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## Cohort Differences in Psychosocial Function over 20 Years: Current Older Adults Feel Less Lonely and Less Dependent on External Circumstances

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### Key Words

Cohort · Subjective age · Loneliness · Control beliefs · Sociocultural factors · Individual differences · Berlin Aging Study · Berlin Aging Study II

### Abstract

**Background:** Lifespan psychological and life course sociological perspectives indicate that individual development is shaped by social and historical circumstances. Increases in fluid cognitive performance over the last century are well documented and researchers have begun examining historical trends in personality and subjective well-being in old age. Relatively less is known about secular changes in other key components of psychosocial function among older adults. **Objective:** In the present study, we examined cohort differences in key components of psychosocial function, including subjective age, control beliefs, and perceived social integration, as indicated by loneliness and availability of very close others. **Methods:** We compared data obtained 20 years apart

in the Berlin Aging Study (in 1990–1993) and the Berlin Aging Study II (in 2013–2014) and identified case-matched cohort groups based on age, gender, cohort-normed education, and marital or partner status ( $n = 153$  in each cohort, mean age = 75 years). In follow-up analyses, we controlled for having lived in former East versus West Germany, physical diseases, cohort-normed household income, cognitive performance, and the presence of a religious affiliation. **Results:** Consistently across analyses, we found that, relative to the earlier-born BASE cohort (year of birth: mean = 1916; SD = 3.38 years; range = 1901–1922), participants in the BASE-II sample (year of birth: mean = 1939; SD = 3.22 years; range = 1925–1949) reported lower levels of external control beliefs ( $d = -1.01$ ) and loneliness ( $d = -0.63$ ). Cohorts did not differ in subjective age, availability of very close others, and internal control beliefs. **Conclusion:** Taken together, our findings suggest that some aspects of psychosocial function of older adults have improved across the two recent decades. We discuss the possible role of sociocultural factors that might have led to the observed set of cohort differences.

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## Introduction

Lifespan psychological and life course sociological perspectives indicate that individual development is shaped by socio-cultural and historical contexts [1, 2]. Cohort differences in fluid cognitive performance over the last century are well documented [3]. Researchers have also examined cohort differences in (trajectories of) personality [4], and subjective well-being [5–8]. In the current study, we examined whether subjective age, control beliefs, and perceived social integration have changed across recent decades. To do so, we used data from the Berlin Aging Study (BASE, in 1990–1993) and the Berlin Aging Study II (BASE-II, in 2013–2014).

## Subjective Age

Subjective age refers to how old individuals feel themselves to be [9] and can be considered a reflection on one's own age and aging. Previous research suggests that a younger subjective age might serve as a self-protective strategy against negative age stereotypes [9]. If individuals distance themselves from age stereotypes through feeling younger, a greater discrepancy between chronological age and subjective age can be expected in (historical) contexts where negative age stereotypes are more present. Although researchers have begun developing frameworks for interventions against negative age stereotypes [10], there has been little systematic research on historical changes in age stereotypes. Thus, we did not have a specific hypothesis on cohort differences in subjective age.

## Control Beliefs

Control beliefs refer to individuals' beliefs about the extent to which they can control various outcomes in their lives [11]. Control beliefs may be internal and external [12], which are typically considered two separable dimensions [11]. For example, a person can hold both internal and external control beliefs about a single outcome at the same time. Individuals with higher levels of internal control believe that they can exert control through personal efforts or abilities, while those with higher levels of external control believe that their life outcomes depend on fate, chance, or powerful others [11]. Higher levels of internal and lower levels of external control beliefs are associated with higher educational attainment, higher socioeconomic status, and better health [11]. Over recent

decades, socioeconomic standards [13] and educational attainment [14] have improved. Trends in the health domain are mixed [see 15]: while some aspects of health have improved across cohorts (e.g., physical functioning), others have declined (e.g., higher multimorbidity). More religious individuals might be more likely to believe that events are predetermined. Religiosity is associated with higher external control beliefs, while associations with internal control beliefs are more complex [16]. Religiosity has declined across cohorts [17]. Taken together, it can be expected that older adults today would feel more in control over their lives.

## Perceived Social Integration

In the present study, perceived social integration was indicated by loneliness and availability of very close others. The size of one's social network typically decreases with age, especially for nonkin relationships [see 18]. Several factors could lead to cohort differences in perceived social integration in old age. First, due to well-documented increases in longevity [19], more members of an older individual's social network can be expected to be still alive. Second, older adults today might be more mobile and able to keep in contact with their social network due to improvements in physical functioning [see 15] and access to facilitating technology. Third, it has been argued that social relationships have become less rooted and more flexible [18], possibly leading to more friend-oriented networks among later-born cohorts [18]. While the first two factors suggest that older adults today might feel more socially integrated, it is less clear how changes in social network structure might affect perceived social integration.

## The Present Study

In the present study, we examined cohort differences in psychosocial function. We used propensity score matching procedures [20] to control for differences in sampling strategies between studies and relevant individual characteristics. We identified case-matched controls based on age, gender, cohort-normed education, and marital or partner status. In follow-up analyses, we controlled for having lived in former East versus West Germany prior to the German reunification, physical diseases, cohort-normed household income, cognitive performance, and having a religious affiliation.

## Method

We used data from the first occasion of BASE (obtained in 1990–1993) [21] and BASE-II (obtained in 2013–2014) [22]. Relevant details are presented below.

### *Participants and Procedure*

**BASE.** BASE initially consisted of 516 participants from former West-Berlin drawn randomly from the obligatory city registry with a 27% response rate [23]. We used data from 507 participants (age: mean = 84.79 years, SD = 8.63, range = 70–103; 50% women; years of education: mean = 10.91 years, SD = 2.01, range = 7–18) who provided data on relevant variables. The testing sessions were administered individually at the participants' place of residence, lasted for 90 min on average, and were split into shorter units if necessary.

**BASE-II.** BASE-II included a convenience sample from the greater Berlin metropolitan area, recruited through a participant pool at the Max Planck Institute for Human Development (Berlin) or through advertisements. We used data from 517 participants (age: mean = 70.59 years, SD = 3.70, range = 61–88; 50% women; years of education: mean = 14.35 years, SD = 2.87, range = 7–18) who contributed data on relevant variables. The psychosocial measures were collected via a take-home questionnaire with an estimated length of 1.5 h. Data from a younger subsample (age 20–35 years) were also collected but not included in the present study.

### *Measures*

**Psychosocial Function.** Subjective age was measured by asking how old participants feel themselves to be [9]. Internal and external control beliefs were assessed with a 14-item questionnaire [24]. Perceived social integration was indicated by loneliness and availability of very close others. Loneliness was measured by seven items from the UCLA Loneliness Scale [25]. Participants were asked whether they have very close others, i.e., one or more persons that they 'feel so close to that it is hard to imagine life without them'. This question pertains to the first circle of the circle diagram [26].

**Matching Variables.** Age was calculated as the difference between the date of the baseline assessment (BASE) or the date that the take-home questionnaire was handed out (BASE II) and the participant's date of birth. Gender was a dichotomous variable (0 = men; 1 = women). Education was indicated by the number of years in formal schooling and standardized by cohort using data of reference groups ( $\geq 70$ -year-olds in 1990 for BASE: mean = 10.69 years, SD = 2.06, and  $\geq 60$ -year-olds in 2010 for BASE-II: mean = 11.83 years, SD = 2.72), established from the German Socio-Economic Panel (SOEP) [27], a representative sample of private households in Germany. Marital or partner status indicated whether participants were living with a spouse or partner (0 = no; 1 = yes). 29% of the initial unmatched BASE sample versus 59% of the initial unmatched BASE-II sample were living with a spouse or partner<sup>1</sup>.

In follow-up analyses, we controlled for four additional variables. The BASE (planned and started prior to the German reunification in 1990) only included participants from former West-Berlin and did not include residents of the former German Democratic Republic (GDR). In contrast, BASE-II included participants from both former West and East Germany. However, BASE-II par-

ticipants were asked whether they had lived in the GDR for at least 1 year prior to the German reunification<sup>2</sup>. Morbidity was indicated by self-reported and physician-observed diagnoses of moderate to severe illnesses [5, 28] largely based on the Charlson index categories [29]. Diagnoses were determined via participant reports and clinical examinations and were supported by additional blood laboratory assessments. Data on monthly household net income was collected at the baseline assessment in BASE and in 2012 in BASE-II and standardized using reference groups established via the SOEP [27];  $\geq 70$ -year-olds in 1990 for BASE (mean = EUR 1,330.34, SD = 1,653.60) and  $\geq 60$ -year-olds in 2012 for BASE-II (mean = EUR 2,476.04, SD = 3,016.89). Cognitive performance was measured with the Digit Symbol test [30]. Religious affiliation with a religious organization or group was indicated by a binary variable (0 = no; 1 = yes).

### *Data Preparation*

We used propensity score matching procedures [20] based on age, gender, cohort-normed education, and marital or partner status. The propensity scores were estimated with a logistic regression with cohort membership as the outcome variable and logit-transformed as recommended in the propensity score matching literature [20]. We used a 1:1 nearest neighbor matching with a caliper (i.e., maximum allowable distance between matched participants,  $c$ ) that was increased by steps of 0.01 until cohort differences in matching variables were no longer reliably different from 0 at  $p < 0.05$  ( $c = 0.15$  SD). We were able to identify a match for 153 participants in each sample. Table 1 gives descriptive statistics for study measures for the matched samples<sup>3</sup>.

<sup>1</sup> In BASE, participants were asked whether they were living alone (marital/partner status coded as 0) or not. Participants not living alone were asked whether they were living with a spouse or partner (marital/partner status coded as 1) or not (marital/partner status coded as 0). In BASE-II, participants were asked about their marital status. If they were married (or in civil union) and living together, marital/partner status was coded as 1. Other participants were asked whether a partner was living in the same household (marital/partner status coded as 1) or not (marital/partner status coded as 0). In both samples, the vast majority of participants living with a spouse or partner were married (95.9% in BASE and 94.1% in BASE-II). The majority of BASE participants not living with a spouse or partner were widowed (75.6%), whereas in BASE-II the majority of participants not living with a spouse or partner were divorced (51.9%). Higher rates of widowhood in BASE might have contributed to this cohort difference in marital/partner status.

<sup>2</sup> As there was little residential mobility between East and West Germany, this variable has been used to determine whether an individual had predominantly lived in East or West Germany prior to the reunification.

<sup>3</sup> Although cohort differences in matching variables were not reliably different from 0 at  $p < 0.05$ , it can be obtained in table 1, for example, that the BASE-II cohort was still somewhat younger than the BASE cohort after matching ( $d = -0.22$ ;  $p = 0.06$ ). Therefore, we conducted a follow-up analysis where cohort differences in matching variables were not allowed to exceed an effect size of  $d = 0.05$ . This was achieved with a caliper of  $c = 0.05$  SD units. There were 134 matched participants in each cohort. Confirming our findings with a less strict matching procedure, the later-born BASE-II cohort showed lower levels of external control beliefs ( $d = -0.93$ ) and loneliness ( $d = -0.62$ ).

**Table 1.** Descriptive statistics and cohort differences in study measures (samples matched based on age, gender, and cohort-normed education, and marital or partner status)

	BASE (n = 153)		BASE-II (n = 153)		F test	p	Cohen's d
	mean	SD	mean	SD			
Age, years (65–89 years)	74.77	3.26	74.07	3.18	F [1, 304] = 3.58	0.06	–0.22
Gender (0 = men; 1 = women)	0.48	0.50	0.48	0.50	F [1, 304] = 0.00	1.00	0.00
Cohort-normed education (–1.78 to 3.55)	0.39	1.10	0.38	0.98	F [1, 304] = 0.02	0.89	–0.01
Living with a spouse or partner (0 = no; 1 = yes)	0.46	0.50	0.48	0.50	F [1, 304] = 0.12	0.73	0.04
Subjective age, years (2–90 years)	64.56	9.93	64.81	9.12	F [1, 304] = 0.05	0.82	0.03
Internal control beliefs (1.33–5.00)	3.58	0.46	3.64	0.64	F [1, 274.8] = 0.87	0.35	0.11
External control beliefs (1.00–4.25)	2.72	0.55	2.16	0.56	F [1, 304] = 75.97	<0.01	–1.01*
Perceived social integration							
Loneliness (1.00–4.14)	2.03	0.65	1.62	0.65	F [1, 304] = 30.17	<0.01	–0.63*
Availability of very close others (0 = no; 1 = yes)	0.80	0.40	0.82	0.38	F [1, 304] = 0.34	0.56	0.05

The F test is based on one-way ANOVAs with test and (if necessary) correction for unequal variances and with cohort membership as the independent variable. Positive values of Cohen's d indicate higher values of the BASE-II cohort. Participants in the matched earlier-born BASE cohort were born 1901 through 1922 (mean = 1916; SD = 3.38 years) and those in the matched later-born BASE-II cohort 1925 through 1949 (mean = 1939; SD = 3.22 years). \* p < 0.05.

## Results

In this section, we will report findings on cohort differences in the matched samples as well as follow-up analyses that examine the robustness of these cohort differences.

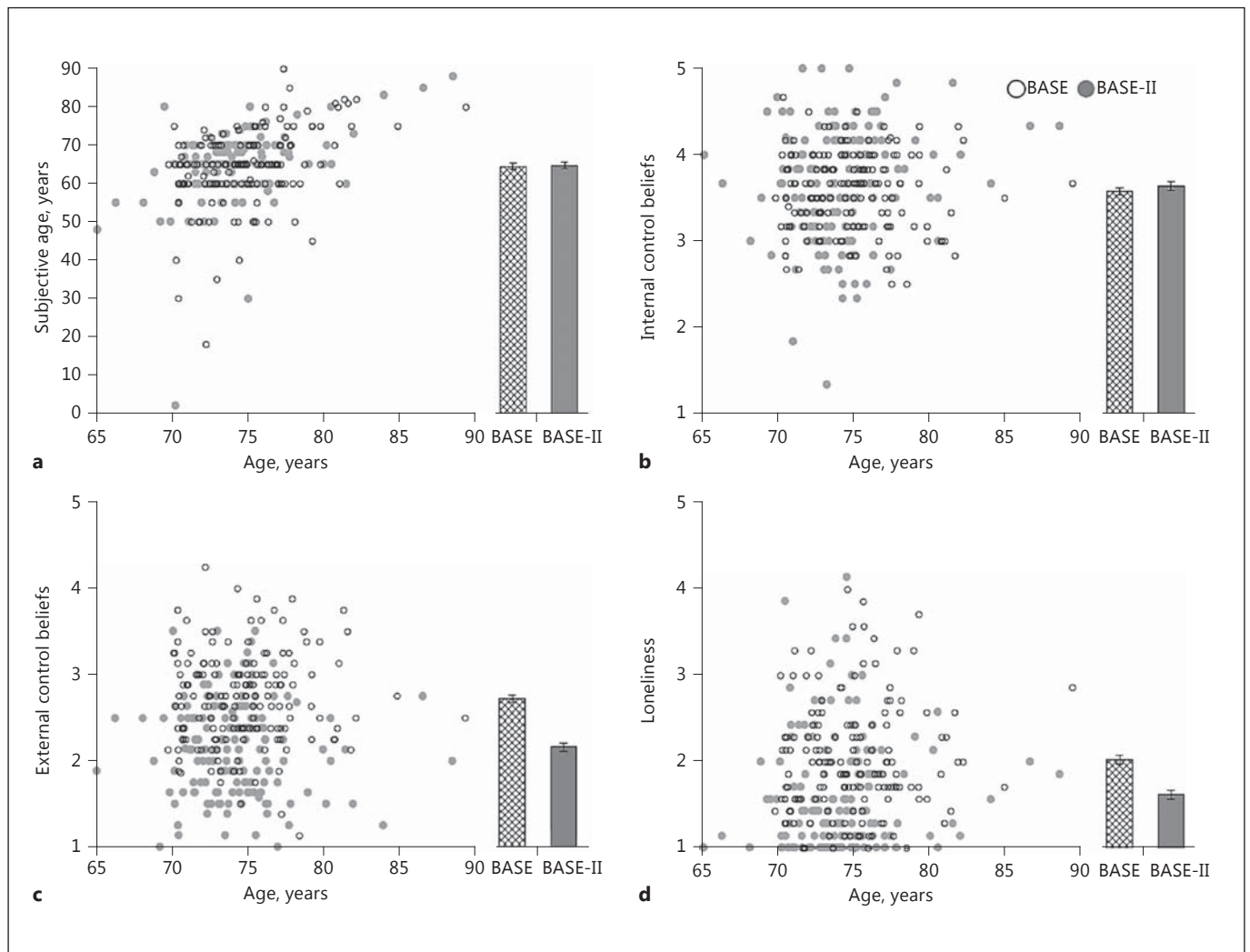
### *Cohort Differences in Psychosocial Function*

We conducted one-way ANOVAs with cohort membership (BASE vs. BASE-II) as the independent variable and each of the indicators of psychosocial function as the dependent variable. We tested and – if necessary – corrected for unequal variances. Table 1 shows the findings along with standardized mean differences between cohorts. The BASE-II sample reported lower levels of loneliness and external control beliefs (p < 0.05). The standardized effect size amounted to a full SD unit for external control beliefs and to about two thirds of a SD unit for loneliness. Effect sizes were similar for external control beliefs in powerful others (d = –0.71; p < 0.05) and in chance (d = –0.87; p < 0.05) [see 24] and for emotional (d = –0.53; p < 0.05) and social (d = –0.53; p < 0.05) loneliness [see 25]. Cohorts did not reliably differ in subjective age, availability of very close others, and internal control beliefs. No cohort differences were found for alternative operational definitions of subjective age, such as the absolute discrepancy between one's actual and subjective age [9] or the proportional discrepancy be-

tween one's actual and subjective age relativized by one's actual age [31]. Also, no cohort differences were found for internal control beliefs over positive and negative events [see 24]. Figure 1 illustrates average cohort differences and the amount of individual differences. Taken together, these findings provide evidence for historical improvements in some aspects of psychosocial function in old age.

### **Follow-Up Analyses**

We conducted five sets of follow-up analyses where we controlled for (1) having lived in the former GDR prior to the German reunification, (2) physical diseases, (3) cohort-normed household net income, (4) cognitive performance, and (5) the presence of a religious affiliation. To control for having lived in the former GDR prior to the German reunification, we excluded data from BASE-II participants who had lived in the former GDR for at least 1 year prior to the reunification and repeated our analyses. In the four other follow-up analyses, we added the control variables to our propensity score matching procedure. All five follow-up propensity score matching procedures resulted in smaller subsamples (ranging from n = 116 to 146 in each cohort). Our findings revealed the same pattern of cohort differences with similar effect sizes: in all sets of follow-up analyses, the later-born BASE-II



**Fig. 1.** Illustrating average cohort differences and individual differences in subjective age (a), internal control beliefs (b), external control beliefs (c), and perceived social integration (loneliness; d). The dots depict raw data from participants in the matched BASE (n = 153; open circles) and BASE-II (n = 153, closed 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 lower levels of loneliness and external control beliefs as compared to the BASE cohort (data obtained in 1990–1993).

sample reported lower levels of external control beliefs ( $d = -0.93$  to  $-1.07$ ;  $p < 0.05$ ) and loneliness ( $d = -0.43$  to  $-0.75$ ;  $p < 0.05$ ). In follow-up analyses controlling for the presence of a religious affiliation, a small cohort difference for internal control beliefs emerged ( $d = 0.23$ ;  $p < 0.05$ ), with the later-born BASE-II cohort reporting slightly higher levels of internal control beliefs. Cohorts did not differ in subjective age and availability of very close others in any of the follow-up analyses. Taken together, these findings suggest that cohort differences in our control variables cannot account for the observed dif-

ferences. However, other aspects of these factors not included in our analyses (e.g., physical functioning, subjective religiosity) might be relevant.

## Discussion

We examined cohort differences in psychosocial function in case-matched control samples of older adults assessed 20 years apart and found some evidence for secular improvements as indicated by lower levels of external

control beliefs and loneliness among the later-born BASE-II cohort (year of birth: mean = 1939; SD = 3.22 years; range = 1925–1949) relative to the earlier-born BASE cohort (year of birth: mean = 1916; SD = 3.38 years; range = 1901–1922).

To our knowledge, our study is the first to examine cohort differences in subjective age. Due to the lack of systematic documentation of historical changes in age stereotypes [but see 32], we are not able to fully understand the meaning of this finding. For example, if age stereotypes were less negative currently, older adults might be more comfortable endorsing a higher subjective age. Future research needs to focus on change in societal attitudes toward old age, as this will also be highly informative for future endeavors to change negative views of aging [10].

The later-born BASE-II cohort reported lower levels of external control beliefs. Although this finding was corroborated in analyses controlling for religious affiliation, more subjective aspects of religiosity (e.g., importance of religious beliefs [16]) which are also declining across cohorts [17] might nevertheless be relevant. Also, the biographies of individuals in the earlier-born cohort are probably to a greater extent shaped by major historical events on which the majority of them had no or little direct personal control, such as the Second World War. This might lead to higher external control beliefs among the earlier-born cohort.

We examined cohort differences in perceived social integration as indicated by loneliness and availability of very close others. Our findings showed that older adults feel less lonely currently. The increased longevity [19] and improved physical functioning [15] might allow older individuals to stay in contact with family and friends. Changing social norms might also be relevant. For example, a recent study found that the effect of divorce on social loneliness in old age was smaller in later-born cohorts, which may have resulted from increasing societal acceptance of divorce [33]. Likewise, increasing acceptance of less traditional ways of life [34] might lead a larger proportion of older adults to feel more accepted and less lonely. Older adults are the fastest growing segment of computer and Internet users [35]. Information technologies could play an important role in the social lives of the new generation of older adults by allowing them to keep in contact with family and friends, and to develop new social activities. In line with this reasoning, a meta-analytic study has shown that computer and Internet-based intervention programs have been successful in reducing loneliness among older adults [36].

## Limitations and Outlook

We note some limitations of our study. First, our sample only included few individuals in very old age, which is typically characterized by substantial functional declines [37, 38]. Based on our previous findings that cohort-related improvements in cognition and well-being do not extend into the last years of life [6, 39, 40], we would expect cohort differences in psychosocial function to become smaller in very old age. Also, BASE was a population-based sample, whereas BASE-II was a convenience sample. However, the response rate in BASE was rather low (27%) and participants completing the first measurement occasion were positively selected regarding education, health, and cognition [23]. From this we conclude that selectivity can occur independent of the recruitment method. Propensity score matching procedures were successful in making BASE and BASE-II samples comparable regarding sociodemographic characteristics. Both matched samples were more educated than the respective reference population, but the amount of selection was comparable across studies ( $d = 0.39$  in BASE and  $d = 0.38$  in BASE-II; see table 1).

Second, the administration of the study differed across cohorts (BASE: personal interview, BASE-II: take-home questionnaire). A recent study comparing mailed questionnaires versus questionnaires collected in person has found that participants reported more depressive symptoms and less positive affect in mailed questionnaires [41]. Applied to our study, a possible speculation is that our report was a more conservative test of historical improvement, which of course would need to be examined in more detail.

Third, variables that could explain our pattern of findings, such as age-related stereotypes, were not consistently available in both studies. Also, our study lacked consistent measures of social network size and structure and the measure of very close others was very basic. Although cohorts did not differ in this measure, it is possible that differences in social networks existed.

## Conclusions

Taken together, our findings from the Berlin Aging Studies (BASE and BASE-II) suggest that some important aspects of psychosocial function of older adults have improved across the two recent decades. Future research should explore underlying mechanisms and examine whether these advantages are maintained into more advanced ages.

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