

Postponing Old Age: Evidence for Historical Change Toward a Later Perceived Onset of Old Age

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“At what age would you describe someone as old?” Perceptions of when old age begins might be prone to upward shifts because of historical increases in life expectancy and in retirement age, as well as because of better psychosocial functioning in later life. We investigated historical changes in within-person trajectories of the perceived onset of old age using data from 14,056 participants who entered the German Ageing Survey at age 40–85 years and who completed up to eight assessments across 25 years. Using longitudinal multilevel regression models, we found that at age 64, the average perceived onset of old age is at about age 75 years. Longitudinally, this perceived onset age increased by about 1 year for every 4–5 years of actual aging. We also found evidence for historical change. Compared to the earliest-born cohorts, later-born cohorts reported a later perceived onset of old age, yet with decelerating trend among more recent birth cohorts. Within-person increases of the perceived onset of old age were steeper in later-born cohorts. The described cohort trends were only slightly reduced when controlling for covariates. Being younger, male, living in East Germany, feeling older, reporting more loneliness, more chronic diseases, and poorer self-rated health were each associated with a perceived earlier onset of old age. Our results suggest that there is a nonlinear historical trend toward a later perceived onset of old age, which might have meaningful implications for individuals’ perspectives on aging and old age.

Public Significance Statement


In this study, we observed that the perceived onset of old age, which describes from which age on individuals perceive a person as “old,” has changed across historical time. Middle-aged and older adults believe that old age begins later than did their peers 1 or 2 decades ago, yet the trend seems to be decelerating recently. Moreover, when getting older, people’s perceived onset of old age increases to a steeper extent today compared to the past. As the historical trend toward a postponed subjective onset of old age were still observable when controlling for sociodemographic, psychosocial, and health-related factors, more research is needed to understand why old age is perceived to begin increasingly later across historical time.


Keywords: subjective age threshold, birth cohort, midlife, old age, subjective age views


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DEAS Data can be obtained via the German Centre of Gerontology, Research Data Centre (<https://www.dza.de/en/research/fdz/access-to-data>;

German Centre of Gerontology, n.d.; for materials, questionnaires, interview codebook, see Engstler et al., 2022). The analytic code for the following analyses is available and part of the online Supplemental Material. Analyses and hypotheses were not preregistered. Preliminary findings related to this study were reported at the German Ageing Survey User Conference in Berlin (June 2023) and at the Fachgruppentagung Entwicklungspsychologie (Developmental Psychology Section conference of the German Psychological Society) in Berlin (September 2023).

Markus Wettstein played a lead role in conceptualization, formal analysis, and writing—original draft and an equal role in methodology, visualization, and writing—review and editing. Rinseo Park played a supporting role in formal analysis and software and an equal role in writing—review and editing. Anna E. Kornadt played a supporting role in writing—original draft and an equal role in conceptualization and writing—review and editing. Susanne Wurm played an equal role in conceptualization, investigation, and writing—review and editing. Nilam Ram played a supporting role in formal

continued

Most people have an idea when old age begins or from which age on they consider a person as “old” (e.g., Barrett & von Rohr, 2008). We refer to this concept as “perceived onset of old age” (Barrett & von Rohr, 2008). The predictive relevance of such perceived onset of old age and related concepts (e.g., the perceived age when midlife ends) for developmental outcomes has been demonstrated by studies showing that perceiving old age to start at older ages (or midlife to end later) is associated with better self-rated health and lower risks for coronary heart disease as well as for poor physical and mental health (Demakakos et al., 2007; Kuper & Marmot, 2003).

People who are chronologically older typically report later perceived onsets of old age (Ayalon et al., 2014; Cameron, 1969; Chopik et al., 2018; Drevstedt, 1976; Jurek, 2022; Kornadt & Rothermund, 2011), but most of the empirical evidence is based on cross-sectional data. Consequently, the noted age differences in perceived onset of old age might not necessarily solely reflect age effects, but also cohort effects—differences related to the historical time individuals were born and live in. Later-born cohorts might set the perceived beginning of old age later than do earlier-born cohorts. However, evidence of historical change in perceived onset of old age and its trajectories over time is very limited. Therefore, the aim of the present study is to fill this gap. Using data from the German Ageing Survey (DEAS), comprising a comprehensive study sample of more than 14,000 individuals who represent the birth cohorts 1911–1974 and who provided up to eight longitudinal observations over up to 25 years, we investigate whether and how within-person trajectories of perceived onset of old age have changed over historical time among middle-aged and older individuals living in Germany.

A Historical Change Perspective on Perceived Onset of Old Age

Demographic shifts and historical trends in key areas of functioning suggest that individuals’ conceptions of the beginning of old age may have changed over historical time. Because of increasing life expectancy, ages that had been considered “old” 20 years ago might no longer be considered old now. Indeed, an older perceived onset of old age was observed in European countries with higher life expectancies at age 65 compared to those countries with lower life expectancies (Augustyński & Jurek, 2021). Similarly, older median population ages and longer healthy life expectancies at age 60 are related to a later perceived onset of old age (Jurek, 2021). The well-documented ongoing population aging in Germany (German Federal Statistical Office, 2023a) might thus contribute to a later perceived onset of old age across subsequent birth cohorts. Also, studies have repeatedly shown that age stereotypes and views on aging are more negative in regions with rapid population aging (North & Fiske, 2015; Wolff et al., 2018) and in countries with a higher proportion of inhabitants aged 65 and older (Löckenhoff et al., 2009). Such population aging might promote negative age stereotypes and trigger “age-group dissociation” (Weiss & Freund, 2012; Weiss & Lang, 2012) so that individuals postpone the perceived onset of the undesired state of old age.

Historical trends in healthy life expectancy and in general health are less consistent (e.g., Crimmins et al., 2021; Deeg et al., 2019). Yet, in Germany, various dimensions of health have indeed improved in late life across historical time, including cardiovascular health (Bachus et al., 2019; König et al., 2018), incidence of dementia (Doblhammer et al., 2015), (severe) care need (Kreft & Doblhammer, 2016), and health-related quality of life (Klar et al., 2021). Such historical trends might translate into later perceived onset of old age, as individuals might consider someone as old only as soon as this person reveals a certain amount of health restrictions.

Jurek (2021) found that in countries with an older retirement age, the subjective onset of old age was later. Retirement age could be an “anchor” individuals rely on when they have to decide from which age on they consider someone as old. In Germany, the official retirement age had been set at 65 years for decades, but from 2012 on it has gradually been raised and will have reached the age of 67 in 2031 (Brussig et al., 2016; German Federal Statistical Office, 2023b).

Education is another potential contributor to individual perceptions of the old age onset (Ayalon et al., 2014; Kuper & Marmot, 2003; Toothman & Barrett, 2011). As pointed out by Ayalon et al. (2014), education is an indicator for socioeconomic status “which is highly correlated with many life course trajectories, including marriage, employment, and parenting” (p. 6). These transitions usually occur later among those with higher levels of education, so that these individuals might have a different mental concept of the life course and of the onset of different developmental steps than individuals with lower education. Therefore, individuals with higher levels of education might believe that old age starts later. Education might also affect the perceived onset of old age via its impact on health and longevity (Crimmins & Zhang, 2019). Education levels have increased over historical time in Germany (Becker & Mayer, 2019), which could contribute to trends toward a later perceived onset of old age as well.

Historical change in psychosocial functioning in later life may also be relevant. In particular, empirical findings suggest that older adults today perform better on cognitive tests (Degen et al., 2022; Gerstorf et al., 2023), report higher well-being (Hülür et al., 2016; Sutin et al., 2013), higher internal control beliefs, and fewer perceived constraints (Drewelies et al., 2018; Gerstorf et al., 2019) and are better socially embedded (Huxhold, 2019; Suanet & Huxhold, 2020) than older adults several decades ago. Yet, little is known about how these factors are associated with people’s perceptions of the onset of old age. One study found that greater life satisfaction as one indicator of well-being and psychosocial functioning is related to a later perceived onset of old age (Ayalon et al., 2014). It is possible that people are considered old once they have fallen below critical levels of functioning. When such thresholds are reached at older ages today, then presumably the subjective onset of old age is shifted to older ages as well.

All these considerations suggest that later-born cohorts might perceive old age to start later compared to earlier-born cohorts, but very few studies have empirically tested this. One exception are time-lagged cross-sectional comparisons of the European Social Survey (ESS) that found, based on an age-heterogeneous sample of

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individuals aged 15 years and older, remarkable historical increases in the perceived old age onset from 63.3 years in 2008 to 68.5 years in 2018, with a rise in Germany from Age 62 to Age 66 (Augustyński & Jurek, 2021).

Correlates of Perceived Onset of Old Age

Sociodemographic Factors

There is consistent evidence that older chronological ages are associated with later perceived onset of old age (Ayalon et al., 2014; Cameron, 1969; Chopik et al., 2018; Drevenstedt, 1976; Jurek, 2022; Kornadt & Rothermund, 2011). It is also known that women perceive a later start of old age (Ayalon et al., 2014; Barrett & von Rohr, 2008; Drevenstedt, 1976), and men seem to perceive that midlife starts and ends earlier than women (Kuper & Marmot, 2003; Toothman & Barrett, 2011). Also, people with lower education and with a lower socioeconomic status report midlife to end and old age to start earlier (Ayalon et al., 2014; Kuper & Marmot, 2003; Toothman & Barrett, 2011). Region of residence (East vs. West Germany, corresponding to the former borders between the Federal Republic of Germany the German Democratic Republic) may also be relevant because it is an indicator of regional and sociohistorical differences, and even decades after the German reunification social inequalities and economic disparities between East and West Germany still exist (e.g., differences in per-capita gross domestic product; German Federal Ministry for Economic Affairs & Energy, 2021), and they might affect psychosocial factors. For example, because West Germans typically report more favorable views on aging than East Germans (Diehl et al., 2021; Wettstein, Spuling, et al., 2023), it is possible that West Germans also perceive a later onset of old age than East Germans. Lower life expectancies among East Germans, particularly throughout the 1990s and 2000s, may also contribute to an earlier perceived onset of old age among East Germans than among West Germans.

Psychosocial Factors

Among the psychosocial factors, individual's subjective age might be an important factor. For example, a 60-year-old who feels like a 40-year-old may perceive the age of 60 years as not "old," whereas a 60-year-old who feels like a 65-year-old does. Indeed, people who feel younger have been found empirically to "postpone" the perceived end of midlife to older chronological ages (Toothman & Barrett, 2011). Likewise, people who were born later in historical time feel younger than their earlier-born peers (Wettstein, Wahl, et al., 2023; but see Wahl et al., 2022). Thus, if later-born cohorts of middle-aged and older adults feel younger than earlier-born cohorts, they might also set the onset of old age later.

Loneliness might also play a role because higher levels of loneliness are related to an older subjective age (Ayalon et al., 2016; Wettstein, Wahl, et al., 2023). Thus, those who report more loneliness might also perceive an earlier onset of old age.

Health-Related Factors

Finally, regarding *health-related factors*, associations of an earlier perceived onset of old age with health risks (Demakakos et al., 2007; Kuper & Marmot, 2003) suggest that health factors are indeed linked with individuals' subjective age thresholds. Specifically, better self-rated health is associated with a later perceived onset of old age (Ayalon

et al., 2014), and individuals with better self-rated health believe that midlife starts and ends later than individuals who rate their health less favorably (Kuper & Marmot, 2003; Toothman & Barrett, 2011).

Because several of these factors—particularly psychosocial and health-related indicators—are themselves subject to historical change, they might also to some extent contribute to historical postponement of the perceived beginning of old age. For example, the described historical change in Germany toward younger subjective ages (Wettstein, Wahl, et al., 2023), compression of life years with severe care need (Kreft & Doblhammer, 2016), and better cardiovascular health (König et al., 2018), but also historical changes, not only in Germany, toward lower levels of loneliness in mid- and later life (Hülür et al., 2016; Suanet & van Tilburg, 2019; Surkalim et al., 2023)—though rising levels of loneliness were observed for other age groups such as emerging adults (Buecker et al., 2021)—could contribute to historical upward trends and postponement of the perceived start of old age. We therefore investigate if the cohort effect in perceived onset of old age is observed and similar in size with and without consideration of sociodemographic, psychosocial, and health-related factors. Finally, associations of the perceived start of old age with sociodemographic, psychosocial, and health-related characteristics might as well change across historical time. Therefore, we also analyze interaction effects of these factors with birth cohort on perceptions of the old age onset.

The Present Study

We investigate historical changes in trajectories of perceived onset of old age, based on a large nationwide sample ($n = 14,056$) of middle-aged and older adults representing the birth cohorts from 1911 to 1974 in Germany. Specifically, using data provided during participation in the German Ageing Survey (DEAS) on up to eight occasions over 25 years (1996–2021), we test the following hypotheses:

1. Later-born adults perceive a person as "old" at an older age compared to earlier-born adults. There might also be historical changes in the extent to which the perceived onset of old age changes within individuals over time. To our knowledge, this has not yet been investigated by any empirical study so far, so we will investigate historical changes in within-person trajectories of perceived beginning of old age in an exploratory way without deriving an a priori hypothesis.
2. We examine how specific sociodemographic indicators (chronological age, gender, West vs. East Germany, education), psychosocial factors (subjective age and loneliness), and health-related factors (number of chronic diseases and self-rated health) are related to interindividual and historical differences in the perceived onset of old age. Birth cohort might act as a moderator of associations between these factors and perceptions of old age onset, so that relations between perceived onset of old age and sociodemographic, psychosocial, and health-related characteristics might be stronger or weaker across successive birth cohorts.

Method

Transparency, Openness, and Data Availability

We used data from the German Ageing Survey (DEAS) for our analyses, which can be obtained via the German Centre of Gerontology,

Research Data Centre (German Centre of Gerontology, n.d.; for materials, questionnaires, interview codebook, see Engstler et al., 2022). Our statistical analysis code for the analyses is available in the online Supplemental Material. The study design, hypotheses, and analytic plan of the present article were not preregistered. In the following section, we report how we determined our sample size, any data exclusions, all data preparations, and all measures that were used for our analyses.

Sample

The German Ageing Survey (Klaus et al., 2017) is a cohort-sequential, nationwide study of individuals who were aged 40–85 years at the time of their study entry. The initial study sample was drawn in 1996 and new samples were added in 2002, 2008, and 2014. Individuals were (re-)assessed in 1996, 2002, 2008, 2011, 2014, 2017, 2020 (Summer), and 2020/21 (Winter). Given its cohort-sequential design, data from the German Ageing Survey have frequently been used to empirically address historical shifts, for example, in subjective age (Wettstein, Wahl, et al., 2023), subjective well-being across the retirement transition (Henning et al., 2022), and social embeddedness (Huxhold, 2019), and to disentangle age and cohort effects (Spuling et al., 2015). These prior studies used methods such as growth curve analyses, multigroup latent regression models, or multigroup latent change score models. Inclusion criteria included being age 40–85 years at study entry, community-dwelling, residing in Germany, ability to understand and speak German, and—only in 1996 and 2002, but not thereafter—German citizenship. Apart from the citizenship exception, the random sampling procedure and inclusion criteria were kept strictly parallel (e.g., same sampling approach via registration offices; same contacting approach, same stratification by age, gender, region of residence) across all measurement occasions to warrant comparability of the study samples. The vast majority of individuals who have participated so far ($n = 19,745$; 95.3%) have a German citizenship ($n = 19,745$; 95.3%); 9.3% ($n = 1,921$) reported to have migration background (see also Klaus & Baykara-Krumme, 2017).

The sizes of the newly drawn samples in 1996, 2002, 2008, and 2014 ranged from $n = 3,084$ (2002) to $n = 6,205$ (2008). From 2008 on, sample sizes were $n > 6,000$ to ensure that each category of every stratification variable (age group, gender, and region of residence) as well as every cross-categorization (e.g., older men in East Germany) are sufficiently represented for in-depth group-specific analyses (Klaus et al., 2019).

For the present study, we used observations from 14,056 individuals (mean age = 61.20 years, $SD = 11.90$ years; birth cohorts: 1911–1974) who provided one or more valid scores on the study variables (including the correlates) on at least one measurement occasion between 1996 and 2021. The German Ageing Survey consists of two parts, an interview and a self-administered questionnaire. Not all individuals filled out the questionnaire after the interview, so that missing values are to a large extent due to missing questionnaire data. Also, we set 189 outliers for subjective age as well as 219 outliers for perceived onset of old age to missing, which is explained in more detail below. The final analysis was based on 34,490 observations of perceived onset of old age (mean number of observations = 2.71, range 1–8) nested within 14,056 individuals nested within 280 municipalities.

Individuals provided informed consent before participating in the survey, and they were informed that they can withdraw their consent any time. The German Ageing Survey maintains an academic advisory board to ensure the scientific quality of the survey. Ethics approvals for this specific analysis were not obtained from a specific organization nor needed because, in Germany, general surveys that do not employ any invasive methods and do not impose any additional risks on the study participants are considered exempt from mandatory ethics review.

Measures

Perceived Onset of Old Age

Study participants' perceived onset of old age was assessed at multiple occasions as response to the question, "At what age would you describe someone as old?" Responses were coded as number of years. Following usual practice in studies of subjective age (e.g., Stephan et al., 2018), scores more than 3 SD above or below the mean were recoded as missing values. In total, 219 scores (<1.2% of all scores per measurement occasion) were set to missing.¹

Historical Time

Historical time was operationally defined using a continuous year of birth variable that ranged from 1911 to 1974. For analysis, birth cohort was centered at 1944. For the sake of graphical illustration only, we categorized individuals into three cohort groups: Those born between 1911 and 1935 ($n = 3,600$), between 1936 and 1951 ($n = 6,256$), and between 1952 and 1974 ($n = 4,227$). This distinction is somewhat arbitrary, as any distinction of cohort groups, but was chosen to maximize age overlap between the cohort groups (see Figure 1).

Time in Study

Time in study was assessed as years since an individual's first report. Scores were person-centered at each individual's median time in study. That is, for an individual who provided all eight reports over 25 years, time in study centered at $25/2 = 12.5$ years ranged from -12.5 to $+12.5$.

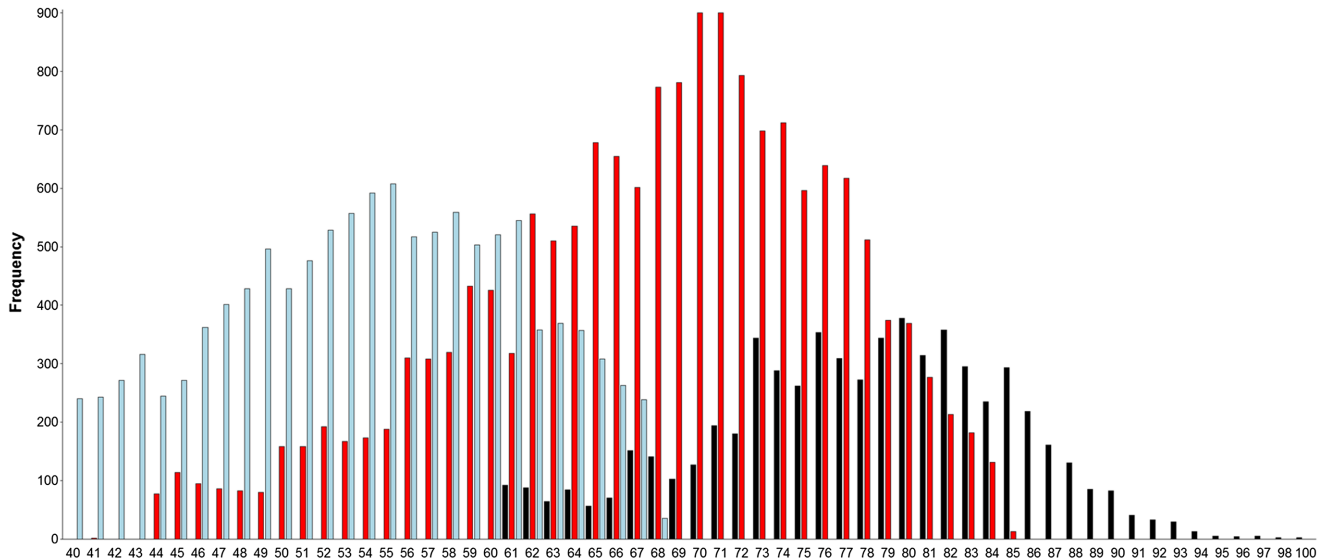
Chronological Age

Chronological age was operationalized as a time-invariant variable, specifically years since birth at an individual's median

¹ The same substantive pattern of results as reported in the main text was obtained when including all outliers in the analyses; we compared the effects of year of birth (model without outliers and without correlates: $\gamma_{010} = 0.057$; model with outliers and without correlates: $\gamma_{010} = 0.056$; model without outliers and with correlates: $\gamma_{010} = 0.055$; model with outliers and with correlates: $\gamma_{010} = 0.052$), Birthyear \times Birthyear (model without outliers and without correlates: $\gamma_{011} = -0.004$; model without outliers and without correlates: $\gamma_{011} = -0.004$; model without outliers and with correlates: $\gamma_{011} = -.002$; model with outliers and with correlates: $\gamma_{011} = -.003$) and Birthyear \times Time (model without outliers and without correlates: $\gamma_{18} = 0.019$; model without outliers and with correlates: $\gamma_{18} = 0.019$; model without outliers and with correlates: $\gamma_{18} = 0.021$; model with outliers and with correlates: $\gamma_{18} = 0.023$) across the models without versus. with outliers and obtained very similar coefficient estimates. We report the findings based on analyses with exclusion of outliers as the number of excluded values was very low (0.6% of all observations) and values regarded as outliers for perceived onset of old age included ages >130 years, which exceeds the known human lifespan.

Figure 1

Frequency of Observations Across Chronological Age Separated for Three Birth Cohorts (1911–1935, Black Bars; 1936–1952, Red Bars; 1953–1974, Blue Bars) as Pooled Across All Available Measurement Occasions of the German Ageing Survey



Note. The age trajectories exhibited a remarkable overlap between the three birth cohorts: From age 61 years to age 68 years for all three cohorts; from age 61 years to age 85 years for the cohort born 1911–1935 and born 1936–1951; and from age 44 years to age 68 years for the cohort born 1936–1951 and those born 1952–1974. See the online article for the color version of this figure.

time in study. For analysis, the chronological age variable was centered at 64 years.

Correlates

We made use of a set of time-invariant sociodemographic, psychosocial, and health correlates.

Sociodemographic Correlates. *Year of study entry* (1996, 2002, 2008, 2014; reference category is 1996) was included (by specifying three dummy-coded variables) because study participants who already joined the study in 1996 and still took part in 2021 might be more positively selected than those whose study entry was in 2014. *Gender* was assessed in the German Ageing Survey as a binary variable (male and female). *Education* was assessed based on the International Standard Classification of Education (ISCED) coding (United Nations Educational, Scientific and Cultural Organization, 2012). This coding takes school and professional education into account to obtain a variable distinguishing four educational levels (low, medium, elevated, and high education). *Region of residence* distinguished individuals living in West versus East Germany.

Psychosocial Correlates. *Loneliness* was assessed using the six-item De Jong Gierveld loneliness scale (Gierveld & Tilburg, 2006; Cronbach's α for the different samples at their baseline assessment in 1996, 2002, 2008, 2014: .82, .82, .83, .81). *Subjective age* at baseline was assessed with the standard approach (e.g., Kotter-Grühn et al., 2015), by asking the study participants "How old do you feel?" Following usual practice (e.g., Stephan et al., 2018), subjective age was transformed and age-standardized into a subjective age proportional discrepancy score ([subjective age – chronological age]/chronological age; Rubin & Berntsen, 2006). Scores that were 3 or more *SDs* above or below the mean were

treated as outliers and recoded as missing values (189 of originally 19,143 values, <1%).

Health Correlates. *Health* at baseline was operationalized using two variables: number of chronic diseases reported by the study participants, based on a list of 11 diseases (e.g., diabetes, cancer, cardiovascular diseases; Wurm et al., 2007), and self-rated health (single-item question; "How would you rate your current health?"; 1 = *very good* to 5 = *very poor*).

Data Analysis

Time-, age-, and history-related differences in perceived onset of old age were examined using multiple-timescale growth models (Ram & Grimm, 2015). Specifically, the repeated measures of participants' perceived onset of old age were modeled as

$$\text{onset}_{ij} = \beta_{0ij} + \beta_{1ij}(\text{timeinstudy}_{ij}) + e_{ij}, \quad (1)$$

where perceived onset of old age score of person i from municipality j at observation t , onset_{ij} , is modeled as a function of a person-specific intercept coefficient, β_{0ij} ; a person-specific linear slope coefficient β_{1ij} ; and residual error, e_{ij} that is assumed normally distributed with variance σ_e^2 . Interindividual differences in the person-specific coefficients were simultaneously modeled as

$$\begin{aligned} \beta_{0ij} = & \gamma_{00} + \gamma_{01}(\text{age}_i) + \gamma_{02}(\text{birthyear}_i) + \gamma_{03}(\text{birthyear}_i \times \text{age}_i) \\ & + \gamma_{04}(\text{birthyear}_i^2) + \dots + u_{0i} + v_{00j}, \end{aligned} \quad (2)$$

$$\begin{aligned} \beta_{1ij} = & \gamma_{10} + \gamma_{11}(\text{age}_i) + \gamma_{12}(\text{birthyear}_i) \\ & + \gamma_{13}(\text{birthyear}_i \times \text{age}_i) + \dots + u_{1i}, \end{aligned} \quad (3)$$

where the γ s are sample-level parameters that describe how aspects of the within-person trajectories (i.e., intercepts and slopes) differ in relation to chronological median age (age_i) and historical time (birthyear $_i$), and u_{0i} and u_{1i} are unexplained individual differences that are assumed to be multivariate normally distributed with variances, σ_{u0}^2 and σ_{u1}^2 , and covariance σ_{u0u1} . The term v_{00j} is used to accommodate the possibility that participants within the same municipality (municipality $_j$) were more similar than participants from different municipalities, specifically by isolating systematic district-level differences in intercepts as variance σ_{v00}^2 . Additional terms that could accommodate potential nonlinearity in the trajectories (with $timeinstudy_{it}^2$) and in the cohort and age differences (birthyear $_i^2$ and age $_i^2$) were tested, but of these terms, only birthyear $_i^2$ was statistically significant and included in the final model.

The role of the year of study entry and of sociodemographic (gender, education, and region of residence), psychosocial (subjective age and loneliness at baseline), and health factors (multimorbidity and self-rated health at baseline) was examined by including these variables as additional predictors (along with interactions with birthyear $_i$) in Equations 2 and 3. To maintain parsimony of presentation, only those interaction terms that were statistically significant were kept in the final models.

Multilevel models were fitted with survey weights to adjust for sample selectivity (Carle, 2009; Rabe-Hesketh & Skrondal, 2006). Prior work on the DEAS has revealed potential factors contributing to sample selectivity and selective dropout (Klaus et al., 2017, 2019). First, as survey participation is of course voluntary, probabilities of selection are unequal across and within different samples (those entering the survey in 1996, 2002, 2008 or 2014) and their subpopulations. Selectivity of the samples may result from intentional oversampling of specific groups (e.g., the oldest age group was oversampled in all baseline samples 1996–2014; see Klaus et al., 2017); decreasing participation rates in surveys over time (Luiten et al., 2020), also across the DEAS samples from 1996 to 2014 (Klaus et al., 2019); and differential attrition during the longitudinal data collection processes. Selective dropout is likely in that not all participants participated at all possible measurement occasions, and, even among individuals who participated in the interview at each measurement occasion, not all of them completed the questionnaire after the interview. Because perceived onset of old age, the outcome variable of the present study, was assessed as part of the questionnaire, the “questionnaire samples” that are particularly relevant to this study might be more selective than the “interview samples.”

Accordingly, we incorporated survey weights into the analyses to improve sample representativeness. The DEAS provides cross-sectional survey weights that are specifically developed for the questionnaire samples at each measurement occasion (for details, see Klaus et al., 2017), adjusting for differences in the distributions of demographic characteristics, such as age group, region of residence, and gender, between the samples and the target populations. After weighting, the DEAS questionnaire samples are representative of the German Microcensus obtained from the Federal Statistical Office in each relevant year.

In the context of multilevel modeling, we performed scaled-weighted analyses following the approach outlined in Carle (2009). Specifically, a wave-specific Level-1 weight $w_{it}^{(1)}$ for each time t for a given individual i , is obtained as the fraction of two weights,

$$w_{it}^{(1)} = w_{it}/w_i^{(2)}, \quad (4)$$

where w_{it} is an observed cross-sectional weight, and $w_i^{(2)}$ is an individual-specific Level-2 weight. Consistent with the previous literature recommendations, we employed individual cross-sectional weights for their entry assessment (e.g., if individual i entered in the sample in 1996, $w_i^{(2)} = w_{1996,i}$) as Level-2 weights; and we scaled the wave-specific Level-1 weights so that the new weights sum to the individual sample size. This process of weighting reduces potential biases and enhances the robustness of fixed effects estimates (also called as Method A in Carle, 2009; Method 2 in Rabe-Hesketh & Skrondal, 2006). Supplemental Material include results obtained using alternative scaling techniques (i.e., unweighted, weighted without scaling, weighted using Method B; see the online Supplemental Material).²

Weighted multilevel models were fitted in R “lme4” package using wave-specific Level-1 weights and study entry variables as auxiliary variables (Lee et al., 2019). Given the large sample size and potential for commission of Type-I errors, statistical significance was evaluated using $\alpha < .001$. Post hoc statistical power sensitivity analysis indicated that the 34,490 observations nested within 14,056 individuals nested within 280 municipalities provided sufficient statistical power (>80%) to detect standardized effect sizes of at least .025 for the within-person time effects, of at least .065 for the between-person effects (e.g., age, birthyear), and of at least .065 between-within interaction effects (e.g., Birthyear \times Time) at $\alpha = .001$.

Results

Table 1 provides a description of study variables at baseline and their intercorrelations (means and correlations were computed including the cross-sectional survey weights, and accounting for the clustering of municipalities). Participants’ mean chronological age at baseline was 58.1 years, whereas their subjective age was on average 13% younger than their chronological age. The mean perceived onset of old age was about 73 years. Older chronological age was correlated with a later perceived onset of old age, $r = .24$.

Time-, Age-, and History-Related Differences in Perceived Onset of Old Age

In the model without correlates, the prototypical individual’s perceived onset of old age was $\gamma_{00} = 74.7$ years at age 64 years and increased by about 2 years over 10 years of time ($\gamma_{10} = 0.185$, $p < .001$). The perceived onset of old age differed with chronological age, $\gamma_{01} = 0.212$, $p < .001$, indicating that for every 10 year difference in chronological age, perceived onset of old age was about 2 years higher. To give an example, for a 64 year old, the estimated perceived onset of old age was 74.7 years, whereas for a 74 year old, the estimated perceived onset of old age was 76.8 years. An older chronological age was also associated with a steeper

² Comparing the effects of birthyear (γ_{010}), Birthyear \times Birthyear (γ_{011}) and Birthyear \times Time (γ_{18}) across the different models with different weighting and nonweighting approaches, the effects of these terms were statistically significant across all models and similar in size (models without correlates: $0.057 \leq \gamma_{010} \leq 0.063$; $-0.004 \leq \gamma_{011} \leq -0.004$; $0.017 \leq \gamma_{18} \leq 0.019$; models with correlates: $0.055 \leq \gamma_{010} \leq 0.057$; $-0.003 \leq \gamma_{011} \leq -0.002$; $0.018 \leq \gamma_{18} \leq 0.021$).

Table 1
Descriptive Statistics at Baseline Assessment and Intercorrelations for Study Measures

Study variable	M	SD	Intercorrelation														
			1	2	3	4	5	6	7	8	9	10	11	12	13		
1. Perceived onset of old age (47–100)	73.00	6.67	—														
2. Year of birth (1911–1974)	1948	14.00	-.22	—													
3. Age (40–85)	58.00	12.10	.24	-.87	—												
Year of study entry: 1996 (reference)	26.4%																
4. 2002	15.2%		.04	-.09	-.02	—											
5. 2008	30.2%		.01	.12	-.01	-.28	—										
6. 2014	28.2%		-.03	.38	-.00	-.26	-.41	—									
7. % Women	52.5%		.15	-.05	.04	-.00	-.01	-.00	—								
8. % East Germany	19.1%		-.07	-.02	.00	.01	-.00	-.02	.00	—							
9. Education	2.41	0.96	-.04	.23	-.19	-.03	.04	.10	-.21	.06	—						
10. Loneliness	1.78	0.57	-.12	.03	-.03	-.05	.00	.03	-.06	-.04	-.06	—					
11. Number of chronic diseases	2.22	1.83	.01	-.36	.39	-.04	-.07	.02	.03	.01	-.14	.17	—				
12. Self-rated health	2.43	0.86	-.06	-.23	.25	-.01	-.04	.00	.02	.05	-.18	.19	.46	—			
13. Subjective age	-0.13	0.11	-.10	-.10	.10	.02	-.00	-.03	-.07	.05	-.04	.07	.16	.27	—		

Note. Means and correlations based on analyses including cross-sectional survey weights and stratified by municipalities. *N* = 14,056. Scores for subjective age, proportional discrepancy score: (subjective age—chronological age)/chronological age, reported for baseline assessment at T1. Intercorrelations of *r* = .03 or above differ statistically significant from zero at *p* < .001.

increase in the perceived onset of old age over time ($\gamma_{11} = 0.015, p < .001$). For a 64 year old, perceived onset of old age increased by about 1.9 years over 10 years time, whereas for a 74 year old, perceived onset of old age increased by about 3.4 year over 10 years time.

In line with our first hypothesis, individuals in later-born cohorts reported later perceived onsets of old age, $\gamma_{02} = 0.06, p < .001$, but with some concave curvature across cohorts, $\gamma_{04} = -0.004, p < .001$. Specifically, as can be seen in Figure 2, persons born after 1935 reported a later perceived onset of old age than those born between 1911 and 1935, but there was no noticeable difference between those born between 1936 and 1951 and those born between 1952 and 1974.

Time-related change in the perceived onset of old age also differed across cohorts ($\gamma_{12} = 0.019, p < .001$): Later-born cohorts exhibit a steeper within-person change toward a later perceived onset of old age, whereas there was even a decrease in the perceived onset of old age over time in the earliest-born cohort (see Figure 2). For instance, the perceived onset of old age for an individual aged 64 years born in 1944 is expected to increase by 1.9 years over 10 years time, whereas the perceived onset of old age for an individual aged 64 years born in 1934 is expected to increase only 0.05 years over 10 years (which is less than 1 month).

Role of Study, Sociodemographic, Psychosocial, and Health Factors

In a model that included sociodemographic, psychosocial, and health correlates (right column in Table 2 and Figure 2 right panel), there was evidence that some of these factors were related to interindividual differences in perceived onset of old age. However, most important for our research question, these variables did not fully account for the cohort differences in perceived onset of old age. Whereas the linear birthyear effect was now no longer significant at *p* < .001, its size was not very different compared to the unadjusted model ($\gamma_{02} = 0.055, p = .003$, unadjusted model $\gamma_{02} = 0.057, p < .001$). The quadratic birthyear effect indicating a concave cohort

pattern remained statistically significant, though its size was smaller than in the unadjusted model ($\gamma_{04} = -0.002, p < .001$, unadjusted model $\gamma_{04} = -0.004, p < .001$). Significant effects of time, age, Age × Time, and Birthyear × Time from the “unadjusted” model described above remained significant in the model with correlates.

Regarding effects of the correlates, women had a subjective onset of old age that was on average about 2.4 years higher than the one of men. In addition, we found a significant interaction effect of gender with birth cohort ($\gamma_{27} = 0.062, p < .001$): The difference between women and men regarding their perceived onset of old age was larger for later-born cohorts. While this gender difference amounted to 2.4 years for those born in 1944, it is as large as 4.3 years for those born in 1974, driven by larger linear historical increase in the perceived onset of old age among women (1.2 years per decade born later) than among men (0.6 years per decade later born; see Figure 3).³ In addition, individuals living in East Germany ($\gamma_{05} = -1.39, p < .001$), reporting greater loneliness ($\gamma_{08} = -1.00, p < .001$), more chronic diseases ($\gamma_{06} = -0.138, p < .001$), poorer self-rated health ($\gamma_{07} = -0.589, p < .001$), and an older subjective age ($\gamma_{29} = -6.511, p < .001$) had an earlier perceived onset of old age.

In contrast to the differences in perceived onset of old age at age 64, differences in rate of within-person change in the perceived onset of old age were not significantly related to any of these correlates, with one exception: Those who entered the survey in 2002 revealed a less steep increase in perceived onset of old age over time ($\gamma_{24} = -0.130, p < .001$).

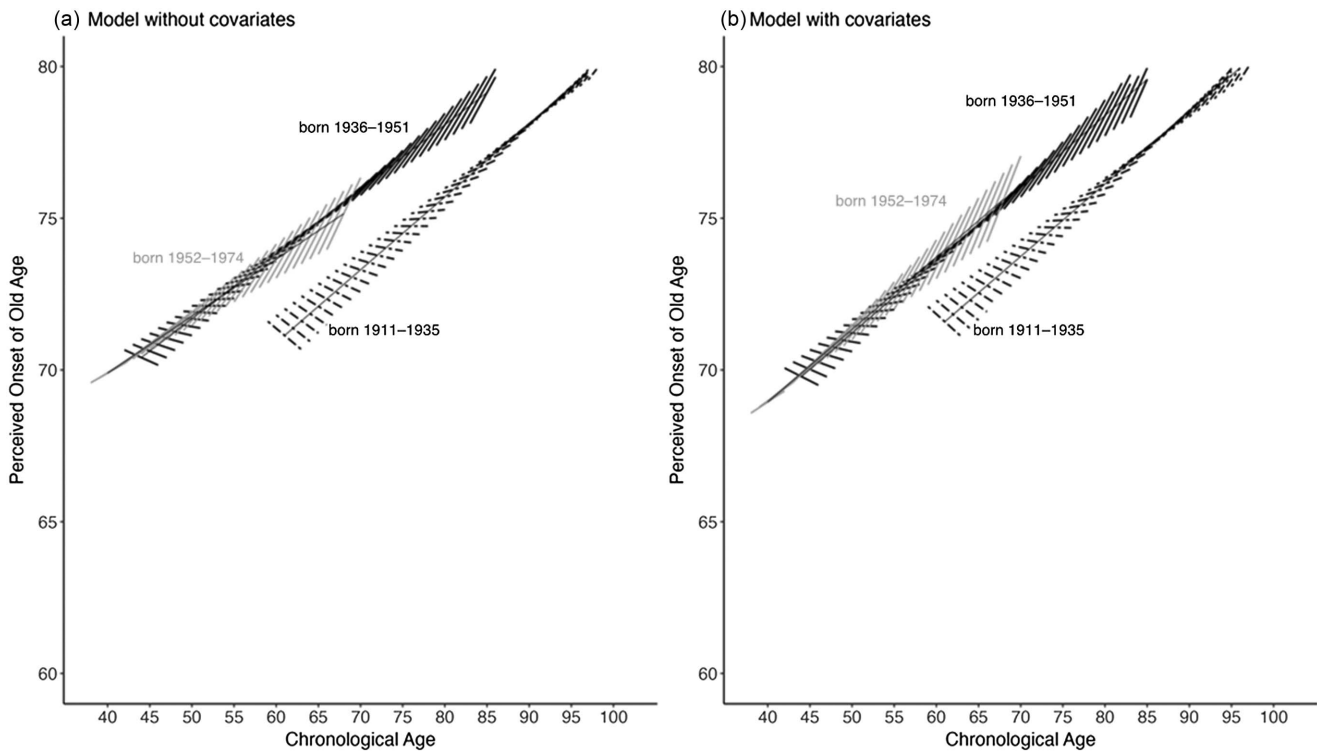
Discussion

In this study, we investigated historical change in the perceived onset of old age, based on a sample of middle-aged and older adults from the German Ageing Survey. We found that on average, people

³ To investigate if the associations of our included correlates with perceived onset of old age vary according to gender, we included Gender × Correlate interactions as part of additional models. All of these interaction terms were not statistically significant (*p* > .001), apart from the already reported interaction of gender with year of birth.

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Figure 2
Birth Cohort Differences in Perceived Onset of Old Age



Note. Left Panel (a): Model without covariates. Right Panel (b): Model with covariates. Historical changes in the perceived onset of old age. Three birth cohorts (1911–1935; 1936–1951; 1952–1974) are distinguished for convenience of plotting. The short thick lines (dashed lines for cohort 1911–1935; black solid lines for cohort 1936–1951; grey solid lines for cohort 1952–1974) indicate estimated 5-year change of the perceived onset of old age across different chronological ages. At the same age, later-born cohorts perceive a higher (i.e., later) onset of old age than earlier-born cohorts. Likewise, later-born cohorts exhibit steeper within-person changes toward a later perceived onset of old age than earlier-born cohorts. Being chronologically older is associated with a higher (i.e., later) onset of old age and also steeper increases in that perceived onset over time.

in their mid-60s perceive that old age starts at around age 75. Perceived onset of old age was found to change across historical time in a nonlinear way: At age 64, people born later than 1911 (which was the earliest-born cohort) reported an increasingly later perceived onset of old age, but with some deceleration of the trend for those born after 1956.

Being born later was also associated with steeper within-person increases of the perceived onset of old age. This historical difference in perceived onset of old age remained similar in size when controlling for sociodemographic, psychosocial, and health-related factors. Being younger, male, living in East Germany, feeling older as well as reporting more loneliness, more chronic diseases, and poorer self-rated health were each associated with a perceived earlier onset of old age.

A Historical Change Perspective on Perceived Onset of Old Age

In general, our finding of a historical trend toward a later perceived onset of old age is in line with those obtained in cross-sectional time-lagged analyses carried out by Augustyński and Jurek (2021) who had used data from the European Social Survey (ESS). They observed that in Germany, people perceived old age to start at

Age 61.9 years in 2008 and at Age 66 years in 2018. However, the perceived onset of old age is lower in their study, and the estimated extent of historical change is larger than in our study. Three points are of note to put these discrepancies in perspective. First, such discrepancies could be due to different question wordings (ESS: “At what age, approximately, would you say women/men reach old age?”; this study: “At what age would you describe someone as old?”). Second, having only two measurement occasions available, Augustyński and Jurek (2021) could not investigate nonlinear trends of historical change; according to our findings, however, historical change in perceived onset of old age might indeed be nonlinear and decelerating among more recently born cohorts. Third, the two study samples cover different age ranges. Specifically, the youngest participants of the ESS were age 15 years, whereas in the German Ageing Survey, the youngest study participants were age 40 years. Given the established association of older chronological age with later perceived onsets of old age (Cameron, 1969; Chopik et al., 2018; Drevenstedt, 1976; Jurek, 2022; Kornadt & Rothermund, 2011), which we also found in this study, the inclusion of adolescents and young adults in the ESS might have resulted in an earlier average perceived onset of old age compared to our study. Interpolation based on the age effect we found would suggest that individuals aged 25 rather than 65 would set the perceived old age at

Table 2
Growth Models of Perceived Onset of Old Age: The Role of Chronological Age, Year of Birth, and Correlates

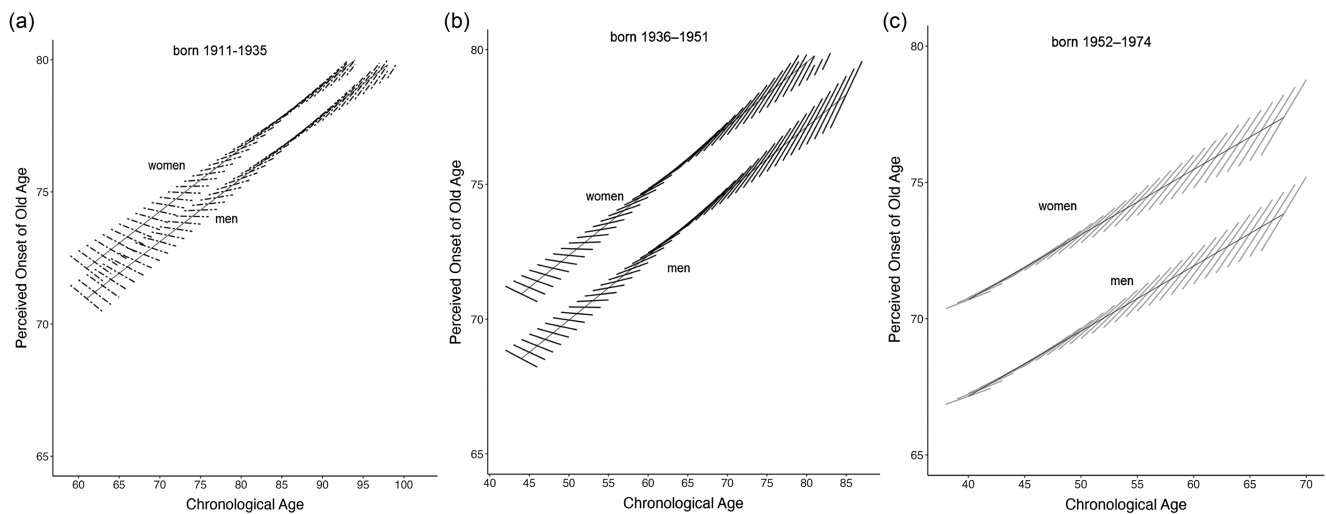
Predictor	Perceived onset of old age			
	Without covariate		With covariate	
	Est.	SE	Est.	SE
Fixed effects				
Intercept γ_{00}	74.67***	0.11	74.56***	0.189
Time γ_{10}	0.185***	0.011	0.234***	0.017
Age γ_{01}	0.212***	0.011	0.239***	0.019
Age \times Time γ_{11}	0.015***	0.002	0.019***	0.005
Correlates				
Women γ_{28}			2.404***	0.121
East Germany γ_{05}			-1.387***	0.181
Education γ_{09}			0.094	0.067
Loneliness γ_{08}			-1.004***	0.108
Diseases γ_{06}			-0.138***	0.038
Self-rated health γ_{07}			-0.589***	0.082
Subjective age γ_{29}			-6.511***	0.552
Study entry 2002 (Ref. 1996) γ_{14}			0.455	0.211
Study entry 2008 γ_{15}			-0.035	0.250
Study entry 2014 γ_{16}			-0.432	0.321
Women \times Time γ_{17}			0.014	0.018
East Germany \times Time γ_{18}			0.037	0.019
Education \times Time γ_{19}			0.007	0.010
Loneliness \times Time γ_{20}			0.054	0.017
Diseases \times Time γ_{21}			-0.007	0.006
Self-Rated Health \times Time γ_{22}			0.022	0.013
Subjective Age \times Time γ_{23}			0.102	0.083
Study Entry 2002 \times Time γ_{24}			-0.130***	0.031
Study Entry 2008 \times Time γ_{25}			-0.097	0.042
Study Entry 2014 \times Time γ_{26}			0.040	0.061
Cohort				
Birthyear γ_{02}	0.057***	0.009	0.055	0.018
Birthyear γ_{04}	-0.004***	0.001	-0.002***	0.000
Birthyear \times Time γ_{12}	0.019***	0.002	0.021***	0.005
Birthyear \times Age γ_{03}	-0.001	0.001		
Birthyear \times Women γ_{27}			0.062***	0.009
Random effects				
Var. intercept, σ_{u0}^2	34.603		30.774	
Var. time, σ_{u1}^2	0.126		0.122	
Correlation intercept slope, r_{u0u1}	-.08		-.07	
Var. municipalities, σ_{r00}^2	1.426		0.924	
Residual variance, σ_e^2	28.010		28.026	
Var. explained in intercept	0.103		0.202	
Var. explained in time	0.004		0.035	

Note. $N = 14,056$ from 280 municipalities who provided 34,490 observations. Subjective age: proportional discrepancy score = (subjective age—chronological age)/chronological age. Likelihood ratio tests comparing (a) a model without a random municipalities component with the full model and (b) a model without a random intercept and time slopes with the full model both indicated a significant difference ($p < .001$), so that all random components can be considered as statistically significant. Unstandardized estimates and standard errors are presented. Age represents the median of all observations per participants and was centered at Age 64 years. Year of birth centered at 1944. Means of all predictors are grand mean centered. Est. = estimate; SE = standard error; Ref. = reference; Var. = variance.
 *** $p < .001$.

66 years rather than at 75 years, which corresponds to the mean perceived onset of old age reported by Augustyński and Jurek (2021). Furthermore, the historical trend toward “postponement of old age” could theoretically also be more pronounced among younger individuals, as adolescence and young adulthood might be critical time periods with regard to conceptions about old age and about when old age starts.

Generally, the historical postponement of the perceived onset of old age that was observed here amounted to about 4 years for birth cohorts that were 45 years apart (1911 vs. 1956), which can be considered a small effect. The small effect size is not surprising given that the factors potentially driving this postponement, such as population aging or increase in life expectancy and in retirement age, are gradually evolving processes. Also, some of these processes

Figure 3
Historical Changes in Perceived Onset of Old Age for Women and Men



Note. Three birth cohorts (a: 1911–1935; b: 1936–1951; c: 1952–1974) are distinguished for convenience of plotting. The short thick lines (dashed lines for cohort 1911–1935; black solid lines for cohort 1936–1951; grey solid lines for cohort 1952–1974) indicate the estimated 5-year changes of perceived onset of old age across different chronological ages. Women have a later perceived onset of old age than men (i.e., women consider a person as old at an older age than do men). The gender difference is increasing across birth cohorts.

are nonlinear. For example, the increase in life expectancy has slowed down in recent decades in Germany (German Federal Statistical Office, 2023c), which might to some extent explain why we do not see a linear historical increase in the perceived onset of old age, but rather a stagnation or slight reversal among the more recent birth cohorts. Moreover, an additional explanation for the small effect size of birthyear could be that the historical time period that was available in our study amounted to 25 years and can thus be regarded as restricted.

Correlates of Perceived Onset of Old Age

Sociodemographic Factors

Our finding that within-person increases in the perceived onset of old age were more pronounced in later-born cohorts suggest that the within-person trend to postpone the perceived onset of old age as one gets older has become stronger across historical time. In contrast, historical increase in the levels of perceived onset of old age did not vary by chronological age. Keeping in mind that later perceived onset of old age is associated with better health outcomes (Demakakos et al., 2007; Kuper & Marmot, 2003), such general historical trends toward postponing the perceived onset of old age may be seen as good news, and these trends might go along with historical trends toward better health in later-born cohorts (Bachus et al., 2019; Doblhammer et al., 2015; König et al., 2018; Kreft & Doblhammer, 2016). At the same time, if such a postponement is too “excessive,” negative implications may arise in that individuals also postpone preparing for old age and are thus not fully equipped for the consequence of age-related decrements and challenges once these arise. Similar to findings in the realm of subjective age (Blöchl et al., 2021; Palgi et al., 2018), there might thus be an “optimal” range over which the perceived onset of old age is adaptive, but this range still needs to be empirically identified.

Furthermore, setting the onset of old age above one’s own chronological age might—just like perceiving one’s subjective age below one’s actual age—reflect the phenomenon of age-group dissociation (Weiss & Lang, 2012), the process of psychologically distancing oneself from the undesired state of old age and from the group of older adults. Given that age-group dissociation is particularly activated when old age has a negative connotation (Weiss & Freund, 2012), the historical shift toward a later onset of old age could thus also reflect a negative trend toward a more negative societal view on old age. Such a trend is, for instance, evidenced by an observed shift toward a greater age stereotype negativity over the past 200 years (Ng et al., 2015), though this shift was observed in the United States and may not necessarily be generalizable to Germany. However, we could not examine age stereotypes in this study because these were not assessed across all measurement occasions of the German Ageing Survey.

Finally, we found that women report a later start of old age than men, which is in line with prior findings (Ayalon et al., 2014; Barrett & von Rohr, 2008; Drevenstedt, 1976). In addition, this gender difference increased over historical time. Specifically, historical change in the perceived onset of old age across 1 birthyear decade amount to an average of 0.6 years among men and to an average of 1.2 years among women. Gender was thus the only factor exhibiting a significant interaction with year of birth. This mirrors recent findings also based on data from the German Ageing Survey suggesting that gender differences in subjective age have also increased across historical time (Wettstein, Wahl, et al., 2023). That is, women feel younger than men, and it seems that this difference is larger in later-born cohorts compared to earlier-born cohorts. The parallel findings for subjective age and perceived onset of old age might indicate that there is a general trend toward diverging aging perceptions of women versus men. According to the “double-standard of aging” (Sontag, 1982), women’s aging is more critically

and negatively perceived than men's aging (for a more recent study that differentiated between stereotype domains, see Kornadt et al., 2013). As an example, older female characters in television—and even in children picture books (Hollis-Sawyer & Cuevas, 2013)—were found to be more negatively portrayed than older male characters (Bazzini et al., 1997; Lauzen, 2021; Lauzen & Dozier, 2005), and they are particularly underrepresented in television series (Kessler et al., 2004). Historical trends which point toward greater gender disparities in subjective age (Wettstein, Wahl, et al., 2023) and in perceived onset of old age could thus be alerting and indicate that women nowadays feel an even stronger pressure to psychologically distance themselves from old age than did women a couple of decades ago. Further monitoring is thus necessary to observe how differences between women and men in age conceptions and views on aging evolve over historical time.

Moreover, East Germans perceived an earlier onset of old age than West Germans, which might reflect well-known East–West differences, with East Germans reporting less positive views on aging (Beyer et al., 2017; Diehl et al., 2021; Wettstein & Wahl, 2021) and older subjective ages (Wettstein, Wahl, et al., 2023) as well as revealing, at least in the past, substantially lower life expectancy (Lampert et al., 2019). East and West Germans who are now older adults have spent a considerable amount of their lifetimes in macrosystems of extremely different political regimes that affected their schooling, education, work lives, media use, and other contextual (e.g., economic) factors. It is therefore possible that the regional difference in the perceived onset of old age—but also in their views on aging and subjective age—is a long-term consequence of such earlier socialization experiences. This might be a reason why even more than 30 years after German reunification, systematic East–West differences in such subjective evaluations and attitudes can be observed. However, as the current region of residence was assessed, it is possible that people lived in one part of Germany at the time of assessment, but spent most of their lives in the other part of Germany, so that socialization might not be the only explanation for the observed East–West difference.

Psychosocial Factors

Individuals who felt older (see also Toothman & Barrett, 2011) and lonelier reported an earlier perceived start of old age. As loneliness is an established health risk factor (Cacioppo & Cacioppo, 2018; Hawkey & Cacioppo, 2010), one mechanism linking loneliness and health might be the impact of loneliness on “accelerated subjective aging” (Ayalon et al., 2016) which might in turn lead to “preponing” the perceived onset of old age. People might interpret loneliness as a consequence of being old, so that persons who feel lonely in midlife might in consequence prepone their perceived start of old age.

Whereas these correlates were found to be related with differences in perceived onset of old age at age 64, none of them were related to the rate of within-person change of the perceived onset of old age over time. It might thus be change in factors such as loneliness or health, rather than their levels at one point in time that is related with change in perceived onset of old age, which requires further studies.

Health-Related Factors

In line with the prior findings (Ayalon et al., 2014; Demakakos et al., 2007; Kuper & Marmot, 2003; Toothman & Barrett, 2011),

individuals with more chronic diseases and with poorer self-rated health perceived old age to begin earlier than individuals with better health. Given that these associations are cross-sectional and that neither chronic diseases nor self-rated health were significantly related to differences in within-person change in the perceived onset of old age, we cannot rule out that our health indicators are outcomes of the perceived onset of old age (Demakakos et al., 2007; Kuper & Marmot, 2003). Still, it is also plausible that health has an impact on perceptions of the onset of old age, as health is a well-documented antecedent of subjective age (e.g., Schönstein et al., 2021; Spuling et al., 2013) and of views on aging (e.g., Miche et al., 2014; Wurm et al., 2007). In analogy to the association between higher levels of loneliness and an earlier perceived onset of old age, people who are suffering from more diseases and those who report poorer self-rated health might attribute their health conditions to their age and in consequence feel older and perceive old age to set-in earlier than do persons with better health. Future research should address and investigate the potential bidirectional associations between health and perceived onset of old age.

Other Potential Factors

Our finding that the historical trend in perceived onset of old age persisted when including sociodemographic, psychosocial, and health-related factors implies that there may be other factors underlying this historical change. Also, none of the correlates revealed a significant interaction with the quadratic birthyear term, so that there might be additional factors which drive the concave historical change pattern; we already discussed the nonlinear change in life expectancy that may play a role.

As noted before, an older population age is related with a later perceived onset of old age (Jurek, 2021), and in Germany, there is an ongoing trend of population aging (German Federal Statistical Office, 2023a). Also, the retirement age, which has been raised in Germany (Brussig et al., 2016; German Federal Statistical Office, 2023b), could be such a factor, as well as the increase in life expectancy (Vaupel et al., 2021) that might have to some extent altered the subjective meaning and the perceived onset of old age. Indeed, both factors have been found to be linked to the perceived onset of old age and to contribute to some extent to country-level variations thereof (Augustyński & Jurek, 2021; Jurek, 2021). Also, historical changes in these factors are not uniform across countries, thereby contributing to the country differences in historical shifts of the perceived onset of old age (Augustyński & Jurek, 2021). As noted earlier, age stereotype negativity has become stronger over the past two centuries, at least in the United States (Ng et al., 2015), and may thus contribute to historical increases in the desire to postpone the onset of the rather undesirable and negatively connotated life phase of old age. Age stereotypes might also be a factor accounting for between-country differences in the perceived onset of old age, as conceptions of old age and aging differ considerably between countries (Kornadt et al., 2022; Löckenhoff et al., 2009; Lu et al., 2023; North & Fiske, 2015).

Digitization might be another important factor. According to data from the German Ageing Survey, more middle-aged and older adults had internet access in 2021 than in 2014, and use of internet for specific purposes such as social contact or online shopping increased in that time period as well (Bünning et al., 2023). Given that heightened internet use is associated with a younger subjective

age (Seifert & Wahl, 2018) and a younger subjective age in turn is related with a later perceived onset of old age (Toothman & Barrett, 2011), this digitization trend could thus contribute to the observed historical shift toward a later perceived onset of old age.

Finally, historical life events might also play a role. As one recent example, the COVID-19 pandemic might have affected views on aging because immediately after the pandemic had started, older adults were primarily portrayed in the media and the public discourse as a homogeneous, vulnerable “risk group,” and experiences of “COVID ageism” (Kessler & Bowen, 2020) might have affected views on aging (Kornadt et al., 2021). Specifically, as individuals exhibited a less positive attitude toward own aging after the onset of the pandemic (Wettstein, Spuling, et al., 2023), they might, as a means of age-group dissociation, also have adjusted and increased their subjective perception of when old age begins. However, it is also possible that the COVID-19 pandemic led to a downward adjustment of the perceived onset of old age, as individuals as old as 60 years (or even 50 years; Robert-Koch-Institut, 2020) were labeled as “risk group” with regard to the severe COVID-19 disease progression, so that the decelerated and recently stagnating trend toward later perceived onsets of old age in the most recent birthyear cohorts could to some extent be due to the pandemic as a period effect. Because the dynamics and severity of the pandemic varied considerably across countries, their effects on the perceived onset of old age might also substantially differ across nations.

Study Limitations

In closing, we would like to note limitations of our study sample, measures, and study design. To begin with, not all individuals took part in all measurement occasions, and the general trend toward lower participation rates in surveys (Luiten et al., 2020) can also be observed in the German Ageing Survey (Klaus et al., 2017). Such selective dropout over time is particularly likely for participants at the lower end of the functioning spectrum and may thus have reduced the frequency of responses of an early onset of old age. It is therefore possible that such increasing sample selectivity has contributed to overestimating both the within-person increase of the perceived onset of old age over time as well as of the historical change effect toward a later perceived onset of old age. In our analyses though, we included attrition-informative variables (e.g., age, sex, education, number of chronic diseases), used wave-specific survey weights, and leveraged study entry variables in ways that enable more valid population inferences and thus alleviate the concerns noted. The analysis of weighted longitudinal survey data remains an active area of research that is progressing rapidly, it will be important for future studies to employ and optimize complex analysis methods that can address issues related to selective attrition and sample refreshment processes.

Moreover, even though the German Ageing Survey is representative for community-dwelling middle-aged and older adults (age 40–85 years) residing in Germany, we cannot generalize our findings to other countries, given existing cross-cultural differences in views on aging (Kornadt et al., 2022; Löckenhoff et al., 2009; Lu et al., 2023; North & Fiske, 2015) and particularly in perceived onset of old age and historical change thereof (Augustyński & Jurek, 2021). Also, as the German Ageing Survey is a frequently used data set, the extensive use of this data set gives “rise to many published findings

that are not independent of one another” (Mroczek et al., 2022; p. 141), so replication of our findings using independent data sets is needed.

Even though study participants were as old as 85 years at their study entry, and they are reassessed over time, very old adults, such as centenarians, are still underrepresented (see Figure 1). The same is true for more vulnerable subgroups such as nursing home residents. As very old age is a particularly challenging and vulnerable life phase due to increasing health constraints, decreasing self-regulatory resources, and proximity to death (e.g., Baltes & Smith, 2003; Gerstorf & Ram, 2009; Wahl & Ehni, 2020), perceptions of age and when old age begins and the implications that may arise might be different compared to earlier life phases.

As limitations of our measures, the correlates we included were treated as time-invariant predictors, although some of them (loneliness, subjective age, and number of chronic diseases) may themselves have changed over time. However, a model including all these time-varying predictors (in addition to the fixed and random effect of time) would be considerably complex and might not be identifiable anymore. Future research should thus address time-varying associations between perceived onset of old age and its correlates, applying analytical approaches to dense enough data that allow for a robust inclusion of such additional complexity. Considering time-varying associations may also help to address bidirectional associations, for instance, regarding the role of health as a potential antecedent and consequence of perceived onset of old age. Additional factors that may contribute to the observed historical trends, including better cognitive functioning (Degen et al., 2022; Gerstorf et al., 2023) and higher internal control beliefs (Gerstorf et al., 2019) as well as lower incidence of dementia (Doblhammer et al., 2015) and of (severe) care need (Kreft & Doblhammer, 2016) in later-born cohorts, but also increasing negativity of age stereotypes across historical time (Ng et al., 2015), were not included in our study because these variables were not assessed in all samples of the German Ageing Survey.

Finally, apart from the perceived onset of old age, there are other subjective developmental transition variables such as the perceived ending of youth or the perceived beginning of midlife (Ayalon et al., 2014; Chopik et al., 2018). These variables were not available in the data set we used, but future research should investigate whether different subjective developmental transitions exhibit comparable historical change trends, as well as whether underlying factors are the same or whether they depend on the specific subjective developmental transition that is considered.

Conclusion

Our findings suggest that there is a historical trend toward a postponement of the perceived onset of old age among middle-aged and older people living in Germany: Later-born cohorts perceive the onset of old age to commence at an older age than do earlier-born cohorts, yet this trend may be decelerating among the recent cohorts. This historical trend was still observable when taking into account sociodemographic, psychosocial, and health factors. We also found that gender differences in perceived onset of old age have widened over historical time. More research is needed to identify the mechanisms underlying historical change toward a postponement of old age and its role for health and well-being in later life, but also its implications with

regard to age-group dissociation, preparations for old age, and the valence of age stereotypes and societal views on aging.

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