Encyclopedia of Geropsychology
DOI 10.1007/978-981-287-080-3_44-1

Berlin Aging Studies (BASE and BASE-II)

Julia A. M. Delius[a]*, Sandra Düzel[a], Denis Gerstorf[b] and Ulman Lindenberger[a]
[a]Center for Lifespan Psychology, Max Planck Institute for Human Development, Berlin, Germany
[b]Institute of Psychology, Humboldt-Universität zu Berlin, Berlin, Germany

Synonyms

Longitudinal studies of old age and aging

Definition

The Berlin Aging Studies (BASE and BASE-II) are two consecutive studies of old age and aging with an interdisciplinary focus. The disciplines involved include psychology, psychiatry, geriatrics and internal medicine, genetics, sociology, and economics. The initial BASE data collection involved 14 sessions and took place in 1990–1993 with 516 men and women aged 70 to over 100 years. BASE-II currently involves five sessions with 1,600 older adults aged 60–80 years as well as 600 younger adults aged 20–35 years, who were assessed for the first time in 2011–2014.

The initial Berlin Aging Study (BASE) was launched in 1989. In 1990–1993, 516 women and men aged 70 to 100+ years and living in the former West Berlin completed an intensive protocol of 14 sessions that exhaustively assessed their physical and mental health, life histories, living conditions, and psychological status. Subsequently, seven longitudinal follow-up assessments of surviving participants who had agreed to take part again were carried out until 2008/2009. In addition, mortality information was obtained regularly from the city registry. This allowed the examination of age- and death-related changes in old age. In 2011, a new study was launched, the Berlin Aging Study II (BASE-II), which focuses on many of the constructs examined in BASE as well as new constructs, but follows a larger group of old participants as well as a group of young adults for comparison.

In the following, BASE and BASE-II are presented in depth, first focusing on BASE, and then drawing attention to select features of BASE-II.

The Berlin Aging Study (BASE)

Institutional Background and Organization of BASE

The first study was initiated in 1989 by the West Berlin Academy of Sciences' interdisciplinary working group "Aging and Societal Development." It was initially directed by the late Paul B. Baltes, psychologist, and Karl Ulrich Mayer, sociologist (Baltes and Mayer 2001; Lindenberger et al. 2010; Mayer and Baltes 1999). From 1994 to 1999 the working group and BASE were continued by the newly founded Berlin-Brandenburg Academy of Sciences. BASE was carried out as a collaboration among several institutions including the psychology and sociology research centers at the Max Planck Institute (MPI) for Human Development, the Department of Psychiatry at the Freie Universität Berlin, institutes and research groups at the Virchow Clinic of the Humboldt-Universität zu Berlin, and the Evangelisches Geriatriezentrum Berlin. Over time, the study was funded by various German federal ministries

*Email: delius@mpib-berlin.mpg.de

DOI 10.1007/978-981-287-080-3_44-1

(Federal Ministry for Research and Technology, Federal Ministry for the Family and Senior Citizens, and finally until 1998 Federal Ministry for the Family, Senior Citizens, Women, and Youth). The Max Planck Society for the Advancement of Science currently supports the study. The study also received additional support from the Berlin-Brandenburg Academy of Sciences and the cooperating institutes and research groups.

The multidisciplinary nature of BASE is reflected in four research units: internal medicine/geriatrics (Elisabeth Steinhagen-Thiessen), psychiatry (Hanfried Helmchen), psychology (Paul B. Baltes, succeeded by Ulman Lindenberger and Jacqui Smith), and sociology/social policy (Karl Ulrich Mayer). At the beginning of the study (1990–1993), the project group consisted of about 60 scientists from different disciplines. In 2015, about ten scientists are still regularly involved in the analysis of the longitudinal data. Since 2004, Ulman Lindenberger heads the current BASE core group at the MPI for Human Development. From the outset, young scientists were heavily involved in BASE. By 2014, 25 diploma and masters' theses and 22 doctoral theses analyzing BASE data were completed. In many cases, the findings were subsequently published in peer-reviewed international journals.

As mentioned above, the study involves eight measurement occasions spaced over 18 years. In addition, several subsamples have been recruited for intensive study. The key features of BASE include (1) a focus on the very old (70 to 100+ years); (2) a locally representative sample, stratified by age and sex; (3) a broadly based interdisciplinarity; and (4) an emphasis on methodological issues, such as selective attrition and the measurement of change.

Theoretical Orientations

In addition to discipline-specific topics, four integrative theoretical orientations have guided 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 theoretical orientations led the selection and analysis of the central topics of BASE that were presented in the initial monographs on the study (Baltes and Mayer 2001; Lindenberger et al. 2010; Mayer and Baltes 1999). The concept of *differential aging* covers a broad range of questions. For example, the cumulative effects of early life experience (such as historically explainable cohort differences in education, consequences of war and epidemics, etc.) on old age, social inequality and aging, and differences between older men and women were analyzed. The question whether dementia represents *discontinuity or continuity* in the course of aging was one of the main research topics of the BASE psychiatry unit. Issues related to *reserve capacity and plasticity* in old age were important for the analyses of the geriatrics unit and the psychology unit. The consideration of aging as a *systemic phenomenon* has always been a key focus in BASE. Here, connections were made across domains such as sensorimotor functioning and cognition or health and well-being, and in a holistic person-oriented approach, subgroups of older adults were identified based on their profiles of functioning.

Sample

The initial focus of BASE (1990–1993) was to obtain a heterogeneous sample, stratified by age and sex, of individuals aged 70 to 100+ years who completed a 14-session intensive protocol that involved detailed measures from each of the four participating disciplines at the first occasion of measurement. The stratified sample participating in this intensive protocol consisted of 258 men and 258 women from the former West Berlin aged 70–74, 75–79, 80–84, 85–89, 90–94, and 95+ years. The parent sample was drawn from the obligatory city register. A standardized intake assessment was also used to collect multidisciplinary data at early stages and as a repeat instrument at each later occasion of measurement. For a detailed documentation of sampling procedures and sample selectivity, see Lindenberger et al. (2001).

Encyclopedia of Geropsychology
DOI 10.1007/978-981-287-080-3_44-1

Longitudinal Continuation

In order to focus on the theoretical orientations that actually emphasize the *processes* of aging as well as the dynamics and consequences for differential aging, a longitudinal continuation of the study was put in place. With longitudinal data, decisive information can be gained on all four theoretical orientations. In particular, longitudinal data allow the identification of interindividual differences in intraindividual change, provide insights into the determinants of change, and enable analyses of systemic linkages among behavioral changes. Seven longitudinal follow-ups of the survivors from the initial sample involving different depths of assessment were 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 repeats of parts of the psychology battery together with multidisciplinary outcome variables (e. g., screening for dementia, assessment of well-being) were collected in 2000 ($N = 82$), 2004 ($N = 46$), and 2005 ($N = 37$). In addition, mortality information about the entire BASE sample is updated at regular intervals. At the eighth (and probably final) measurement occasion in 2008–2009, 22 surviving participants were reexamined, concentrating on psychological, geriatric, and dental assessments.

An additional focus that also influenced the design of the longitudinal study deals with the transition of the Third Age to the Fourth Age. Within the last phase of the life span, in old age, scientists differentiate between the Third and Fourth Age or between the "young old" and "old old" (Baltes and Smith 2003). This differentiation is based on the heterogeneity within the elderly population with respect to important characteristics such as morbidity, the need for care, cognitive functioning, well-being, social participation, and mortality. The precise definitions of the determinants of membership in the one or the other group or that characterize the transition from the Third to the Fourth Age still need to be identified. Based on theory, the Third Age can be described as a phase of positive quality of life, whereas the Fourth Age is characterized by dysfunction, illness, and death. Some demographers have identified the age of 85 as the average entrance criterion into the Fourth Age (Suzman et al. 1992). However, the question remains open whether this age is a fixed or mobile criterion for the end of the Third and beginning of the Fourth Age. Therefore, the analysis of the longitudinal BASE data also focuses on the investigation of the transition from the Third to the Fourth Age and the characteristics of the Fourth Age.

Data from the Berlin Aging Study continue to provide the basis for new original publications on individual differences in late-life development. Furthermore, DNA specimens, derived from blood samples frozen at the first occasion of measurement to allow later analyses, have been retrieved and analyzed for about 380 BASE participants. Adding genetic information to the BASE data set allows researchers to explore and test genetic contributions to individual differences in late-life development.

The initial sample of 516 individuals formed the basis of the cross-sectional analyses reported in two monographs (Baltes and Mayer 2001; Mayer and Baltes 1999). Current interests of the BASE core group include issues of sample selectivity and representativeness; intraindividual variability and change; terminal decline; cognitive aging; mortality prediction; self-related change, well-being, and antecedents of successful aging; and genetic predictors of individual differences in cognitive and self-related change in old age.

The BASE data set is rich: For the first cross-sectional data collection alone, there are already 10,000 variables available per participant. External scientists can apply for access to parts of the BASE data set. Data can then be made available in accordance with the German data protection laws. In the interest of scientific exchange, BASE researchers have invested much effort and time into the documentation and archiving of the data set. This is in line with endeavors in the USA to make central data bases of important studies available to the scientific community. The data of BASE are described in an extensive and detailed

DOI 10.1007/978-981-287-080-3_44-1

documentation that can be provided on a compact disc. Copies of the questionnaires used in BASE can also be requested, and some are already part of the documentation. The BASE website (www.base-berlin.mpg.de) provides an overview of the study and includes a searchable catalog of the numerous BASE publications. It is updated regularly and includes a contact e-mail address (basempi@mpi-berlin.mpg.de) for reprint or information requests.

Trajectories of Change: Age Versus Time to Death

One example of the kinds of analyses possible with the BASE data was published by Denis Gerstorf et al. (2013). Mortality-related processes are known to modulate late-life changes in cognitive abilities, but it is an open question whether precipitous declines with impending death generalize to other domains of functioning. The authors used 13-year longitudinal data from 439 deceased BASE participants to compare changes as a function of time since birth (i.e., age models) with changes as a function of time to death (i.e., mortality models). Across a large range of functional domains such as subjective health, emotional loneliness, grip strength, perceived control, and the score in the Digit Letter Test (a marker of perceptual speed), mortality models revealed reliably steeper average rates of change than age models. These findings underscore the pervasive presence of processes leading toward death in old age. Multivariate analyses with more closely spaced multi-domain measurements are needed to identify the temporal dynamics and dimensionality of this end-of-life cascade.

Genetic Contributions to Individual Differences in Late-Life Cognitive Development

Another example of BASE findings highlights the importance of the genetic analyses that have become possible. The brain-derived neurotrophic factor (BDNF) promotes activity-dependent synaptic plasticity and contributes to learning and memory. Paolo Ghisletta et al. (2014) investigated whether a common Val66Met missense polymorphism (rs6265) of the *BDNF* gene is associated with individual differences in cognitive decline in old age. A total of 376 BASE participants with a mean age of 84 years at the first occasion of measurement were assessed longitudinally up to 11 times (due to multiple testing at several occasions of measurement) across more than 13 years on the Digit Letter Test. Met carriers ($n = 123$, 34 %) showed steeper linear decline than Val homozygotes ($n = 239$, 66 %). This effect was not moderated by sex or socioeconomic status and was also observed when individuals at risk for dementia were excluded from the analysis. This finding is in line with the hypothesis that normal aging magnifies the effects of common genetic variation on cognitive functioning.

The Berlin Aging Study II (BASE-II): Understanding Heterogeneity in Aging

BASE findings confirmed that heterogeneity is one of the most salient aspects of aging. Some individuals maintain their health and preserve their cognitive abilities into advanced ages, whereas others show precipitous and early decline. To understand the mechanisms that produce this diversity of outcomes and trajectories of aging, individuals need to be followed over time. With this goal in mind, researchers from Berlin and Tübingen initiated the Berlin Aging Study II (Bertram et al. 2014). Like BASE, BASE-II was set up as a multidisciplinary and multi-institutional longitudinal study that captures a wide range of different functional domains. Geriatrics and internal medicine, psychology, sociology, and economics are again among the disciplines involved, moreover, immunology and genetics were additionally included. Thus, the BASE-II steering committee represents a wide range of these disciplines and involves many of

DOI 10.1007/978-981-287-080-3_44-1

the scientists who also collaborated in BASE. Elisabeth Steinhagen-Thiessen, Evangelisches Geriatriezentrum Berlin, was the first BASE-II speaker from 2010 to 2014. In 2015, she was succeeded by Denis Gerstorf, Humboldt-Universität zu Berlin. The study received financial support from the Federal Ministry of Education and Research, the Max Planck Society for the Advancement of Science, and other participating institutions.

The BASE-II Sample

The recruitment of the BASE-II cohort resulted in a consolidated baseline sample of 1,600 older adults aged 60–75 years and of 600 younger adults aged 20–35 years (Bertram et al. 2014). Potential participants were drawn from a pool of individuals originally recruited at the MPI for Human Development for a number of earlier projects with a focus on neural correlates of cognition.

Briefly, participant recruitment was based on advertisements in local newspapers and the public transport system of Berlin. Interested individuals of the greater metropolitan area of Berlin were further screened to meet the inclusion criteria of BASE-II (either in-house or by telephone) leading to 2,262 healthy individuals who were eligible for inclusion in BASE-II. Individuals were included if they were not taking medication that could affect memory function and did not report a history of head injuries or neurological or psychiatric disorders. Finally, 2,200 individuals were selected to represent the BASE-II baseline cohort.

It is well known that some age-related functional and cognitive changes, such as decline in perceptual speed, evolve in early adulthood. At the same time, recent longitudinal studies indicate that other cognitive abilities, such as episodic memory (EM), are relatively stable until about 60 years of age and start declining thereafter. In order to identify and follow associations of multiple factors influencing age-related changes, the decision was taken to start observing healthy older adults at an age of relative health and stability, but where most would be at risk of subsequent age-related changes on multi-dimensional variables of interest. Thus, a total of 1,600 participants were assigned to an older subgroup aged between 60 and 80 years, and 600 individuals were assigned to a younger subgroup (serving as a reference population) aged between 20 and 35 years. By design, each age subgroup contains an approximately equal number of men and women. To estimate sample selectivity, data from this baseline sample are linked to the German Socio-Economic Panel (SOEP) study, a longitudinal panel survey that is representative of the German population. To date, BASE-II only includes cross-sectional variables but is planned as a longitudinal study.

Interdisciplinary Research in BASE-II

In many countries around the world, current cohorts of adults are living longer than earlier cohorts and are reaching old age in better health. There is a growing need to investigate the interactions among genetic, psychosocial, demographic, and lifestyle factors that shape individual pathways into old age (Lindenberger 2014). Multidisciplinary approaches are required to understand how individual differences in cognitive and psychosocial domains of functioning relate to the wide range of genetic, somatic, and sociological markers and constructs assessed in BASE-II and how these associations change over time. Additionally, socioeconomic data and data about life satisfaction and habits, the social environment, and attitudes in life were collected and can be taken into account as explaining factors. The BASE-II design allows younger and older participants to be directly compared on all dimensions assessed.

An overarching goal of BASE-II is to follow up the trajectories and the strengths of the multidisciplinary associations revealed in the first wave of BASE-II. Repeated investigations after a certain time will allow more specific observation and classification of individual trajectories of aging. Longitudinal findings may contribute toward bolstering action strategies for demographic change and increasing knowledge of the conditions necessary for independent living.

DOI 10.1007/978-981-287-080-3_44-1

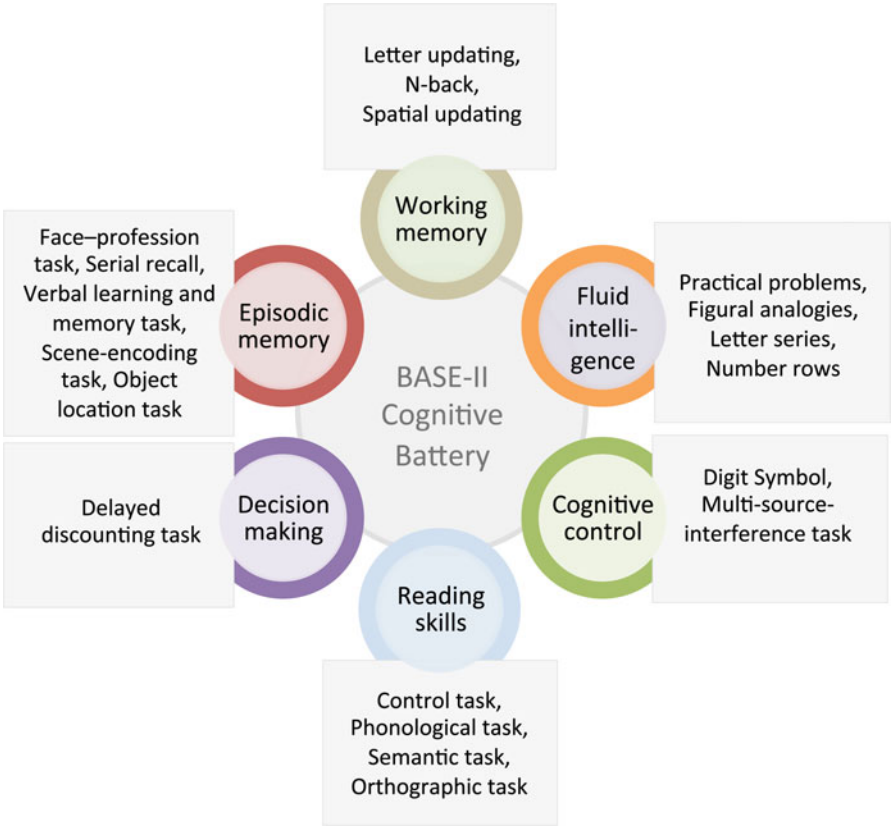

Fig. 1 Overview of cognitive domains with associated tasks within the baseline assessment of BASE-II

Assessing Cognitive Functioning

A major aim of the psychology subproject is to obtain a detailed and comprehensive picture of cognitive abilities and psychosocial characteristics that can serve as a solid baseline for subsequent longitudinal observations (Fig. 1). Throughout all analyses, structural equation modeling was used (McArdle 2009) in order to establish latent constructs and examine associations among them. Thus, by relating individual differences in cognitive abilities to variations in lifestyle, environmental factors, and personality, it is possible to identify different patterns and psychosocial contexts of cognitive aging and to investigate links to multiple domains within BASE-II (Fig. 1).

After extensive piloting, a comprehensive battery of cognitive tests and a psychological questionnaire were added to the baseline protocol in 2013. The cognitive battery of BASE-II covers key cognitive abilities such as episodic memory (EM) as well as measures of working memory (WM), cognitive control, fluid intelligence (FI), reading skills, and decision making. The assessment is distributed across two testing sessions that last three hours each and are seven days apart. The Digit Symbol Substitution Test (WAIS-II; paper-and-pencil version) was applied to relate performance levels observed in BASE-II to other studies, including BASE (cf. Gerstorf et al. 2015). In summary, the psychometric space of human cognitive abilities is represented more broadly than in most other comparable studies.

Assessing Psychosocial Functioning

To cover a broad range of key psychosocial correlates of health and cognition in old age, a comprehensive psychosocial assessment battery was compiled for BASE-II. A total of eight domains of psychosocial functioning are assessed. Data collection takes place between the first and second cognitive session at the participants' place of residence (i.e., private household or institution). Overarching constructs include

DOI 10.1007/978-981-287-080-3_44-1

well-being, affect, perceived stress, motivation and control, personality, perceptions of time and aging, social embedding, and perception of neighborhood characteristics. The selection of psychosocial measures was based on conceptual considerations and empirical evidence to permit the investigation of links to physical health and cognitive functioning (e.g., Diener et al. 2006). Selection of (sub)scales and items for the constructs was based on empirical reports attesting that psychometric properties were acceptable. To allow for direct empirical comparison across studies, several (sub)scales and items that were also applied in closely related studies, including SOEP (Headey et al. 2010), BASE (Baltes and Mayer 2001; Lindenberger et al. 2010; Mayer and Baltes 1999), and the COGITO study (Schmiedek et al. 2010), were chosen. This design strategy allows comparison of individuals from the later-born cohorts of BASE-II with their age peers from earlier cohorts in BASE (e.g., comparing 75-year-olds born in 1915 with 75-year-olds born in 1938). The strategy also makes it possible to analyze longitudinal data from participants who were previously part of the SOEP and COGITO studies.

Developing New Measures of Active Aging

Maintaining cognitive abilities in aging is important for everyday competence and an independent lifestyle. A lifestyle associated with exposure to novel and varied information ("enriched environment") is considered beneficial for healthy cognitive aging (Lindenberger 2014; Hertzog et al. 2008). Psychological concepts of motivation postulate that the subjective appraisal of the time left to life affects individuals' goal- and activity-related motivations (Lang and Carstensen 2002). Hence the "Subjective Health Horizon Questionnaire" (SHH-Q) was developed and validated. This novel questionnaire captures individuals' expectations regarding their ability to explore and engage with novel information in the future alongside their expectations concerning bodily health and fitness. The SHH-Q is administered within the cognitive session by means of a computer. The SHH-Q forms four correlated but distinct subscales: (1) novelty-oriented exploration, (2) bodily fitness, (3) occupational goals, and (4) goals in life (cf. Düzel et al. under review).

Summary of Initial Results from BASE-II

Changes in psychosocial functioning across cohorts. Initial analyses of the psychosocial measures focused on secular changes in aspects of motivation and control, social embedding, and perceptions of time and aging. As mentioned above, levels of functioning in more objective and performance-based measures assessed in BASE and BASE-II such as physical health and cognition were higher in more recent cohorts of older people. Does this mean that they also perceive themselves as having more control over their life and feel socially integrated and young? To examine these questions, Hülür and colleagues (in press) compared data obtained in BASE (in 1990–93) and BASE-II (in 2013–2014) and applied a case-matched control design based on age, gender, education, comorbidities, and cognition. Results revealed evidence for considerable secular changes in people's perceptions of their lives. For example, 75-year-olds nowadays hold fewer external control beliefs and report less loneliness. Possible correlates underlying such cohort differences are being examined at the time of writing.

Cognitive functioning. Using confirmatory factor analysis (CFA), it was possible to validate a three-factor model of memory for both age groups. This latent approach is important to further investigate the associations between cognitive functioning and other psychosocial, medical, genetic, and socioeconomic indicators assessed in BASE-II.

Associations between health and cognition. Being physically active and having a higher overall health status have protective effects on brain structure and function and are associated with later onset or lower degree of age-related cognitive decline (Hertzog et al. 2008; Maass et al. 2015). The examination of associations of health- and fitness-related measures to global measures of cognitive functioning using CFA is in planning. Medical data are used to generate global measures of health (e.g., grip strength) and

DOI 10.1007/978-981-287-080-3_44-1

fitness (e.g., lung functioning). Initial multiple hierarchical regression analyses with the sample of older BASE-II adults showed that grip strength predicts performance in all memory domains (FI, WM, and EM) beyond age, gender, and years of education. In the younger BASE-II subsample, neither of these health and fitness measures was associated with any of the three cognitive abilities. Future analyses will investigate age group differences in the associations between somatic health and cognition.

Establishing metabolic status as a latent construct. Epidemiological studies have linked features of the metabolic syndrome (MetS; a clustering of several frequent medical disorders such as abdominal obesity, hypertriglyceridemia, and hypertension) to cognitive decline in old age. However, it is not clear to what extent each indicator of MetS contributes to pathophysiology and how single or combined MetS features affect cognitive functioning. Additionally, little is known about associations among vascular risk, metabolic status, and cognition in healthy aging. The underlying hypothesis is that memory functions are moderated by metabolic and vascular factors. Biomarkers were collected within the medical subproject of BASE-II and include systolic and diastolic blood pressure, glucose and insulin area under the curve, triglycerides, HDL cholesterol, body mass index (BMI), waist circumference, and trunk fat. To investigate the aforementioned links between MetS and cognition, MetS was established as a latent construct, again using CFA. A one-factor model of MetS provided acceptable model fit, with three measures loading adequately on the MetS factor (triglyceridemia, trunk fat, fasting glucose level). This factor is in line with medical descriptions of MetS. Initial analyses suggest reliable associations among MetS, cognition, and subjective measures of future time horizon.

Psychosocial functioning. With the validation of SHH-Q, the new self-report measure of distinct future time perspectives, within the healthy older sample of BASE-II, the SHH was shown to account for a significant proportion of memory performance variability. Initial analyses indicate that greater self-reported novelty orientation is associated with higher EM performance and greater self-reported bodily fitness with better metabolic status (Düzel et al. under review). These initial results pave the way to a better understanding of the connections between subjective activity-related motivation and health behavior.

Outlook

The psychometric validation of the BASE-II cognitive battery is an important starting point toward investigating associations with other functional domains. In particular, analyses at the latent level will enhance statistical power and generalizability when exploring links to genetic variation (e.g., Papenberg et al. 2014). Further analyses will explore across-domain associations between aspects of physical health, cognitive functioning, and psychosocial characteristics. Additional analyses will focus on identifying psychosocial variables that may serve as protective or risk factors for dealing with health challenges. To move toward a better understanding of whether and how contextual factors shape individual functioning and development, geo-coded information (e.g., to index distance to green spaces) will be linked to psychosocial characteristics (e.g., chronic stress) and to health information (e.g., biomarkers of stress).

Synergies between BASE and BASE-II

One way to explore the malleability of the human life course is to directly compare different cohorts of the same age across historical time (Baltes 1968; Schaie 1965). The similarities between BASE and BASE-II offer excellent opportunities for comparisons of this kind. In a recent study, Gerstorf and colleagues (2015) quantified secular increases in fluid intelligence in old age favoring later-born cohorts. They compared data obtained 20 years apart in BASE and BASE-II, applied a case-matched control design, and quantified sample selection using a nationally representative sample as the reference (Fig. 2; see also Hülür et al. in press). The later cohort performed better on the fluid intelligence measure and reported higher morale, less negative affect, and more positive affect than the earlier cohort. The authors concluded that secular advances have resulted in better cognitive performance and perceived quality of life among

DOI 10.1007/978-981-287-080-3_44-1

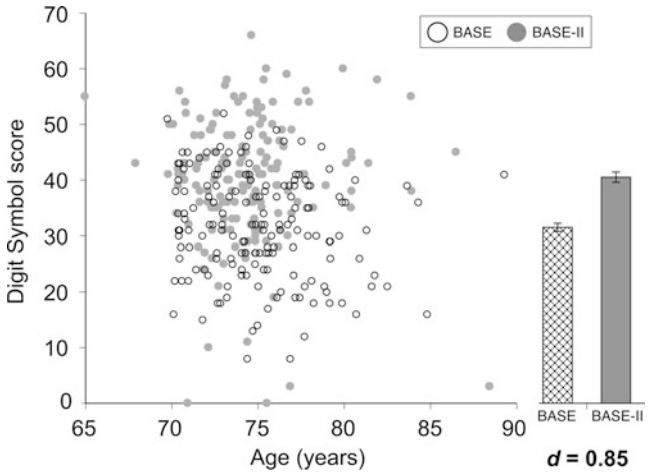

Fig. 2 Average cohort differences and individual differences in cognitive performance. The dots represent participants' scores in the matched BASE (*open circles*) and BASE-II (*gray circles*) samples. Sample means and standard errors for each cohort are displayed separately. Participants in the BASE-II cohort (data obtained in 2013–2014) showed higher levels of cognitive performance ($d = 0.85$) than the BASE cohort (data obtained in 1990–1993). For details, see Fig. 2 in Gerstorf et al. (2015)

older adults. To the extent that BASE-II will be continued as a longitudinal study, it will permit researchers to study the ways in which longitudinal trajectories of adult development evolve over historical time.

Summary

Taken together, the combination of findings from BASE and BASE-II and the possibility to analyze BASE-II data in conjunction with BASE data provide singular opportunities to address a wide range of questions about old age and aging. Both studies are unique with their wide-ranging interdisciplinarity that allows processes of aging to be examined across a broad spectrum of domains. As is already the case for BASE (Lindenberger et al. 2010), BASE-II is likely to yield a rich scientific harvest over the next years, as foreshadowed by initial publications (e.g., Bertram et al. 2014; Gerstorf et al. 2015; Hülür et al. in press; Maass et al. 2015; Papenberg et al. 2014).

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ Cognitive Plasticity
- ▶ Distance-to-Death Research in Geropsychology
- ▶ Individual Differences
- ▶ Intraindividual Variability
- ▶ Normal and Age-Related
- ▶ Plasticity of Aging
- ▶ Psychological Theories on Health and Aging
- ▶ Sensory Effects on Cognition in Later Life
- ▶ Time Perception
- ▶ Well-being, Psychosocial

DOI 10.1007/978-981-287-080-3_44-1

References

Baltes, P. B. (1968). Longitudinal and cross-sectional sequences in the study of age and generation effects. *Human Development, 11*, 145–171.

Baltes, P. B., & Mayer, K. U. (Eds.). (2001). *The Berlin Aging study: Aging from 70 to 100* (2nd ed.). New York: Cambridge University Press.

Baltes, P. B., & Smith, J. (2003). New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age. *Gerontology, 49*, 123–135.

Bertram, L., Böckenhoff, A., Demuth, I., Düzel, S., Eckardt, R., Li, S.-C., … Steinhagen-Thiessen, E. (2014). Cohort profile: The Berlin Aging Study II (BASE-II). *International Journal of Epidemiology, 43*, 703–712.

Diener, E., Lucas, R. E., & Scollon, C. N. (2006). Beyond the hedonic treadmill: Revisions to the adaptation theory of well-being. *American Psychologist, 61*, 305–314.

Düzel, S., Voelkle, M. C., Düzel, E., Gerstorf, D., Drewelies, J., Steinhagen-Thiessen, E., … Lindenberger, U. The Subjective Health Horizon Questionnaire (SHH-Q): Assessing the future time perspective for an engaged and exploratory lifestyle (Ms. under review).

Gerstorf, D., Ram, N., Lindenberger, U., & Smith, J. (2013). Age and time-to-death trajectories of change in indicators of cognitive, sensory, physical, health, social, and self-related functions. *Devlopmental Psychology, 49*, 1805–1821.

Gerstorf, D., Hülür, G., Drewelies, J., Eibich, P., Düzel, S., Demuth, I., … Lindenberger, U. (2015). Secular changes in late-life cognition and well-being: Towards a long bright future with a short brisk ending? *Psychology and Aging*, *30*, 301–310.

Ghisletta, P., Bäckman, L., Bertram, L., Brandmaier, A. M., Gerstorf, D., Liu, T., & Lindenberger, U. (2014). The Val/Met polymorphism of the brain-derived neurotrophic factor (BDNF) gene predicts decline in perceptual speed in older adults. *Psychology and Aging, 29*, 384–392.

Headey, B., Muffels, R., & Wagner, G. G. (2010). Long-running German panel survey shows that personal and economic choices, not just genes, matter for happiness. *Proceedings of the National Academy of Sciences, 42*, 17922–17926.

Hertzog, C., Kramer, A., Wilson, R., & Lindenberger, U. (2008). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest, 9*, 1–65.

Hülür, G., Drewelies, J., Eibich, P., Düzel, S., Demuth, I., Ghisletta, P., . . . Gerstorf, D. (in press). Cohort differences in psychosocial function over 20 years: Current older adults feel less lonely and less dependent on external circumstances. *Gerontology.*

Lang, F. R., & Carstensen, L. L. (2002). Time counts: Future time perspective, goals, and social relationships. *Psychology and Aging, 5*, 125–139.

Lindenberger, U. (2014). Human cognitive aging: Corriger la fortune? *Science, 346*(6209), 572–578.

Lindenberger, U., Gilberg, R., Little, T. D., Nuthmann, R., Pötter, U., & Baltes, P. B. (2001). Sample selectivity and generalizability of the results of the Berlin Aging Study. In P. B. Baltes & K. U. Mayer (Eds.), *The Berlin Aging study: Aging from 70 to 100* (pp. 56–82). New York: Cambridge University Press.

Lindenberger, U., Smith, J., Mayer, K. U., & Baltes, P. B. (Eds.). (2010). *Die Berliner Altersstudie* (3rd ed.). Berlin: Akademie Verlag.

Maass, A., Düzel, S., Goerke, M., Becke, A., Sobieray, U., Neumann, K., . . . Düzel, E. (2015). Vascular hippocampal plasticity after aerobic exercise in older adults. *Molecular Psychiatry*, 20, 585–593.

Mayer, K. U., & Baltes, P. B. (Eds.). (1999). *Die Berliner Altersstudie*. Berlin: Akademie Verlag.

DOI 10.1007/978-981-287-080-3_44-1

McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology, 60*, 577–605.

Papenberg, G., Li, S.-C., Nagel, I. E., Nietfeld, W., Schjeide, B.-M., Schröder, J., . . . Bäckman, L. (2014). Dopamine and glutamate receptor genes interactively influence episodic memory in old age. *Neurobiology of Aging*, *35*, 1213.e3–1213.e8.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64*, 92–107.

Schmiedek, F., Lövdén, M., & Lindenberger, U. (2010). Hundred days of cognitive training enhance broad cognitive abilities in adulthood: Findings from the COGITO study. *Frontiers in Aging Neuroscience, 2*, 27.

Suzman, R. M., Willis, D. P., & Manton, K. G. (Eds.). (1992). *The oldest old*. New York: Oxford University Press.