berlin): Research in teaching and learning; developmental regulation across the lifespan; transition from school to vocational training; quantitative methods of empirical social research (LIFE).

Pachur, Thorsten (Dipl.-Psych., 2002, Freie Universität Berlin; MSc in Health Psychology, 2002, Sussex): Role of recognition in decision making; sampling based simple heuristics; ecological rationality; process models of decision under uncertainty; risk perception and communication.

Pfahl, Lisa (Dipl.-Soz., 2003, Freie Universität Berlin): Sociology of youth and education; biographical research; social constructions of gender.

Röcke, Christina (Dipl.-Psych., 2002, Freie Universität Berlin): Within-person coupling of well-being and cognitive performance across the lifespan; intraindividual variability as a tool to understand lifespan development; emotion and emotion regulation across the lifespan; social relationships and closeness across the lifespan.

Rünger, Dennis (Dipl.-Psych., 2002, Humboldt-Universität zu Berlin): Implicit learning; information reduction in cognitive skill acquisition; consciousness (LIFE).

Schäfer, Sabine (Dipl.-Psych., 2001, Freie Universität Berlin): Cognitive-sensorimotor coordination across the lifespan; age differences in the regulation of sequential action (LIFE).

Scheibehenne, Benjamin (Dipl.-Psych., 2004, Humboldt-Universität zu Berlin): Cognitive modeling of preferential choice; effects of having too much choice; food choice.

Schellenbach, Michael (Dipl.-Inf., 2004, Universität des Saarlandes): Spatial navigation; hybrid pedestrian assistance systems; intelligent instrumented environments.

Schneider, Michael (Dipl.-Psych., 2002, Technische Universität Berlin): Cognitive learning theories; conceptual and procedural knowledge; diagrams as cognitive tools.

Shing, Yee Lee (MA, 2003, University of Georgia): Cognitive development and aging; development of children's strategy use.

Stange, Antje (Dipl.-Psych., 2000, Freie Universität Berlin): Wisdom; social perception; nonverbal expressiveness; lifespan development (as of 2004: Georgia Institute of Technology, Atlanta).

Tsai, Yi-Miau (MS in Psychology, 2003, National Taiwan University, Taiwan): Research in learning and instruction; achievement motivation and goals; context and cultural effects on motivation.

Werkle-Bergner, Markus (Dipl.-Psych., 2004, Universität des Saarlandes): Lifespan development of memory and cognitive control functions; neuronal correlates of lifespan plasticity and change; EEG methods in lifespan research; multivariate statistical models of variability and change.

Wilke, Andreas (Dipl.-Psych., 2002, Freie Universität Berlin): Emotions; evolutionary psychology; judgment and decision making (LIFE).

Wittig, Jutta (Dipl.-Psych., 2004, Humboldt-Universität zu Berlin): Food choice (decision strategies, developmental aspects); nutrition behavior; development of prosocial behavior (behavioral game experiments) (LIFE).

Wolf, Regina (Dipl.-Psych., 2000, Technische Universität Berlin): Control strategies in the lifespan; coping with finiteness; managing the transition from school to work (as of 2003: Vocational Training Academy Plauen).

The Institute was founded in 1963 by Hellmut Becker, who was joined subsequently by Friedrich Edding (1964), Dietrich Goldschmidt (1964), and Saul B. Robinsohn (1964) as the first generation of scientific directors and senior fellows of the Max Planck Society. In the first decade of its existence, the development of educational research and educational policy was emphasized.

The appointment of a second generation of directors (Wolfgang Edelstein, 1973, and Peter M. Roeder, 1973) added to this framework a commitment to basic research in human development and educational processes. Primary emphases included longitudinal research on child and adolescent development (Edelstein) and educational research on classroom processes and school organization (Roeder).

Since the 1980s and with the appointment of a third generation of senior fellows and scientific directors (Paul B. Baltes, 1980; Karl Ulrich Mayer, 1983; Jürgen Baumert, 1996; Gerd Gigerenzer, 1997), research at the Institute has concentrated more and more on questions of basic research associated with the nature of human development, education, and work in a changing society. At the same time, life-span developmental and life-course research were added as a signature profile of the Institute's research program.

The latest development in the succession of generations is marked by the appointment of Ulman Lindenberger as new director of the Center for Lifespan Development (2004), adding a new emphasis on the study of the neural correlates of human behavior and cognitive plasticity to the research agenda. Continuity and change is also involved in the establishment of a Max Planck International Research Network on Aging (MaxnetAging) directed by Paul Baltes.

Max-Planck-Institut für Bildungsforschung



Research Report 2003–2004

Center for Adaptive Behavior and Cognition
(Director: Gerd Gigerenzer)

Center for Educational Research
(Director: Jürgen Baumert)

Center for Sociology and the Study of the Life Course
(Director: Karl Ulrich Mayer)

Center for Lifespan Psychology
(Director: Paul B. Baltes/Ulman Lindenberger)

Independent Research Group
(Head: Heike Solga)

International Max Planck Research School LIFE
(Co-chairs: Paul B. Baltes, Jacquelynne Eccles – University of Michigan,
John R. Nesselrode – University of Virginia)

Max Planck International Research Network on Aging
(Director: Paul B. Baltes)