How Social and Temporal Comparisons Shape Subjective Aging

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Abstract

How we perceive and evaluate our own aging is shaped by both social and temporal comparisons. Social comparison involves evaluating oneself in relation to others, while temporal comparison focuses on assessing changes within oneself over time. Comparative information can produce opposing effects, causing individuals to feel either relatively younger or older than their chronological age: While temporal comparisons are often perceived as threatening in the second half of life, social comparisons are frequently employed to bolster self-perceptions. We investigated how social and temporal comparisons shape subjective aging in two studies, a longitudinal (Study 1, N = 2,425, 39-93 years; 55.5% women) and an experimental study (Study 2, N = 160, 50-75 years, 58% women). The results of both studies demonstrate that "me vs. them" comparisons result in feeling relatively younger, whereas "me vs. past/future me" comparisons lead to feeling relatively older. Study 2 also reveals evidence for the mediating role of self-perceptions of aging in this relationship. We discuss how social and temporal comparisons influence subjective age in opposite ways, offering important insights into the cognitive and motivational processes underlying subjective aging.

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Key words: subjective aging; temporal comparison; social comparison; felt age; self-perception of aging

Public Significance Statement

This research provides important insights into how subjective aging is shaped by both social ("me" vs. "them") and temporal ("me" vs. "past/future me") comparisons in the second half of life. Our findings from both a longitudinal and experimental study reveal that these two types of comparisons have opposite effects on subjective age, and point to the mediating role of self-perceptions of aging. These insights enhance our understanding of the cognitive and motivational processes that shape subjective aging, providing valuable insights for interventions and policies aimed at fostering positive self-perceptions and promoting healthy aging.

How Social and Temporal Comparisons Shape Subjective Aging

"How am I aging?" Research demonstrates that people's subjective evaluation of their aging (e.g., how young or old a person feels) is a better predictor of their biological aging than their chronological age (Elliot et al., 2021; Stephan et al., 2023). But how do people know?

Research shows that beyond the age of 40, the majority of adults report feeling considerably younger than their actual age, a phenomenon known as subjective age bias (Pinquart & Wahl, 2021; Weiss & Weiss, 2019). Subjective age is a complex and multifaceted construct, reflecting both cognitive and motivational processes that are deeply embedded in social experiences rather than formed in isolation. Specifically, people rely on comparative information from various sources to form an understanding of themselves and their aging process (Ferring & Hoffmann, 2007; Suls & Mullen, 1983). Different comparison standards, such as social and temporal comparisons, provide meaningful frameworks for understanding how individuals evaluate their own aging. First, people rely on social comparisons to assess their abilities and characteristics by comparing themselves to other people (between-person/group comparisons; Festinger, 1954; Turner et al., 1987). Second, people use temporal comparisons to evaluate themselves over time, comparing their current self to their past or anticipated future (within-person comparisons; Albert, 1977). More specifically, to determine how one is aging, such as in terms of cognitive and physical abilities or appearance, individuals can compare themselves to other specific individuals or groups (social comparison). By contrast, they can evaluate changes in their cognitive and physical abilities or appearance over time by comparing themselves to their past (when they were younger) or anticipated future (when they will be older; temporal comparison).

Research suggests that comparative information can produce opposing effects, causing individuals to feel either relatively younger or older than their chronological age. However, when and why individuals feel either relatively younger or older remains unclear so far. To address this question, we propose that these effects can be explained by considering the specific

context of the comparison – whether it is social or temporal – and considering the direction of the comparison rendering it favorable or unfavorable for the self (i.e., upward or downward comparisons). Specifically, we propose that when middle-aged and older adults assess their current state in relation to their past or anticipated future self (temporal comparison), they attribute their personal experiences to aging, which typically leads to feeling older. By contrast, when middle-aged and older adults compare themselves to generalized perceptions of older people (e.g., "typical older people," "people my age"; social comparison), they often distance themselves from salient generalized negative views of aging, which leads to feeling younger.

Social and Temporal Comparisons Across the Life Span

Social comparison accounts for between-person similarities and differences in the comparison dimension across individuals and groups, whereas temporal comparison accounts for within-person changes or stability in the comparison dimension across time. Both comparison processes shape individuals' current self-perception and research suggests that individuals rely on both social as well as temporal comparisons (Sayag & Kavé, 2022; Wilson & Ross, 2000; Wilson & Shanahan, 2020). With regard to the direction of effects, theory and research suggest (Albert, 1977; Festinger, 1954; Wills, 1991) that when individuals perceive themselves as *better off* (downward comparison) in aging-related domains (e.g., health, appearance) than their past self or a comparison target, they tend to adopt more favorable self-perceptions, whereas feeling *worse off* (upward comparison) can lead to less favorable self-perceptions and a feeling older. Research has shown that temporal and social comparisons operate similarly, in that they result in assimilation or contrast effects in response to upward and downward comparison standards, respectively (Vogel et al., 2020).

Studies show that among younger adults, social comparisons are more frequent and have a stronger effect on self-evaluations than temporal comparisons (Zell & Strickhouser, 2020). In addition, research indicates that social comparisons remain stable throughout adulthood (Brown & Middendorf, 1996), while other studies suggest that older adults engage

in fewer social comparisons than younger adults (Callan et al., 2015), and other findings suggest a U-shaped pattern, with social comparison peaking during adolescence and young adulthood, declining in midlife, and rising again in later adulthood around the age of 60 (Buunk et al., 2020). Moreover, some evidence suggests that temporal comparisons tend to become more frequent and significant in later adulthood (Brown & Middendorf, 1996; Spini et al., 2007; Suls & Mullen, 1983; Suls et al., 1991). However, other studies have not consistently supported this trend (Ferring & Hoffmann, 2007; Robinson-Whelen & Kiecolt-Glaser, 1997; Sayag & Kavé, 2022).

Comparison standards and comparison directions might shift with age. Research suggests that young adults believe that they have improved in many attributes across time (Wilson & Ross, 2001) and that they will continue to do so in the future (Kremble & Busseri, 2023; Ross & Newby-Clark, 2003; Ryff, 1991). However, with increasing age, temporal comparisons to the past and future may become more negative, reflecting a heightened perception of deterioration over time (Lachman et al., 2008; Suls et al., 2021). This growing awareness of physical, cognitive, and social decline in the second half of life (Diehl et al., 2014) may lead to the salience of upward temporal, intrapersonal comparison standards, resulting in a shift from self-improvement or growth to integrating these unfavorable changes into the self-concept (Ferring & Hoffmann, 2007; Freund, 2006; Rothermund & Brandtstädter, 2003b; Suls & Mullen, 1983; Suls et al., 2021). In line with this, Suls et al. (1991) found older adults' self-assessments were more negative when they engaged in temporal comparisons (reflecting on past or anticipated health), because older adults often had better past health and anticipated worsening future health. In addition, research suggests that if comparison standards are perceived as threatening, individuals often engage in downward comparisons for self-protective reasons (Buunk et al., 1990; Rickabaugh & Tomlinson-Keasey, 1997; Wills, 1981). For older adults, viewing themselves as relatively advantaged to people their age can bolster self-evaluation and well-being (Cheng et al., 2007; Heckhausen &

Brim, 1997; Heidrich & Ryff, 1983; Hughes & Lachman, 2018; Stewart et al., 2013). Frieswijk and colleagues (2004) further found that older adults reported higher life satisfaction after downward social comparisons, but only when they perceived the older comparison target as different from themselves.

The Impact of Social vs. Temporal Comparison Standards on Subjective Aging

The current research examines the impact of social ("me" vs. "them") vs. temporal ("me" vs. "past me" & "me" vs. future me") comparison standards on individuals' subjective aging. Instead of relying on spontaneous comparisons, participants were instructed to actively engage in either social ("typical older adults" or "other people your age") or temporal ("past" or "future") comparisons. Although prior studies link individual differences in personality (e.g., extraversion, conscientiousness, openness, perceived control), views of aging (e.g., age stereotypes, awareness of age-related change, self-perceptions of aging, essentialist beliefs), health events (e.g., memory loss), biological indicators of aging (e.g., DNA methylation), situational cues (e.g., retirement), and historical context (e.g., being born earlier) to feeling younger or older than one's chronological age (Bodner et al., 2017; Diehl et al., 2021; Kotter-Grühn et al., 2015; Montepare, 2009; Stephan et al., 2012, 2021; Weiss et al., 2019; Wettstein et al., 2023), our goal is to show that comparative processes further explain middle-aged and older adults' subjective age assessments.

"Me" vs. "them"

When middle-aged and older adults engage in *group-based social comparisons*, they often contrast themselves with generalized representations of the group of older people as comparative standard leading them to feel relatively younger. This process involves motivated and deliberate processing, driven by self-enhancement and self-protection motives, ultimately leading to downward comparisons and contrast effects.

Research suggests, that these old-age stereotypes are predominantly negative, exaggerating decline and overgeneralizing negative characteristics (Rothermund & de Paula

Couto, 2024). This fosters a homogenous view that overlooks the diverse and variable nature of the individual aging process (Weiss, 2018). Such perceptions can be detrimental, posing a threat to individuals' positive self-perception and overall health (Levy, 2009; Rothermund & Brandtstädter, 2003a) and are often internalized subtly over time through repeated exposure (Kornadt et al., 2023; Weiss & Kornadt, 2018). However, research also suggests that when people face a threat, they tend to react in a motivated way (Alicke & Sedikides, 2009). According to Mussweiler (2003), comparative thinking involves similarity and dissimilarity testing. When older adults are confronted with negative old-age stereotypes, dissimilarity testing is often the predominant response (Weiss et al., 2013). In line with this, studies demonstrate that negative age stereotypes temporarily caused individuals to report younger subjective ages, indicating a contrast effect of negative age stereotypes (see also Kornadt et al., 2023; Terracciano et al., 2021). In addition, research suggests that older adults often compare themselves to a stereotypical image of older adults with more health problems (e.g., frail), in order to differentiate and feel better about themselves (Freiswijk et al., 2004; Heckhausen & Brim, 1997; Suls et al., 2021). Experimental studies show that providing older adults with feedback that they performed better than same-age peers on physical (handgrip) or cognitive tasks (memory) can lead them to feel younger (Shao et al., 2020; Stephan et al., 2013). Furthermore, studies suggest that the harmful effects of negative age stereotypes on self-esteem, well-being, and cognitive performance can be mitigated when older adults dissociate themselves from the group of older adults (Armenta et al., 2018; Kang & Chasteen, 2009; O'Brien & Hummert, 2006; Weiss et al., 2013; Weiss & Kornadt, 2018). Thus, in an immediate situation older individuals tend to focus on differences when comparing themselves to the group of older adults ("they" are old but "I" feel younger; Weiss & Freund, 2012; Weiss & Lang, 2012). As such, difference testing is motivated by the self-protective attempt to shield oneself from negative age stereotypes associated with the group of older people.

"Me" vs. "past/future me"

The capacity for self-awareness allows humans to think about the past, anticipate the future, and reflect their own aging. When middle-aged and older adults engage in *temporal, intrapersonal comparisons* by reflecting on their past or anticipating their future selves, they may notice or expect declines in certain cognitive or physical abilities, which leads them to adopt less favorable self-perceptions of aging and prompts them to feel relatively older. These responses tend to be automatic, as personal aging experiences become integrated into the self-concept, especially when age is a salient aspect of those changes (Rothermund et al., 2021).

Previous research by Sargent-Cox and colleagues (2012) found that a deterioration in self-perceptions of aging across 16 years could be predicted by a rise in difficulties with daily activities and an increase in the number of medical conditions reported by a person. Further, longitudinal (Barrett & Gumber, 2020) and daily diary studies (Bellingtier et al., 2017; Kotter-Grühn et al., 2015) showed that people feel significantly older and adopt more negative self-perceptions of aging when they experience an increase in everyday health problems, stress, and negative affect. Bodner et al. (2017) found that negative self-perceptions of aging predicted increases in subjective age across time. Experimental research showed that manipulated within-person changes regarding visual disfluency increased subjective age and made adults feel older (Eibach et al., 2010). In another set of experiments, older adults (but not younger adults) felt significantly older than their chronological age after taking a memory test (but not after taking a vocabulary test) compared to how they felt at baseline, showing that intrapersonal perceptions of decline elicit a relative older subjective age (Hughes et al., 2013).

The Current Research

Building on the idea that two distinct comparison processes shape subjective aging, we conducted two studies to explore the effects of social comparisons ("me" vs. "them") and

temporal comparisons ("me" vs. "past me," "me" vs. "future me") on perceptions of aging. Because subjective age becomes particularly salient from midlife onward, with the most pronounced shifts in subjective age bias leveling off around age 40-50 (Kornadt et al. 2018; Pinquart & Wahl, 2021), we included adults aged 40-50 and above in our studies.

First, we tested this idea in a 10-year longitudinal study of middle-aged and older adults, examining how social ("me" vs. "people my age") and temporal comparisons ("me" vs. "past me," "me" vs. "future me") related to physical health influence subjective age over time. Second, we conducted an experimental study with middle-aged and older adults to examine how social ("me vs. them") and temporal ("me vs. past/future me") comparisons influence self-perceptions of aging and subjective age.

We hypothesized that, when comparing themselves to "typical older people", middle-aged and older adults should positively differentiate and distance themselves from salient negative age stereotypes and feel relatively younger. In contrast, we predicted that when middle-aged and older adults perceive a decline in comparison to their past self or anticipate deterioration with regard to their future self, they should develop more negative self-perceptions of aging and report a relative older subjective age.

Transparency and Openness

Research materials and study analysis code (IBM SPSS version 27) can be accessed via OSF (https://osf.io/8hdqv/?view_only=f2222c65789a4f80aa6ec1453b491599). We report how we determined sample size, data exclusions, manipulations, and measures in the Method sections. Study design, hypotheses, and analytic plan were not preregistered. The studies were conducted in compliance with the Universities' Ethics Advisory Board. Data of Study 1 is based on the publicly available Midlife in the United States (MIDUS) dataset (https://midus.wisc.edu). Participants in Study 2 did not consent to the broader dissemination of their information. However, the data is available upon request from the first author. The first author has previously analyzed subjective age data from the MIDUS study (Wave 2,

Wave 3) in earlier research (authors, blinded for peer review). However, that research focused on the relationship between subjective age and essentialist beliefs and personality, rather than on social or temporal comparisons.

Study 1

We used data from a longitudinal sample (two waves) of the Midlife in the United States study (MIDUS; Brim et al., 2004), spanning 8-10 years (MIDUS 2: 2004–2006; MIDUS 3: 2013–2014). We included assessments of subjective age at T1 (wave 2) and T2 (wave 3) as dependent variable and measures of temporal and social comparisons in relation to subjective health at T2 as independent variables. Previous research using different waves of the MIDUS dataset examined social and temporal health comparisons (but not subjective age; Suls et al., 2021), as well as how social comparisons influence subjective age (without addressing temporal comparisons, see Hughes & Lachman, 2018). The longitudinal sample (T1-T2) included N = 2,445 participants (age range: 39-93*;* M = 64.46*,* SD = 11.18; 55.5% women). Because the sample size was predetermined by the MIDUS study, providing sufficient power to detect even small effects, we did not conduct an additional power analysis.

We compared individuals with complete subjective age data from both waves (N = 2,445) to those who only provided data at T1 (N = 3,903). The analysis indicated that participants who completed both waves had slightly higher education levels (d = .11) and reported better current subjective health (d = .13) than those who participated only at T1. Participants with data on both waves also reported better future health (d = .33) and better health compared to people their age (d = .11). There were no notable differences in age (d = .06), gender (d = .02), past health (d = .05), and subjective age bias (d = .06).

Independent Variables

Health-Related Temporal Comparison

Past, present, and future health was assessed with three questions. First, to assess present subjective health, participants were asked: “Using a scale from 0 to 10 where 0 means

'the worst possible health' and 10 means 'the best possible health,' how would you rate your health these days?". Second, to assess past subjective health, participants were asked: "Looking back ten years ago, how would you rate your health at that time using the same 0 to 10 scale?". Third, to assess future subjective health, participants were asked: "Looking ahead ten years into the future, what do you expect your health will be like at that time?"

We computed a **"me" vs. past "me"** score (present - past health; M = -.76, SD = 1.76) with higher values indicating perceived improvement and lower values perceived decline in health from the past. Participants perceived their past health as significantly better than their present health, $t(2,434) = -21.77$, $p < .001$; $d = -.44$. In addition, we computed a **"me" vs. future "me"** score (future - present health; M = -.84, SD = 1.48) with higher values indicating an anticipated improvement and lower values an anticipated deterioration of health in the future. Participants perceived their future health as significantly worse than their present health, $t(2,426) = -28.56$, $p < .001$; $d = -.58$

Health-Related Social Comparison

To assess upward, lateral, and downward social comparisons, participants were asked: "Compared to *other people your age,* how would you rate your overall health?" and responded on a 5-point Likert-type scale from 1 'excellent' to 5 'poor'. We reverse coded the scale, resulting in a "me" vs. "them" comparison measure (M = 3.78, SD = .99), with higher values indicating that individuals felt *better off* relative to same aged people (downward comparison) and lower values indicating feeling *worse off* relative to same-aged people (upward comparison). Participants felt "above average" (3) reporting a better health than most other people their age, $t(2,443) = 40.98$, $p < .001$; $d = .83$.

Dependent Variable

Subjective Age Bias. Subjective age was assessed in both waves by asking participants, "Many people feel older or younger than they actually are. What age do you feel most of the time?" Given the wide age range of the sample (39-93 years), we computed the

relative subjective age bias as the difference between chronological age and subjective age by dividing this difference by chronological age. In our analyses, we included subjective age bias from T1 (M = .18, SD = .17) as a control variable to examine residual change over the 8 to 10 years in subjective age bias at T2 (M = .17, SD = .15).

Results Study 1

The bivariate correlations (see Table 1) reveal several significant relationships between chronological age and social as well as temporal comparisons. Chronological age was weakly positively correlated with "me vs. them" comparisons (r = .07, p < .001), suggesting that older individuals tend to make slightly more favorable social comparisons. In contrast, chronological age was negatively correlated with "me vs. past me" (r = -.14, p < .001) and "me vs. future me" (r = -.32, p < .001), indicating that as individuals age, they perceive themselves less favorably compared to their past and anticipate even less favorable comparisons in the future.

Next, to test our hypotheses we conducted multiple regression analysis (see Table 2) to examine social and temporal comparisons as predictors of subjective age bias at T2 by adjusting for subjective age bias at T1. Social comparisons ("me vs. them") had a significant positive effect, indicating that individuals who viewed themselves more favorably compared to others their age felt relatively younger at T2. In contrast, those who viewed themselves less favorably compared to their peers tended to feel relatively older at T2. Temporal comparisons with regard to the past ("me vs. past me") and the future ("me vs. future me") also showed significant but smaller effects on subjective age bias at T2. These results suggest that individuals who perceive a decline in their health over time or anticipate future health deterioration tend to feel significantly older. By contrast, those who perceive improvements in their health compared to the past or expect better health in the future feel relatively younger at T2. The final model accounted for 30% of the variance in subjective age bias, indicating that both social and temporal comparisons explained 5% in changes of subjective age over time.

The pattern of effects did not change after the inclusion of age and gender as covariates (see Table 2).

Finally, we examined whether chronological age moderates the effect of temporal and social health-related comparisons on changes in subjective age bias. The results revealed a significant interaction between age and social comparison (B = –.001, SE = .001, p = .002; $F(9, 2407) = 115.95$, adj. $R^2 = .30$), indicating that for middle-aged adults' subjective age bias is more strongly influenced by health comparisons with their age peers than for older adults. In contrast, the effect of past and future temporal comparisons on subjective age bias was not moderated by chronological age (all p's > .44). In addition, the pattern of results for the older adult group (60-93 years) was similar to those observed in the full sample (see Supplementary Table S1).

Discussion Study 1

Overall, the results suggest that with chronological age, middle-aged and older adults tend to make less favorable temporal comparisons for the self with their past and future, while favorable social comparisons remain relatively stable and even show a slight increase. These findings are consistent with previous research suggesting that with advancing age people engage more in downward social comparisons, while temporal comparisons tend to become less favorable (Buunk et al., 2020; Ferring & Hoffmann, 2007; Heckhausen & Brim, 1997; Suls et al., 1991). In line with this, Suls et al. (2021), drawing on MIDUS Waves 1 and 2, found that while younger adults anticipated future health improvements, middle-aged and older adults overestimated the likelihood of health decline and also perceived themselves as healthier than their same-age peers.

In line with our hypotheses, results show that social comparisons ("me vs. them") had a significant positive effect, with individuals who viewed themselves more favorably with regard to their health than their peers (downward comparison) feeling relatively younger at T2, while those with less favorable views (upward comparison) felt older. Temporal

comparisons, both with the past ("me vs. past me") and future ("me vs. future me"), also had significant but smaller effects. Individuals perceiving a decline in their health or anticipating future deterioration (upward comparison) felt older, while those perceiving health improvements (downward comparison) felt younger.

As predicted, the results suggest that individuals perceived themselves more favorably compared to others with regard to their health and showed a contrast effect by feeling relatively younger, differentiating their self-perception from the negative comparison standards. Conversely, individuals tended to perceive a decline in health with advancing chronological age with regard to the past or anticipated future and experienced an assimilation effect, leading them to feel relatively older.

In the second study, we conducted an experiment to establish a causal relationship between social and temporal comparisons and subjective age. With this approach we aimed to demonstrate that the observed effects (e.g., feeling relatively younger or older) are directly linked to comparison standards and to rule out alternative explanations and confounding variables. In addition, we investigated whether self-perceptions of aging mediate the link between comparison standards and subjective age. Specifically, self-perceptions of aging capture how individuals interpret and evaluate their aging-related experiences (e.g., Diehl et al., 2021; Heckhausen & Brim, 1997; Rothermund et al., 2021), which in turn may shape the extent to which they feel younger or older.

Study 2

Method

The study consisted of a 2x3 mixed design, combining a pre-post assessment (within) with a 3-between-group factor including a final sample of $N = 160$ adults between 50 and 75 years ($M = 62.22$, $SD = 6.62$; 58% women). A priori power analysis using G*Power 3.1 was conducted for a repeated-measures mixed-design ANOVA, aiming for a power of .80, with an effect size of ($f = .15$) and an alpha level of .05. The analysis determined that a sample size of

N = 111 participants would be required to detect the predicted within-between interaction effect. We conducted an online study and engaged a professional panel provider to recruit participants from a nationally representative online panel in Germany, with the goal of somewhat oversampling to ensure a more robust dataset. All participants provided informed consent and received monetary compensation (ca. €2) for their participation in the study. Ethical approval for this study was obtained from the University Ethics Committee (Approval Number: 2410DWD; 'The Influence of Social and Temporal Comparisons on Subjective Aging'). Participants took part in a pre-study reporting their subjective age and were re-invited to a follow up study 12 weeks later, which included the experimental manipulation (2024). At baseline, 243 individuals participated, and when invited to take part in the experiment 12 weeks later, 178 agreed to participate, resulting in a 27% attrition rate. At the second assessment, participants were randomly assigned to one of three conditions (temporal comparison: past, *n* = 52, and future, *n* = 48, as well as social comparison: typical older adults, *n* = 60). On average, participants took 4.8 min to complete the experiment. Participants who did not pass the attention check, did not finish the survey (*n* = 11), or did not adequately respond to the social comparison task (*n* = 7) were excluded.

Baseline Assessment

Demographic variables

We assessed chronological age (in years) and gender (0 = male, 1 = female) at the baseline as covariates.

Subjective Age Bias (SAB)

Subjective age was assessed at baseline by asking participants: “When you think about your age: How old do you feel you are? (in years).” Participants then reported the age they felt in years. We calculated the subjective age bias, that is, the discrepancy between chronological age and subjective age (*M* = 7.68, *SD* = 8.17), with negative values indicating

that people feel older than their chronological age and positive values indicating that people feel younger than their chronological age (Blöchl et al., 2021).

Experimental Procedure

The study was introduced as a short survey on "perceptions of aging". The study involved three experimental conditions designed to examine the impact of (1) 'temporal past', (2) 'temporal future', and (3) 'social group' comparisons on participants' subjective aging. After participants started the study, they were randomly assigned to one of three comparison conditions and were asked to write down their thoughts regarding personal changes over time and similarities and differences in relation to older adults in general. Participants wrote an average of 10 words in their responses to the comparison task. Two raters independently coded the open-ended responses into these three categories (see results section). Agreement between the two raters was high (Kappa > .78) and we solved discrepancies through discussion.

Temporal, Intrapersonal Comparison

In these conditions, participants were asked to reflect on their (a) own life experiences over the past decade or (b) changes that appear in their future in 10 years. Participants were instructed write down their thoughts regarding personal changes they had experienced or anticipated experiencing.

(a) Past ("me" vs. "past me"). Participants were instructed to write down their thoughts regarding personal changes they had experienced. Specifically, they were presented with the following question: *"Please think about your life ten years ago: What are the most significant changes you have noticed in yourself over the past ten years?"*

(b) Future ("me" vs. "future me"). Participants were instructed to write down their thoughts regarding personal changes they anticipate to experience in the future. Specifically, they were presented with the following question: *"Please think about your life ten years from now: What are the most significant changes you expect for yourself over the next ten years?"*

Social, Interpersonal Comparison: Group ("me" vs. "them")

In this condition, participants were prompted to engage in a comparative evaluation between themselves and typical older people. Participants were instructed to write down their thoughts regarding both similarities and differences with older people. Specifically, they were presented with the following question: *"Please think about typical older people: What differences and similarities do you see when you compare yourself with older people?"*

After participants wrote down their thoughts, they were asked to answer a series of questions, including those on subjective age and self-perceptions of aging. Following this, they were debriefed and thanked for their participation.

Post-Manipulation Assessment

Self-Perceptions of Aging (SPA)

SPA was assessed using the 5-item Attitude Toward Own Aging subscale from Lawton's (1975) Philadelphia Geriatric Center Morale Scale (PGCMS). Sample items are "I have as much pep as I had last year"; "Things keep getting worse as I get older" (recoded); "As I get older, I feel less useful" (recoded). Participants were asked to indicate on a 7-point Likert scale how much they agreed with each statement ranging from 0 (*do not agree*) to 6 (*absolutely agree*; $M = 3.72$, $SD = 1.33$; Cronbach's Alpha = .85).

Subjective Age Bias (SAB)

Again, we assessed subjective age and then calculated the subjective age bias as described above ($M = 6.66$, $SD = 8.60$).

Results Study 2

First, qualitative analyses of participants responses to the temporal (i.e., past and future) and social comparison conditions (i.e., typical older adults) revealed distinct patterns related to the reported content regarding: (a) growth, (b) decline, and (c) dissociation. We selected these themes, based on theories of development and aging (Baltes, 1987; Diehl et al., 2014; Weiss & Kornadt, 2018), suggesting aging involves the experience of both gains and

losses, as well as individuals' active strategies to deal with aging-related changes. Specifically, "growth" highlights positive developments and the gains participants perceived or anticipated (e.g., "I have become more relaxed," "Stay fit and healthy through sport + a positive attitude," "Retirement and enjoying life,"). "Decline" captures the concerns and losses participants associate with getting older (e.g., "Probably more health problems," "Less physical fitness," "My memory is fading. I can't do squats as well anymore," and "General deterioration: teeth, joints, osteoporosis, vision."). "Dissociation" reflects how individuals may distance themselves from old-age stereotypes and older people in general ("I don't feel that old," "Many women my age look older," "I'm much more active than other people my age," and "I look considerably younger ... I have somewhat more relaxed and liberal views."). Results show that when focusing on the past, older adults mostly reported perceptions of decline (75%) followed by growth (14%). When focusing on the future, older adults primarily reported perceptions of decline (58%), followed by growth (19%), and maintenance (13%). In contrast, when comparing themselves to typical older adults, participants predominantly reported dissociation (53%), followed by decline (22%) and, to a lesser extent, growth (8%).

Second, to test our hypothesis, we conducted a mixed-design ANOVA with one within-subjects factor (time: subjective age bias assessed pre vs. post) and one between-subjects factor (3 conditions: past, future, group). There were no significant main effects of time or condition on SAB. However, the analysis yielded a significant interaction effect between time and condition on SAB, $F(2,157) = 140.19$, $p = .005$, $\eta_p^2 = .07$. This suggests that the direction of change in subjective age from pre- to post-test differed depending on the condition (see Figure 1). Between the two temporal conditions there was no significant difference. Specifically, after reflecting on personal changes they had experienced and those they anticipated in the future, participants reported feeling significantly older, $t(51) = 2.18$, $p = .02$, $d = .30$; $t(47) = 2.25$, $p = .02$, $d = .32$, respectively. By contrast, in the social comparison condition after thinking about similarities and differences between themselves

and typical older people, participants felt significantly younger, $t(59) = -1.96$, $p = .027$, $d = .25$. Finally, we found no evidence that chronological age modulates the influence of social or temporal comparisons on subjective age bias. Specifically, a mixed-design ANOVA with time, condition, and age as factors revealed no significant (two- or three-way) interaction effects involving age (all p's > .21). In addition, as in Study 1, the pattern of results for the group of older adults was similar to the effects observed in the full sample (Supplementary Table S2).

Third, we conducted a mediation analysis to examine whether the effect of condition (social comparison: "typical older adults" = 1 vs. temporal comparison: "past/future" = 2) on subjective age bias was mediated by self-perceptions of aging, while controlling for initial subjective age bias. The regression of the mediator (SPA) on condition was significant, $B = -.66$, $SE = .21$, $p = .002$, 95% CI [-1.077, -.244]. The model explained 10% of the variance in SPA, $F(2,154) = 8.15$, $p < .001$. Self-perceptions of aging had a significant positive effect on subjective age bias, $B = 1.09$, $SE = .38$, $p = .005$, 95% CI [.336, 1.852]. The effect of condition on SAB, controlling for self-perceptions of aging and initial subjective age bias, was also significant, $B = -2.21$, SE = 1.04, $p = .03$, 95% CI [-4.259, -.167]. Finally, the indirect effect of condition on subjective age bias through self-perceptions of aging was significant, with a point estimate of -.72, and a 95% bootstrap confidence interval that did not include zero [-.1.757, -.043], based on 5,000 bootstrap samples. This suggests that self-perceptions of aging partially mediated the relationship between temporal vs. social comparison on changes in SAB (see Figure 2). Further analyses confirmed that the effects reported above remained significant and robust after including chronological age, and gender as covariates.

Discussion Study 2

The results of Study 2 replicated and extended findings of Study 1. As predicted, the results demonstrate that individuals felt significantly older after temporal ("me" vs. "past/future me") but significantly younger after social comparisons ("me" vs. "them"). In

addition, a mediation analysis confirmed that self-perceptions of aging partially mediated the effect of comparison condition on subjective age bias. This suggests that self-perceptions of aging play a significant role in how social and temporal comparisons affect subjective age. Specifically, temporal comparisons, both with the past and future, led to a relatively older subjective age compared to social comparisons, as they elicited more negative self-perceptions regarding aging.

The results also show that middle-aged and older adults primarily reported perceptions of decline when reflecting on the past and future, while dissociation was most salient when participants were asked to compare themselves to "typical older people". Notably, although participants in the social comparison condition were asked to think about both "*differences and similarities*" between themselves and typical older people, they were more likely to focus on differences and distancing themselves from generalized views of older people. In addition, the results also show that future comparisons elicited perceptions of growth, which were rarely reported in the past temporal or social comparison condition. However, despite this, perceptions of decline and deterioration were prevalent in future comparisons of middle-aged and older adults, leading to the tendency of feeling significantly older.

General Discussion

The present findings highlight the complex and contrasting effects of comparative information on subjective aging. Despite the growing body of research on subjective aging, the conditions under which individuals feel relative younger or older than their actual chronological age remained underspecified until now. Across a longitudinal and an experimental study, we identified two important pathways including temporal ("me" vs. "past/future me") and social comparisons ("me" vs. "them") that lead to opposing effects of feeling relatively older and younger in midlife and old age. Importantly, our results suggest that social comparisons foster a more favorable self-perception of aging and a tendency to feel significantly younger, while temporal comparisons result in less favorable self-perceptions

and a tendency to feel relatively older.

The current results demonstrate that social and temporal comparison processes provide distinct pathways through which subjective aging is shaped. From an information processing perspective, attributional processes entail temporal comparisons, linking personal experiences to aging. With advancing age both experienced and anticipated changes attributed to aging can foster perceptions of decline, resulting in more negative self-perceptions of aging and a relatively older subjective age (Eibach et al., 2010; Hughes et al., 2013). By contrast, from a motivational perspective, self-protective evaluative processes consist of social comparisons that allow older adults to distance themselves negative age stereotypes and generalized representations of older people (Weiss & Kornadt, 2018). This results in more positive self-perceptions of aging and a relatively younger subjective age.

Findings from Study 1 suggest that health related temporal comparisons become increasingly unfavorable with age, as older adults often perceive health declines, when comparing themselves to their younger or older selves. Adopting more realistic and less overly optimistic perceptions of aging in later adulthood might be one strategy, which may help older adults to deal with aging-related challenges (Lang et al., 2013). Aligning perceptions and expectations with the reality of aging, might help older adults to maintain self-continuity (Ferring & Hoffmann, 2007; Rutt & Löckenhoff, 2016). At the same time, however, our mediation results suggest that these unfavorable self-perceptions arising from temporal comparisons may become threatening as they undermine a favorable self-perception in later adulthood. Thus, in this situation individuals can rely on social comparisons in order to maintain more positive and favorable perceptions of themselves. As such, downward social comparisons may mitigate the detrimental consequences of temporal comparisons in the second half of life.

Strength and Limitations

The current research highlights the significant role of comparative information in shaping perceptions of aging. Specifically, older adults rely on social and temporal comparison standards to evaluate their aging process, resulting in distinct effects. However, it remains important to further explore whether these two comparison processes interact or compensate for one another. Thus, future research might examine their dynamic interplay to provide deeper insights into how individuals maintain or adjust their self-perceptions as they grow older. Future research should also examine whether one type of comparison can trigger the other, and how often they co-occur. In later life, social downward comparisons may buffer the adverse effects of unfavorable temporal comparisons associated with perceived decline over time, resulting in a more positive self-perception of aging and a relative younger subjective age. Thus, it would be interesting to investigate whether social downward comparisons have the capacity to mitigate the negative effects of unfavorable temporal comparisons that emerge in older age. These insights could enhance our understanding of how these different types of comparisons interact to shape individuals' perceptions of their own aging.

In our two studies, we examined social and temporal comparisons related to health (Study 1) and general changes in attributes and characteristics (Study 2). This approach provides a comprehensive view of how individuals perceive aging in both specific and broad contexts, enhancing the relevance of the findings. However, future research is needed to further examine different comparison standards (e.g., social status, physical and cognitive functioning, or appearance) to more fully capture the multidimensional and multidirectional nature of aging. For example, social comparisons that center on career or social status may be especially salient and influential in midlife, whereas temporal comparisons with regard to health may become more negative and potentially more impactful in older age. Future studies should examine these patterns in more detail in order to deepen our understanding of how individuals navigate the complexities of aging (Baltes, 1987; Kornadt et al., 2020).

It is important to acknowledge that the information processing pathway involving temporal comparisons to both the past and future may be influenced by age stereotypes. Studies have shown temporal comparisons are linked to greater feelings of decline and accelerated subjective aging when reinforced by negative age stereotypes. For example, Rothermund et al. (2021) have provided evidence for the "correspondence principle of age-related attributions" which suggests that age-related attributions are stronger (i.e., more frequent or salient) for events or changes that align in valence with a person's age-related beliefs and stereotypes. Thus, a limitation of the current study is that we did not directly investigate the influence of age stereotypes on temporal comparisons. Future research should address this gap by examining how age stereotypes shape temporal comparisons and their effects on subjective age and self-perceptions of aging. Assessing personally endorsed age stereotypes and including them as additional variables might provide a possibility to explain variability in the strength or direction of effects of comparison information on subjective age, and it might also elucidate individual differences within the experimental conditions in which temporal or social comparisons were enforced.

Our results provide evidence for the mediating role of self-perceptions of aging in the relationship of social vs. temporal comparisons on subjective age. Thus, these finding suggest that the primary focus of self-perceptions of aging is the individual's personal assessment of intrapersonal evaluations rather than a direct reflection or measure of (internalized) age stereotypes (e.g., Tully-Wilson et al., 2021; Levy et al., 2002). For example, the Attitude Toward Own Aging scale (ATOA, Lawton, 1975), which is a prominent measure of self-perceptions of aging that was also implemented in the current research, includes statements like "Things keep getting worse as I get older" and "I have as much pep as I did last year." These questions prompt individuals to make temporal comparisons between their current and past selves, focusing on personal aging experiences. In addition, research suggests only 38% of shared variance between personal and generalized views of aging in a sample of middle-

aged and older adults (de Paula Couto et al., 2024). Besides, a study by Brothers et al. (2021) showed that age stereotypes predicted gain ($\beta = .20$, $p < .001$) and loss ($\beta = -.29$, $p < .001$) aging self-perception in the second half of life. This suggests that most of the variance in self-perceptions of aging is not accounted for by internalized age stereotypes and must be influenced by other factors. As the current research suggests, self-perceptions of aging primarily capture an individual's personal evaluation of their own aging process rather than directly measuring the extent to which they have internalized stereotypes about aging. Thus, conflating self-perceptions of aging with internalized stereotypes can oversimplify the complex ways in which people understand and experience aging.

In our study, examining middle-aged and older adults together provides a broad lens on subjective aging. Yet, these two life phases diverge in developmental tasks, role transitions, health changes, and social expectations. For instance, middle-aged adults may be more likely to be immersed in careers or parenting, whereas older adults often face retirement, potential caregiving responsibilities, or changing health conditions (Diehl et al., 2014). However, results of Study 1 revealed only age differences in how social comparisons (but not temporal comparisons) shape subjective age bias, indicating that the effect becomes weaker with advancing age. Thus, future research should examine potential age-related differences in more detail, for example, how different age-related contexts might influence comparative processes and subjective aging across the lifespan.

Finally, future research should test when and why older adults exhibit attributional or self-protective processing. Specifically, personal and situational factors (e.g., individual differences in aging mindsets, internalized age stereotypes, availability of cognitive resources) might influence whether older adults attribute changes to aging via temporal comparisons, or whether they may counteract generalized negative views of aging by distancing themselves from these views via social comparison.

Conclusion

In the current research, we aimed to disentangle the effects of temporal and social comparison processes on subjective aging in the second half of life. Longitudinal and experimental findings demonstrate that social comparison leads to feeling younger, while temporal comparisons result in feeling significantly older relative to one's chronological age. These effects were mediated by self-perceptions of aging, showing that social versus temporal comparison processes elicit positive or negative aging self-perceptions, which are associated with feeling significantly younger or older. We submit that temporal and social comparisons reflect distinct cognitive and motivational functions in later adulthood. Temporal comparisons (e.g., "me" vs. "past/future me") involve more automatic, experience-based processing, while social comparisons (e.g., "me" vs. "them") often reflect more deliberate, self-protective motivations. Together, these findings improve our understanding of the complex mechanisms underlying subjective aging, shedding light on how different types of comparisons standards influence how individuals perceive their own aging.

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Figure 1

Interaction effect between time and condition (temporal past, temporal future, and social comparison group condition) on subjective age bias, Study 2.

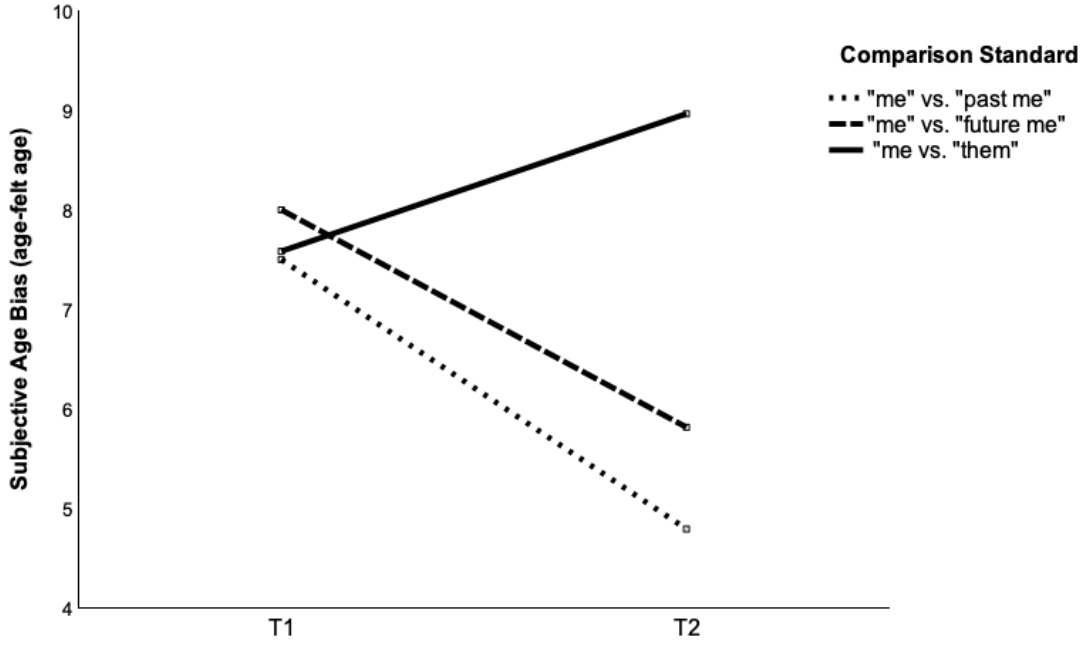

Figure 2

Mediation model illustrating that the effect of temporal vs. social comparison on changes in subjective age bias is partially mediated by self-perceptions of aging, Study 2.

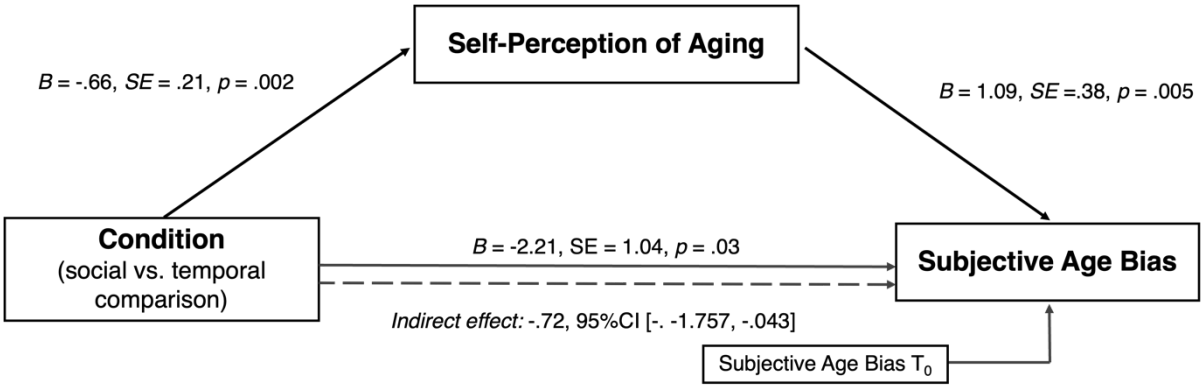

Table 1

Bivariate Correlations, Study 1

Variable	1	2	3	4	5	6
1. Chronological Age	1					
2. Gender	-.01	1				
3. "me" vs. "them"	.07***	-.04*	1			
4. "me" vs. past "me"	-.14***	-.01	.28***	1		
5. "me" vs. future "me"	-.32***	.06**	.04	.11***	1	
6. SAB T1	.10*	.01	.21***	.05*	.01	1
7. SAB T2	.01	.01	.28***	.15***	.08***	.51***

Note. $N = 2425$*; Age Range:* 39-93*;* $M = 64.35$*,* $SD = 11.12$; Gender: 0 = men, 1 = women;
2 - 4: Higher values indicate more favorable comparisons for the self

Table 2

Regression Predicting Subjective Age Bias at T2, with and without covariates, Study 1

Variable	*B*	*SE*	β	*t*	*p*	*B*	*SE*	β	*t*	*p*
age						.001	.001	-.02	-1.09	ns
gender						.004	.005	.01	.85	ns
SABT1	.42	.02	.47	26.86	<.001	.42	.02	.47	26.66	<.001
"me" vs. "them"	.03	.003	.17	9.19	<.001	.03	.003	.17	9.45	<.001
"me" vs. past "me"	.006	.002	.06	3.53	<.001	.005	.002	.06	3.41	<.001
"me" vs. future "me"	.006	.002	.06	3.55	<.001	.006	.002	.05	2.88	<.001

Note. N = 2425*; Age Range:* 39-93*; M* = 64.35*, SD* = 11.12; *adj.* R^2 = .30; SAB_{T1}= subjective age bias assessed at T_1, "me" vs. "…" = higher values indicate more favorable comparisons for the self