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Daily Fluctuations in Subjective Age among Older Adults: Links with Stressors, Positive Events, and Emotional Reactions

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Keywords

Stressors · Positive events · Stress reactivity · Affect

Abstract

Introduction: Subjective age, or felt age, refers to individuals' perception of their age compared to their chronological age. Feeling older than usual has been associated with experiencing more same-day stressors and higher negative affect. Feeling older may indicate depleted psychological resources, increasing the likelihood of interpreting everyday situations as stressful and reacting more intensely to them. Conversely, feeling younger may indicate greater psychosocial resources, enhancing engagement in and responsiveness to positive events. **Methods:** This study investigated fluctuations in subjective age as a predictor of same-day event occurrence (stressors and positive events) and affective responses to these events using 14-day diary data from a sample of 108 older Swiss adults (aged 65–92). **Results:** On average, participants felt approximately 8 years younger than their chronological age, with significant day-to-day variability (ICC = 0.69). On days when individuals felt older than usual, they reported more stressors and fewer positive events. Older subjective age was also associated with greater stress reactivity (greater upticks in negative affect and greater dips in positive affect) and more pronounced responses to positive events. Time-ordered effects showed subjective age predicting positive events, but not

stressors. **Conclusion:** These findings underscore the importance of subjective age as a dynamic psychological construct potentially shaping the events people encounter and how they affectively respond to them. In addition, the lagged analyses provide evidence for subjective age as a predictor of daily event processes, but not for daily events as predictors of future subjective age, which contributes to disentangling the direction of association.

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Introduction

Subjective age, also known as felt age, refers to how old individuals feel compared to their chronological age [1] and serves as a central indicator of individual differences in the experience of aging [2]. Subjective age becomes particularly important later in life, as attitudes toward aging are believed to take on greater personal relevance than one's actual age [3]. Research has shown that feeling younger than one's chronological age is associated with better cognitive functioning [4], improved health outcomes including longevity [5], and more favorable well-being [6].

Feeling older than one's chronological age might be an outcome of health to the extent that negative physical sensations remind one of age-related physical declines

[1]. However, subjective age is also an important predictor of future health and well-being, as has been demonstrated in numerous longitudinal studies (for a meta-analysis see [7]). Indeed, some research investigating the causal interplay of subjective age and developmental outcomes found stronger evidence for subjective age as a predictor rather than outcome of individual functioning [8, 9]. This might partly be driven by behavioral processes, as younger subjective age has been linked with engaging in more health-promoting behaviors and adaptive coping strategies [10].

Furthermore, feeling younger than one's chronological age might also be due to a need to distance oneself from negative images of aging [11]. In addition, it might reflect an appraisal of higher physical and psychological resources compared to peers or age-related stereotypes [11]. While past work has highlighted substantial connections between higher subjective age and indicators of insufficient sleep [12], exhaustion [13], and fatigue [14], these associations are small to moderate in size. This suggests that subjective age is a distinct construct that may capture a variety of different indicators making it a useful construct for better understanding individual differences in behavioral and affective daily life processes across the adult lifespan.

Previous conceptualizations of subjective age have typically measured it as a stable trait-like construct using one-time assessments. However, recent studies have highlighted that subjective age can vary from day to day or even within a single day, with short-term fluctuations accounting for about 25% of the variance [15, 16]. Although these fluctuations are substantial, limited research has explored the characteristics of days when individuals feel older or younger than usual.

Most existing work on day-level correlates of subjective age focused on negative factors that are associated with feeling older than usual. In particular, people tend to feel older on days on which they experience stressors, physical symptoms, or report higher levels of negative affect [16–19]. For example, a daily diary study of older adults found that feeling older than usual was linked to more same-day stressors and this association was attributable to higher same-day levels of negative affect [17]. While the authors suggest that experiencing a stressor may make one feel older (“weathering effect”), it could also be that older subjective age indicates depleted psychological resources to cope with challenging circumstances. Thus, on days on which people feel older than usual, they may interpret situations as more demanding or threatening, perceiving everyday challenges that are usually manageable as stressors [20]. As a result,

higher subjective age may be related to reporting more frequent same-day stressors and elevated negative affect.

While previous work has shown that feeling older is linked to a greater likelihood of reporting same-day stressors [17], people may also react differently to these stressors if they feel older. The Transdisciplinary Model of Stress highlights that the impact of an acute stressor may depend on social, psychological, and behavioral factors [21]. Feeling older may indicate fewer available coping resources, leading to heightened stress reactivity [22]. Consequently, it is hypothesized that subjective age moderates the relationship between stressor occurrence and same-day affect, with stress reactivity expected to be more pronounced on days when individuals feel older.

H1: Days with higher subjective age will be linked to a greater likelihood of experiencing daily stressors compared to days with lower subjective age.

H2: Days with higher subjective age will be linked to greater stress reactivity as indicated by the within-person relationship between stressor occurrence and negative affect compared to days with lower subjective age. Thus, we hypothesize subjective age as a moderator of affective responses to stressors.

Focusing only on daily stressors provides an incomplete portrayal of daily life and neglects the more frequent occurrences of positive events (happening on 70% of interview days; Klaiber et al. [23]; Zautra et al. [24]). Daily positive events are relatively minor events in everyday life that are often actively sought, considered favorable, and usually result in upticks of positive emotions [23]. Taylor and Brown's [25] model of mental health posits that positive illusions (i.e., beliefs that depart from reality) are foundational for psychological well-being. Older adults with a youthful bias (i.e., younger subjective age) have been shown to be more satisfied with their leisure time, possess higher self-esteem, and are less prone to boredom [26]. Thus, younger subjective age may reflect a person's psychological resources to engage with the world in more positive and fulfilling ways.

In addition, on days on which older adults feel younger, they might act more in line with stereotypes of youthfulness, actively seeking out positive activities – also outside their home (e.g., attending a community gathering) [27–29]. Conversely, days with higher subjective age may activate negative age stereotypes, such as feeling like a burden or not feeling needed. Consequently, people may show more reclusive behaviors when they tend to feel older, making it less likely for positive events to occur on these days [30, 31]. Therefore, older adults are expected to experience more positive events on days on which they feel younger.

Finally, older adults may respond more positively to positive events on days on which they feel younger. Past theory and research suggest that people actively enhance affective benefits of positive events through savoring strategies such as being mentally present or sharing with others [24, 32]. People likely use these strategies more effectively on days when they feel younger, given that younger subjective age has been associated with a tendency to notice and attach importance to favorable aspects of life [33]. In addition, a more expansive future time perspective has been linked with greater use of savoring strategies [34]. Thus, we expected the within-person relationship between daily positive events and positive affect to be more pronounced on days on which people feel younger compared to days on which they feel older.

H3: Days with lower subjective age will be linked to a greater likelihood of experiencing positive events compared to days with higher subjective age.

H4: Days with lower subjective age will be linked to more favorable responses to positive events as indicated by a stronger positive within-person relationship between positive events and positive affect compared to days with higher subjective age. Thus, we hypothesize subjective age as a moderator of affective responses to positive events.

Thus, the aim of this study was to examine whether subjective age is related to differences in event occurrence (H1&3) and whether subjective age moderates affective responses to these events (H2&4). To test these hypotheses, we used daily diary data collected from a group of community-dwelling Swiss older adults that includes information on subjective age, daily events, and affective well-being. Past work has been ambiguous about whether to conceptualize subjective age as an antecedent or outcome of daily events [16]. Thus, on an exploratory basis, we aim to investigate the directionality of the relationship between subjective age and daily events using cross-lagged analyses across consecutive days. While we acknowledge that sleep's restorative function may diminish some day-to-day effects, identifying the presence or absence of time-ordered associations remains valuable. Such findings could offer important insights and guide future research.

Methods

Procedures and Participants

We used data collected from the ZWÄG 65+ study, which is an app-based, observational, intensive-longitudinal daily-diary study [35]. The daily-diary protocol was chosen because many of the events of interest such as stressors tend

to not occur more frequently than once a day [36]. One hundred and eight community-dwelling older adults aged 65+ with Swiss residency were recruited for the study by handing out flyers and through mailing lists and newsletters. Eligibility criteria were a minimum age of 65 years, willingness and ability to use a mobile device for the study, and to read newspaper-sized print. Exclusion criteria were a diagnosed neurodegenerative disease (e.g., Alzheimer's disease) and physical impairments affecting the mobility of hands or fingers that could interfere with the completion of questionnaires.

During an initial laboratory visit, participants provided informed consent, installed the "Ethica" experience sampling app (Avicenna Research), and completed a baseline survey. For the next 14 days, participants completed a short daily survey, which was triggered at 8:30 pm and a reminder was sent at 9 pm. All questionnaires were administered in German but will be described below in English.

On average, participants were 73 years old ($SD = 5.93$, range: 65–92) and majority women (58%), which resembles the gender distribution among older adults in Switzerland [37]. Only about 40% of the sample completed the highest level of Swiss secondary education.

We used Monte Carlo simulations ($n = 500$) to calculate this study's statistical power. Based on 108 people providing an average of 12 out of 14 assessments and using an alpha-error rate of 5%, we can detect within-person effects of $r = 0.10$ (which corresponds to explained variance at the within-person level of 0.01) with about 92% power. Code for the power analysis is available on the OSF (<https://osf.io/93kts/>).

Measures

Subjective Age

As part of the daily diaries, participants were asked: "How old do you feel today?" and were able to enter a number that corresponds to their subjective age on that day [15]. We subtracted a person's chronological age from their subjective age to get a discrepancy index of whether they feel younger or older than their chronological age. Discrepancy scores aid in controlling the influence of chronological age and allow for a more precise measurement of subjective age beyond feeling older, younger, or no different from one's chronological age [17].

Daily Stressors

Stressors were assessed in the daily surveys using an adjusted version of the Daily Inventory of Stressful Events [38]. Every evening, participants were asked in which of

the following domains they experienced a stressful event: (1) argument, conflict or disagreement, (2) family/home-related, (3) financial problems, (4) traffic or transportation, (5) health problem or accident, (6) stressful event that happened to close friends or family, or (7) any other stressful event. As participants rarely reported more than one stressor per day ($M_{\# \text{ of stressors per day}} = 0.39$, $SD = 0.62$, % of days with more than one stressor = 6.2%), a dichotomous variable was created indicating whether a person experienced a stressor (1) or not (0) on any given day [36].

Daily Positive Events

Daily positive events were assessed with questions adapted from the National Study of Daily Experiences [23, 36]. Every evening, participants indicated in which of the following domains they experienced a positive event: (1) positive social interaction – in-person, (2) positive social interaction – remote (such as on the phone or online), (3) positive event at work, school, or volunteer position, (4) positive event at home, (5) positive event that happened to a close friend or family member, (6) spent time enjoying or viewing nature, (7) any other positive event. As participants often reported positive events in multiple domains per day and at least one positive event was reported on about 95% of days, the number of domains in which a person experienced a positive event was used as an indicator of daily positive events.

Daily Positive and Negative Affect

Positive and negative affect were assessed in the daily surveys with items from the affective circumplex [39]. People were given the following instruction: “Since waking up today, I felt. . .” Participants made their ratings using a slider with anchors at 0 = not at all and 100 = very much. The items for positive affect were happy, excited, enthusiastic, calm, relaxed, content; and the items for negative affect were distressed, frustrated, tense, unhappy, sad, depressed. Within- and between-person reliabilities were satisfactory (positive affect: $R_{\text{within-person}} = 0.81$, $R_{\text{between-person}} = 0.99$; negative affect: $R_{\text{within-person}} = 0.78$, $R_{\text{between-person}} = 0.99$).

Data Analysis

Analyses were conducted in R 4.4.1 [40] and MPLUS v. 8.3 [41]. Data preparation was done using the tidyverse-package [42]. The data had a multilevel structure with days (Level 1, within-person variation) being nested within participants (level 2, between-person variation). To disentangle between and within-person

effects, all daily predictor variables were person-mean centered prior to analysis. Continuous between-person (level 2) variables were grand-mean centered. Person-means were entered on the day level to examine between-person effects. Within-person effects of subjective age explore whether fluctuations in how young or old individuals feel relative to their own average are associated with corresponding variation in the outcome. In contrast, between-person effects examine whether individuals who on average feel older or younger than their peers of the same chronological age tend to differ systematically in the outcome.

Two-level multilevel Bayesian Models with default uninformative priors using the brms package [43] were computed using R 4.3.2. 95%-credible intervals were used for determining the precision of the model estimates. These models include a random intercept to account for differences in mean levels between participants and we also included random slopes for all within-person (level 1) predictors to allow the effects to differ between people. All models used two Markov chains with 5,000 repetitions including 500 as a warm-up. As a sensitivity check, we also ran frequentist models using the lme4-package [44], which resulted in the same pattern of results. All data and code can be accessed on the Open Science Framework (<https://osf.io/93kts/>). This study’s hypotheses and analytical models were preregistered on the Open Science Framework (https://osf.io/b286k/?view_only=2963a706d5d945e9822d4787b7a7c1ac).

H1 was examined using a logistic regression model predicting stressor occurrence by subjective age and covariates. H3 was examined using a linear regression model predicting positive event frequency by subjective age¹. Hypotheses 2 and 4 (reactivity hypotheses) were tested in two linear models predicting positive and negative affect with subjective age, stressor occurrence, and positive event frequency. To evaluate whether subjective age moderates the within-person link between daily events and affect, two interaction terms (stressor occurrence \times subjective age; positive event frequency \times subjective age) were entered into the models. These terms were also added at the between-person level. All models covaried for chronological age, education (0 = no matura, 1 = matura), and gender (0 = man, 1 = woman), given that prior work has shown

¹Given that positive event frequency can be seen as a count variable, we also ran a Poisson regression resulting in the same pattern of results. Thus, we report the preregistered analyses for simplicity.

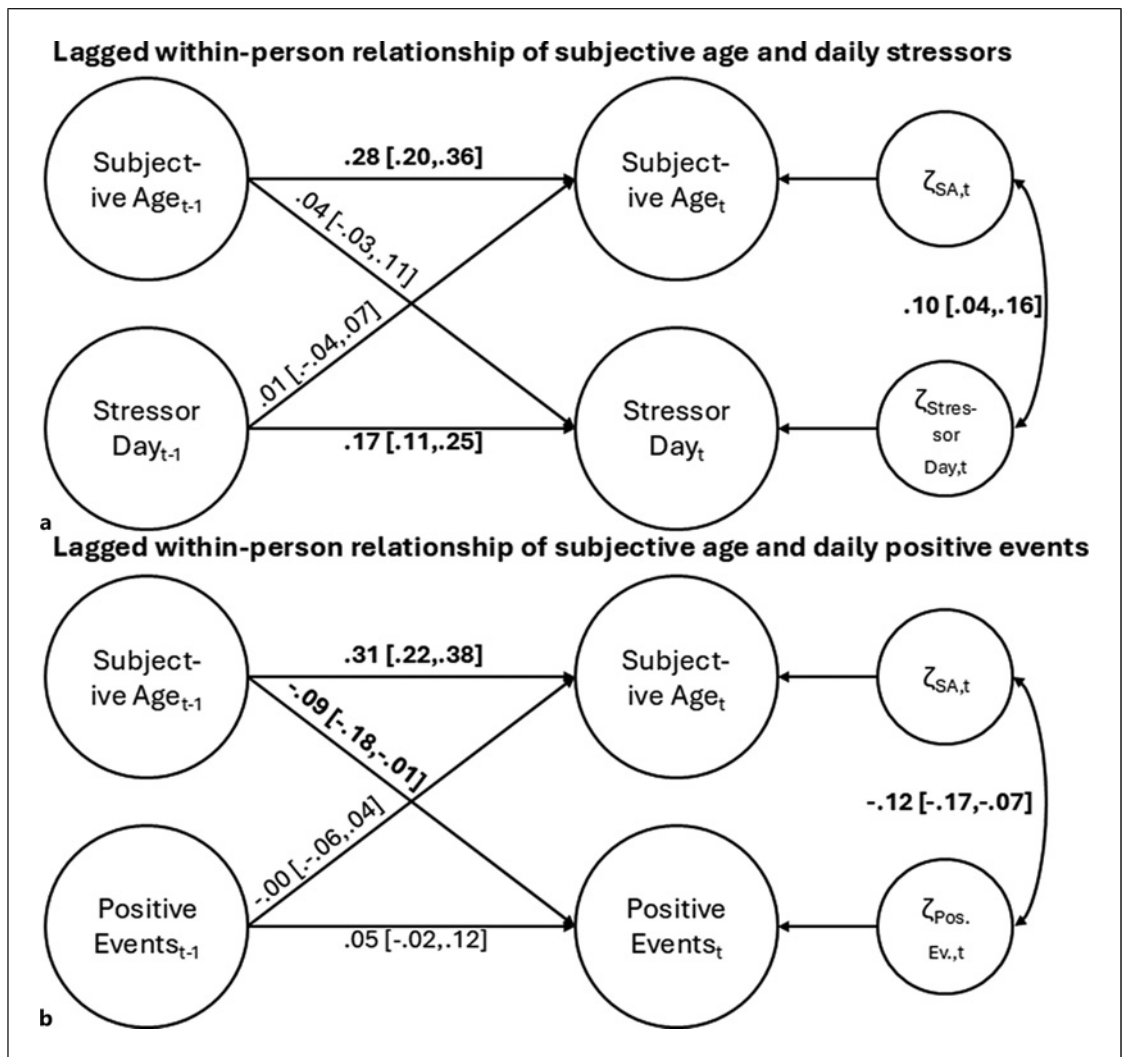


Fig. 1. Lagged bidirectional within-person relationships between subjective age, daily stressors (a), and positive events (b). Standardized estimates from dynamic structural equation models. Numbers in brackets depict 95%-credible intervals, significant estimates are bold.

differences in stress and positive event processes related to these covariates [45, 46].

For our exploratory analyses examining the directionality of effects, we ran two Dynamic Structural Equation Models with days nested within persons in MPLUS version 8.3. Models estimated autoregressive paths between measurement occasions and cross-lagged paths between variables on consecutive days (see Fig. 1 for within-person model). We used Bayes estimation with Mplus default diffuse priors and Markov Chain Monte Carlo (MCMC) algorithms. We used the same model specification as described by Hamaker and colleagues [47].

Results

Descriptive Results

Table 1 presents descriptive statistics and within- and between-person correlations of study variables. On average, participants felt about 8 years younger than their chronological age. Daily stressors occurred on 33% of days and participants reported about 2.51 positive events each day. Positive affect was on average slightly above the scale midpoint ($M = 63.23$; 0–100) and negative affect was close to the lower end of the scale ($M = 12.63$).

Regarding between-person associations, chronological age was not related to discrepancies in subjective age,

Table 1. Descriptive statistics and correlations among study variables

	M (SD)	Age	Subjective age	Stressor occurrence	No. of positive events	Positive affect	Negative affect
Age [65; 92]	73.11 (5.93)	1	–	–	–	–	–
Subjective age [–32.64; 8.93]	–8.05 (6.70)	–0.02	0.69	0.12***	–0.13***	–0.35***	0.28***
Stressor occurrence [0; 1]	0.33 (0.25)	0.05	0.18	0.23	–0.08**	–0.24***	0.29***
No. of positive events [0; 7]	2.51 (0.93)	–0.21*	–0.07	–0.10	0.51	0.20***	–0.18***
Positive affect [0; 100]	63.23 (15.47)	–0.08	–0.35***	–0.44***	0.46***	0.63	–0.58***
Negative affect [0; 100]	12.63 (12.95)	0.04	0.17	0.50***	–0.31**	–0.52***	0.66

Between-person correlations are below and within-person correlations are above the diagonal, and values on the diagonal are intra-class correlations (variance due to between-person differences). Chronological age is a between-person variable, thus, within-person correlations could not be computed, means and SD are person-weighted averages, empirical ranges are denoted for age and SA, while possible scale range are denoted for the remaining variables. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

affect, or number of days with a stressor, but older age was linked to fewer positive events. Regarding within-person associations, higher daily subjective age was linked to lower positive and higher negative affect, a greater likelihood of experiencing stressors, and fewer positive events. As expected, days with stressors were characterized by higher negative affect and lower positive affect compared to non-stressor days. Conversely, experiencing more positive events was linked with higher same-day positive affect and lower same-day negative affect.

Main Results

H1: Subjective Age as a Predictor of Stressor Occurrence

People were more likely to experience stressors on days on which they reported feeling older than usual (see Table 2). The odds ratio of 1.09 indicates that for each year higher subjective age, the odds of experiencing a stressor were about 9% higher. No between-person effect of subjective age or any of our covariates was observed.

H2: Subjective Age as a Predictor of Stress Reactivity

Positive Affect. To examine differences in stress reactivity, interactions between stressor occurrence and subjective age were examined. Declines in positive affect on stressor days were more pronounced on days on which people felt older (vs. younger, see Table 3). Simple slopes

are depicted in Figure 2a. On stressor days on which people felt 6 years older than usual, their positive affect dropped 7.55 units (95%-CI: –10.09, –4.80) compared to non-stressor days. On days on which someone felt 6 years younger than usual, their positive affect dropped 2.69 units (95%-CI: –5.51, 0.06) compared to non-stressor days. Between-person subjective age was not associated with stressor-related dips in positive affect.

Negative Affect. Similar to the pattern observed for positive affect, stressor days on which people felt older than usual were related to more pronounced upticks in negative affect compared to stressor days on which people felt younger than usual (see Table 3). Simple slopes depicted in Figure 2b show that negative affect increased 6.77 units (95%-CI: 4.70, 8.83) on stressor days (vs. non-stressor days) on which someone felt about 6 years older than usual. Stressor days on which someone felt 6 years younger than usual were related to upticks of 3.55 units (95%-CI: 1.45, 5.76). Between-person subjective age was not associated with stressor-related upticks in negative affect.

H3: Subjective Age as a Predictor of Positive Event Occurrence

On days on which people felt younger than usual, they tended to report more positive events compared to days when they felt older than usual (see Table 2). Each year higher subjective age was related to 0.03 fewer positive

Table 2. Bayesian multilevel (logistic) regression models evaluating subjective age as a predictor of stressor occurrence and number of positive events (H1 and H3)

Predictor	Outcome	
	stressor occurrence [0; 1]	No. of positive events
Fixed effects	<i>b</i> [95% CI]	<i>b</i> [95% CI]
Intercept	-1.26 [-1.82; -0.72]	2.41 [2.10; 2.71]
Subjective age (wp)	0.09 [0.04; 0.14]	-0.03 [-0.04; -0.02]
Subjective age (bp)	0.04 [-0.00; 0.09]	-0.01 [-0.03; 0.02]
Age	0.01 [-0.04; 0.07]	-0.04 [-0.07; -0.01]
Gender (1 = women)	0.34 [-0.28; 0.97]	-0.11 [-0.45; 0.25]
Education (1 = Matura)	0.11 [-0.53; 0.73]	0.41 [0.06; 0.76]
Random effects	SD [95% CI]	SD [95% CI]
Intercept	1.40 [1.13; 1.72]	0.88 [0.76; 1.02]
Subjective age (wp)	0.09 [0.03; 0.15]	0.02 [0.00; 0.04]

Models based on 1,429 observations from 108 individuals, 95% CI refers to 95% Bayesian Credible Intervals; wp, within-person; bp, between-person.

Table 3. Bayesian multilevel regression models evaluating subjective age as a moderator of stress reactivity and responses to positive events (H2 and H4)

Predictor	Outcome	
	positive affect [0; 100]	negative affect [0; 100]
Fixed effects	<i>b</i> [95% CI]	<i>b</i> [95% CI]
Intercept	65.30 [61.07; 69.62]	11.11 [7.51; 14.81]
Stressor occurrence (wp)	-5.13 [-6.92; -3.33]	5.15 [3.79; 6.49]
No. of positive events (wp)	1.67 [0.94; 2.39]	-1.27 [-1.86; -0.68]
Subjective age (wp)	-0.81 [-1.02; -0.60]	0.50 [0.33; 0.67]
Stressor occurrence (bp)	-21.40 [-30.80; -12.22]	20.26 [12.11; 28.47]
No. of positive events (bp)	6.41 [3.76; 9.06]	-3.20 [-5.57; -0.84]
Subjective age (bp)	-0.60 [-0.95; -0.24]	0.10 [-0.22; 0.42]
Stressor occurrence (wp) × SA (wp)	-0.40 [-0.75; -0.06]	0.27 [0.00; 0.54]
No. of positive events (wp) × SA (wp)	0.33 [0.17; 0.49]	-0.17 [-0.29; -0.05]
Stressor occurrence (wp) × SA (bp)	0.11 [-0.16; 0.40]	-0.07 [-0.28; 0.14]
No. of positive events (wp) × SA (bp)	0.12 [0.00; 0.24]	-0.01 [-0.10; 0.08]
Age	0.08 [-0.31; 0.46]	-0.15 [-0.51; 0.21]
Gender (1 = women)	-1.69 [-6.53; 3.21]	1.16 [-2.86; 5.19]
Education (1 = Matura)	-1.88 [-6.87; 3.17]	1.41 [-2.78; 5.59]
Random effects	SD [95% CI]	SD [95% CI]
Intercept	12.04 [10.39; 14.02]	10.90 [9.46; 12.61]
Stressor occurrence (wp)	5.59 [3.66; 7.59]	3.91 [2.43; 5.48]
No. of positive events (wp)	1.82 [0.78; 2.84]	1.43 [0.57; 2.30]
Subjective age (wp)	0.67 [0.49; 0.89]	0.56 [0.41; 0.73]

Models based on 1,429 observations from 108 individuals. 95% CI, 95% Bayesian credible intervals; wp, within-person; bp, between-person; SA, subjective age.

events. On the between-person level, subjective age was not related to the number of positive events reported. Among the covariates, only education was linked to positive events with higher educated older adults experiencing positive events more frequently.

H4: Subjective Age as a Predictor of Affective Responses to Positive Events
Positive Affect. Experiencing more positive events than usual was related to upticks in positive affect and these upticks were moderated by subjective age (see Table 3).

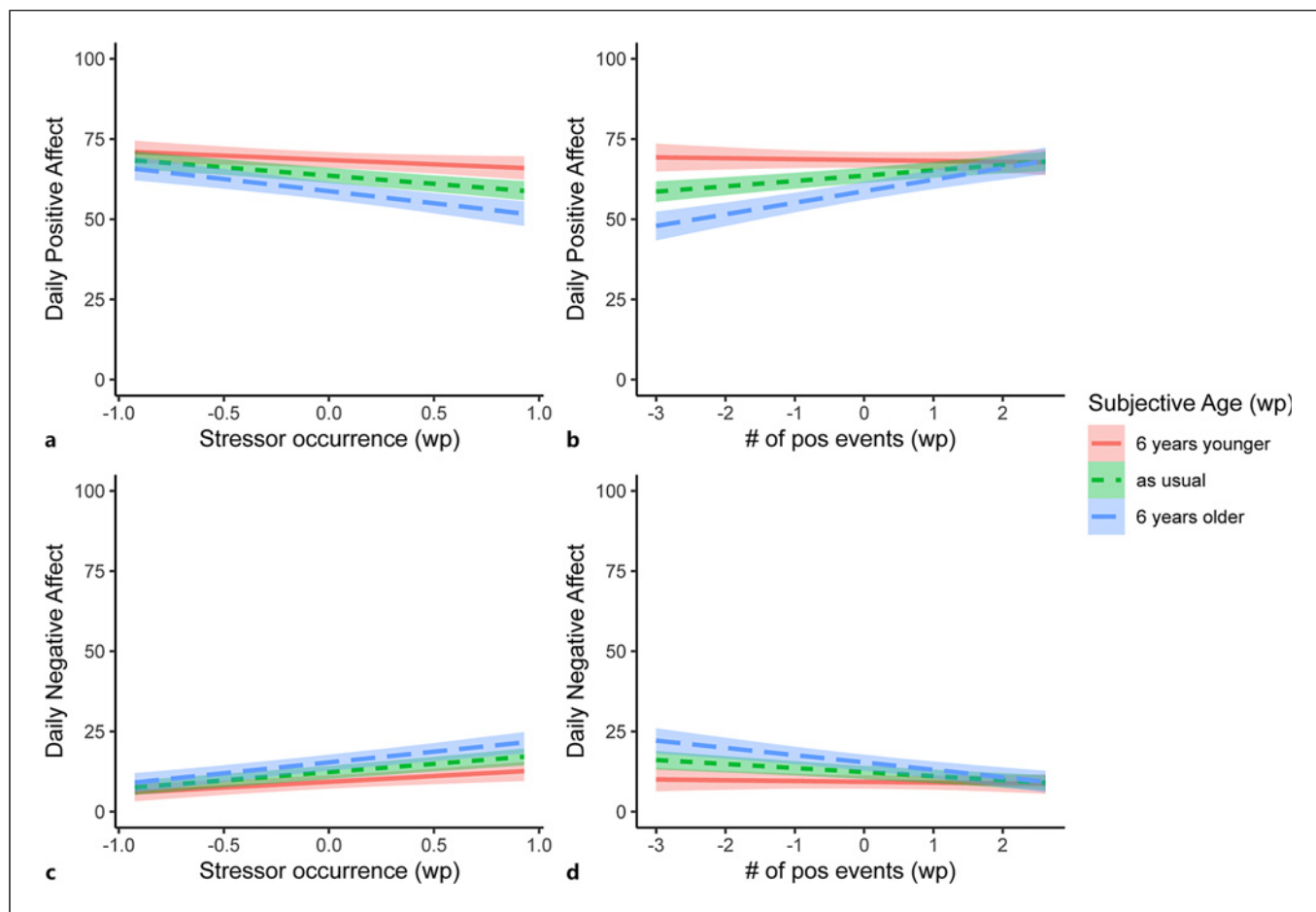


Fig. 2. Fluctuations in daily affect in responses to stressors and positive events by within-person differences in subjective age. Simple slopes were selected based on ~ 1 SD above and below the mean of subjective age.

However, the moderation was opposite to the hypothesized direction. On days on which people reported feeling older than usual, the positive event-related upticks in positive affect were more pronounced compared to days on which they reported feeling younger than usual. Considering the simple slopes (see Fig. 2c), positive events were not related to positive affect on days on which someone felt 6 years younger than usual (simple slope = -0.29 , 95%-CI: $-1.48, 0.92$). Positive events, however, were related to upticks in positive affect on days on which people felt 6 years older than usual (simple slope = 3.61 , 95%-CI: $2.43, 4.77$). The simple slope plot highlights that the uptick on days on which people feel older may be due to people experiencing relatively lower levels of positive affect on days with no positive events and relatively higher subjective age. Experiencing more positive events tends to close this gap associated with subjective age, and there are no subjective age-related

differences in positive affect on days with many positive events.

On the between-person level, subjective age also moderated positive event-related changes in positive affect (similar pattern to within-person effects). People who on average felt older showed stronger upticks in positive affect on days with more positive events compared to people who felt younger.

Negative Affect. Mirroring the pattern observed for positive event-related fluctuations in positive affect, negative affect tended to be lower on days with more positive events and this effect was more pronounced on days on which people felt older than usual compared to days on which people felt younger than usual (see Table 3). Examining the simple slopes (see Fig. 2d), the positive events were not related to daily negative affect on days on which people felt 6 years younger than usual (simple slope = -0.26 , 95%-CI: $-1.15, 0.70$). On days on

which people felt 6 years older than usual, experiencing more positive events was related to lower negative affect (simple slope = -2.29 , 95%-CI: -3.22 , -1.35). Mirroring the results on positive affect, the steeper declines in negative affect on days on which people felt older are likely due to the higher base levels of negative affect on days with no positive events. These subjective age-related differences in negative affect disappeared on days with a high number of positive events. Between-person subjective age was not associated with positive event-related fluctuations in negative affect.

Time-Lagged Follow-Up Analyses

To further shed light on any time-ordered effects for event occurrence, we examined bidirectional, time-lagged effects of subjective age and daily events. The results of the within-person part of the models are depicted in Figure 2. Regarding the first model (Fig. 1a) on daily stressors, autoregressive paths were detected for both subjective age and stressor days, but the cross-lagged paths were nonsignificant.

Concerning positive events, people reported feeling relatively younger the day before engaged in more positive events 1 day later (Fig. 1b, subjective age at $t-1$ predicting positive events at t). No evidence for the opposite pattern was observed. In addition, there was an autoregressive effect for subjective age but not for positive events (full model results are available on the OSF: <https://osf.io/93kts/>).

Discussion

This study examined whether fluctuations in older adults' subjective age are related to the occurrence of same-day stressors and positive events, and associated affective fluctuations. We confirmed our hypotheses that on days on which older adults tend to feel older, they have a higher likelihood of experiencing a stressor (H1) and report a relatively lower number of positive events (H3). Follow-up analyses showed that previous-day subjective age predicted next-day positive events but not next-day stressors. Previous-day stressors and positive events were not predictive of next-day subjective age. In line with our hypothesis (H2), older subjective age was related to greater affective stress reactivity (greater fluctuations in effect on stressor days). However, contrary to our hypotheses (H4), older subjective age was related to greater affective responses to positive events as indicated by more pronounced links between positive events and same-day affect.

Results highlight a consistent connection between one's self-evaluation of aging-related experiences and daily event processes including both the occurrence and affective responses to stressors and positive events.

The present results are in line with prior work using samples of both younger and older adults showing that people tend to feel older on days on which they experience one or more stressors [16–18]. While it is unlikely that higher subjective age leads to more stressful situations, subjective age might be related to how older adults appraise potentially stressful events, possibly lowering the bar of what they perceive as a stressor. In addition, people might be worse at handling everyday life situations when they feel older making it more likely that these situations turn into a stressor (e.g., a difficult conversation turning into an argument or fight), given that past work has linked feeling older with more maladaptive coping strategies, e.g., less task-oriented coping [48]. Future research is needed to further disentangle these processes and examine the link between subjective age and stress appraisals.

Furthermore, there was no evidence for day-to-day lagged effects between stressor occurrence and subjective age, which is in line with a previous daily diary study [16]. However, a recent study has shown that within the same day, perceived stress and higher cortisol levels were preceding upticks in subjective age, but not vice versa [49]. Importantly, this study did not examine the exposure to distinct stressful events and relied on perceived stress levels instead, which may share more variance with subjective age due to the more subjective nature of perceived stress. More experience sampling work is needed to examine the immediate consequences of experiencing a stressful event for subjective age across hours and the impact of subjective age on stress appraisal processes.

Days, when individuals felt older than usual, were not only marked by a higher likelihood of reporting a stressor but also by increased affective stress reactivity. This is significant because heightened affective stress reactivity has been linked to poorer future health outcomes, including the development of affective disorders, chronic health conditions, and premature mortality [50–52]. A person's subjective age may reflect internal psychological (e.g., energy levels) and physiological factors (e.g., proprioceptive cues) that have been shown to influence the magnitude of stress responses [21]. Subjective age may tap into processes through which an individual assesses their readiness to deal with a stressful event, thereby being a useful predictor of the magnitude of an individual's stress

response. However, it is also possible that exaggerated affective responses to stressors deplete psychosocial resources and thus, subjective age could be characterized as an outcome of stress reactivity. This aligns with the contextual model of subjective age, as it highlights subjective age as both a predictor of daily activities, reflecting readiness to handle challenges, and as an outcome influenced by the experience of age-related physical and cognitive symptoms [53].

The current study expanded past work by also considering engagement in and responses to positive events. As expected, people reported more positive events on days on which they felt younger than usual. Days with subjective youthfulness likely reflect days on which older adults perceive to have more physiological and psychological resources to actively engage in pleasant activities, get out of the house, and reach out to their loved ones [27–29]. Lagged follow-up analyses provided evidence for subjective age as a predictor rather than outcome of positive event engagement; previous-day subjective age was associated with more positive events on the following day. People may actively plan meaningful and positive activities for the upcoming days when they feel younger than usual providing extended benefits over and above the current day.

Past work has called the link between daily stressors and subjective age a “weathering” effect [17]. We did not find evidence for a “rejuvenation” effect given that previous-day positive event engagement was not associated with next-day subjective age. In contrast to stressful experiences which are often avoided, positive events are actively sought out and created, possibly requiring significant resources [24]. It could be that older adults feel more youthful during and directly after positive event engagement, but that they feel exhaustion or fatigue after a few hours have passed, especially if the activity involved prolonged socializing, physical activity, or high-arousal emotions. Future research could include more dense assessments of subjective age and event engagement to uncover these temporal mechanisms.

However, despite people experiencing more positive events on days on which they felt younger than usual, positive events on these days were not related to an uptick in positive emotions or a dip in negative emotions. The link between positive events and both same-day positive and negative affect was estimated to become stronger the older people felt suggesting that older adults reaped more affective benefits from their positive events on days on which they felt relatively older. There are multiple possible explanations for this perhaps counterintuitive finding.

First, people might need the emotional benefits more on days when they feel older, as these days are characterized by worse affective well-being. There might be more “emotional room” for increases in positive emotions in response to positive events on these days. Similarly, positive events can only reduce negative emotions if negative emotions are present. Thus, these results could also be interpreted as positive events buffering the negative affective implications of feeling older, given that on days with a high number of positive events subjective age-related differences in affect disappeared. Thus, positive events may enhance emotional well-being, especially on more challenging days, which is in line with ideas on the stress-buffering effects of positive events [54].

Second, on days when older adults report feeling older than usual, they might be more acutely aware of their limited time left. According to Socio-Emotional Selectivity Theory [55], a more limited future time perspective (higher self-appraised age or subjective age) may shift motivation toward maximizing hedonic well-being. Consequently, older adults may employ savoring strategies to fully benefit from positive events on days with relatively higher subjective age, leading to more pronounced affective responses [56]. While this interpretation is speculative, it is grounded in influential theories of adult development and warrants empirical testing in future research. Third and finally, days with lower subjective age can be characterized by greater homeostasis.

Older adults may be more stable in their affect and less perturbed by external events as both affective responses to positive events and stressors were attenuated on these days. Younger subjective age may signify days on which people are more steadfast and emotional fluctuations are more driven by internal emotion regulation and less by external events. This notion aligns with recent suggestions that having a sense of purpose might be an indicator of such greater homeostasis by recentering conscious attention toward prospective and overarching aims, thereby limiting the magnitude of disruption to well-being caused by proximal stimuli [57], which has been empirically shown in prior work for both daily stressors and positive events [58]. Future work should further examine the existence of such homeostatic processes and whether subjective age may be an easily accessible indicator of these processes.

Strengths and Limitations

The current study needs to be interpreted in light of its strengths and limitations. This is the first study, to the best of our knowledge, to consider both stressors

and positive events in their interplay with subjective age to better understand the well-being implication of subjective age in older adults' daily lives. In addition, we have expanded past work by also examining links with affective responses and bidirectional lagged effects. However, the chosen time scale from 1 day to the next might not be ideal for examining micro-processes, as the restorative function of sleep may wash out some effects. While experience sampling studies with multiple assessments per day might be useful for tracking moment-to-moment fluctuations in subjective age, it is unclear whether peoples' felt subjective age changes as quickly and whether these fluctuations across hours are meaningful. A simple recommendation for future work would be to add a morning assessment of subjective age to a daily diary study which can be used to examine daily events as a predictor of changes in subjective age from morning to evening, thus better testing any "weathering" or "rejuvenation" effects. Furthermore, this approach would also allow us to examine whether affective reactivity to daily events is moderated by a morning or evening rating of subjective age, providing insights into whether subjective age is better conceptualized as a predictor or an outcome of affective responses to daily events. These will be important next steps for research on subjective age to bring the field further in the direction of understanding the causal ordering of any effects.

While the sample matches demographic patterns of Swiss older adults, it is unclear whether the results will translate to other cultural contexts given that recent work has shown cultural differences in the coupling of subjective age and negative affect between Israeli Arabs and Israeli Jews [59]. In addition, our measures of daily stressors and positive events have been previously used [38], but they require people to assess whether any of the encountered events fall within the positive events or stressor domains laid out. This inadvertently conflates measures of event occurrence with appraisals and future work is needed to examine the role of appraisals (e.g., event significance, threat, coping resources).

Conclusion

This study underscores the dynamic nature of subjective age, showing its significant association with the events that older adults encounter and their affective responses to these events. These results highlight the interaction between personal aging experi-

ences and environmental factors as a unique contribution, suggesting that subjective age may be a useful metric for better understanding how older adults interact with their daily uplifts and challenges. The study emphasizes subjective age's potential as a target for interventions to improve emotional well-being and stress resilience in older adults. Future research should explore these associations further, including diverse populations and more intensive time sampling to examine the rate of fluctuations in subjective age.

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Statement of Ethics

Data collection was approved by the Ethics Committee of the University of Zurich (Approval No. 22.4.11) and secondary data analysis by Tilburg University's Social and Behavioral Sciences Ethics Review Board (TSB_RP_FT09). Written consent was obtained from all participants prior to participation.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Conceptualization and writing – review and editing: P.K. and T.P.; writing – original draft preparation: P.K.; data collection and project management: T.P. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

Study data are available on the Open Science Framework: <https://osf.io/93kts/>.

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