Age-Specific Predictors of Changes in Subjective Life Expectancy: A 10-year Longitudinal Study

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Abstract

Introduction. Subjective life expectancy (SLE) is considered an indicator of future time perspective and has implications for developmental outcomes in different areas of life. Previous studies rarely took a lifespan approach, although it would allow for a better understanding of whether the factors affecting SLE vary with participants' chronological age. Therefore, in this study, we aimed to investigate the predictors of changes in SLE across the lifespan, focusing on views of aging and preparation for old age.

Methods. SLE was assessed across a 10-year longitudinal interval in a sample of German adults participating in the Ageing-as-Future study (*n* = 514; age range at T1: 30-80 years). Personalized views of aging (future self-views) and preparations for old age assessed at T1 were used to predict changes in SLE across the longitudinal interval.

Results. Positive future self-views predicted greater stability in SLE across the 10-year interval; this effect was only obtained for younger adults. High levels of preparation for old age predicted greater stability in SLE, but only for older participants.

Conclusion. Psychological variables capturing beliefs and behaviors regarding old age and aging have been shown to play a pivotal role in development in old age. The current study demonstrates that these variables influence an important aspect of future time perspective, namely, the subjectively expected time left to live. Examining psychological and behavioral predictors of SLE is relevant, as it broadens the understanding of which factors play a role in expanding or shrinking the perceived remaining lifetime.

Keywords: perceived remaining life time, views of aging, preparation for old age, time perspective

Except for rare and extreme situations, no one can know their exact time of death. When thinking about and planning the future, people thus estimate how old they might get, and consequently, how much time they still have left to live. This estimation is termed "subjective life expectancy" (SLE). As an indicator of future time perspective, SLE marks the perceived endpoint of life, highlighting opportunities for adjustments as well as limitations regarding self-directed development and life planning, e.g., [1]. Consequently, SLE has been shown to have implications for decision making and developmental outcomes across life [2,3]. For instance, people with shorter SLE (compared to those with longer SLE) report earlier retirement intentions, less adaptive health self-regulation, worse health, a reduced sense of personal control, less efficient coping with losses and critical life events, and actually die earlier e.g., [4], and [3] for an overview.

Considering these effects, a large body of research has addressed the factors that influence individuals' SLE. In their theoretical framework, Rupprecht and Lang [3] identify biographical and psychological factors as antecedents of SLE across the lifespan. Biographical predictors include cultural expectations regarding late-life provision or socioeconomic factors, such as education and childhood socioeconomic status as well as personal experiences and age-related behaviors. Behavioral aspects, such as preparation for old age, might lead to the perception that one has the means and resources to tackle challenges of the aging process and thus experiences a higher confidence in surviving them [5, 6, 7]. Psychological factors include optimism, attitudes towards death and dying, but also views on aging, such as future self-views [3, 8]. Future self-views, that is personal expectations for one's future as an older person, influence the likelihood of encountering critical life events and changes in the future, as well as their interpretation [9], and thus can positively shape estimations of the remaining lifetime.

Rupprecht and Lang [3] also identify age as an important moderator of these antecedents, however, this is rarely considered in empirical studies. As people age, the salience of their remaining lifetime increases, time horizons shift from time since birth towards time left to live [8], and different contextual opportunities for age-related actions are available [5]. Furthermore, findings regarding

the underlying sources of SLE are often based on cross-sectional designs, which leads to interpretational ambiguities.

In the current study, we investigated future selves as a psychological predictor and preparation for later life as a behavioral predictor of changes in SLE in a longitudinal study spanning 10 years with a sample covering a broad age range. We hypothesized that both future selves and preparation are positively related to positive changes in SLE (that is, people with more positive future selves and higher reported preparation should develop more positive estimates of their life expectancy).

Additionally, we assume that the predictive effect of both future selves and preparation for changes in SLE is moderated by chronological age. Preparation might become more relevant at later stages of the lifespan when being prepared (or not) has concrete effects on personal aging experiences [6]. Future self-views as an older person have a less direct impact on behavior and likely influence subjective life expectancy more abstractly, through expectations, anticipations, and interpretations. This may be especially true for younger people, for whom the end of life feels distant and personal aging experiences are not yet relevant [7].

Methods

Sample and Procedure

We used data from the Ageing-as-Future longitudinal study (AAF) [10]. The initial sample comprised N = 768 participants aged 30-80 years at the time of inclusion (M_{age} = 55.27, SD = 14.85, 49.5% female). We recruited participants from two cities in Germany: Jena and Erlangen. For the current analyses, we included participants who took part at baseline (T1 = 2009) and at the 10-year follow-up (T3 = 2019). The final sample for this study comprised n = 514 German participants aged 30-80 years at T1 (M_{age} = 53.77, SD = 13.91, 52% female) and 39-89 years at T3 (M_{age} = 62.71, SD = 13.91). At each measurement occasion, participants received a questionnaire, answered it alone at home, and after completing and returning the questionnaire, they received a gift card valued at approximately $20 as compensation.

Measures

Our measures were part of a larger questionnaire that included variables that assessed future self-views (FS), preparations for aging, and SLE, which were measured at all time points. For FS and preparations for aging, we report aggregated values across seven life domains (FS: family, friendships, leisure activities, personality, finances, work, health, and appearance; preparations: social relations, leisure activities, finances, work, mental and physical fitness, health, and appearance).

Future Self-Views. We assessed future self-views (FS) using the scales we developed [9]. Each item was preceded by a one-sentence description of the life domain, and participants had to rate *themselves when they are older* on an 8-point bipolar scale (sample item friendships: "When I am older, I will have many (vs. few) friends and acquaintances"). Higher values indicated a more positive FS. Reliabilities of the FS scales were high (α = .89 at T1, and α = .91 at T3).

Preparations for Aging. We measured preparation for old age using scales we developed to cover domain-specific preparatory activities for aging [4]. Participants rated their agreement using a 4-point Likert scale that ranged from 0 ("not at all") to 3 ("a lot"). A sample item for the domain finances would be "I am actively providing for my financial situation in old age (e.g., retirement accounts, savings, etc.)"; for each item, we also asked whether participants thought about the topic or exchanged with others. Higher values indicate higher levels of preparation for old age. Reliabilities of the preparation for aging scales were high (α= .91 at T1, and α = .90 at T3).

Subjective Life Expectancy. Participants were asked the following question: "I believe that I am probably going to become _____ years old." The SLE for each time point was derived by subtracting the participants' chronological age from the age indicated in the question above. This difference score indicates how many remaining life-years participants perceive. Higher values indicate more remaining expected life-years.

Additional variables. We further controlled all analyses for the main effect of chronological age (in years) and subjective health ("How would you rate your current state of health?", 0 = "not good at all" to 4 = "very good") at T1.

Statistical Analyses

To examine the effects of T1 predictors on changes in SLE assessed at T3, and to test whether age moderated these effects, we conducted a moderated multiple regression analysis. The model included SLE at T3 as the outcome variable, and future self-views, preparations for aging, chronological age, and 2-way interactions of future self-views × chronological age, and preparations for aging × chronological age as predictors. We controlled for subjective health status and SLE at T1 as covariates, so that the results reflect the effects of the predictors on changes in SLE (Δ SLE T3-T1). All predictors were assessed at T1 and centered to allow for the simultaneous interpretation of the main effects and interactions. Following up on the significant interactions, we then tested age-specific factors associated with SLE by carrying out simple slope analyses. The analyses were carried out with R (version 4.3.3).

Results

Descriptive Analyses

On average, participants reported they expected to live until $M = 80.48$ years at T1 ($SD = 6.73$, range = 40 - 101 years), and until $M = 83.57$ years at T3 ($SD = 6.62$, range 55 - 101 years). In terms of SLE, participants expected to still have $M = 26.97$ ($SD = 14.21$, range 1 - 68 years) and $M = 21.20$ ($SD = 13.27$, range 0 - 56 years) life years at T1 and T3, respectively. Between T1 and T3, most participants (83%) experienced a decline ($M = -7.55$, $SD = 4.81$) in SLE, whereas 16% showed an increase ($M = 2.31$, $SD = 3.51$) in SLE. Only 1% of the participants showed stability in SLE. Further analysis of younger (64 years and younger) and older (65 years and older) participants revealed a similar pattern.

Predictors of SLE

Table 1 shows the estimates of the regression predicting expected SLE at T3. More perceived remaining life years and more positive future self-views at T1 were associated with more perceived remaining life years at T3, whereas older age was associated with fewer perceived remaining life years. Most importantly, interactions with age were significant. Following up on these 2-way interactions, we conducted simple slope analyses to estimate the effects of baseline future self-views (Fig. 1A) and preparations for aging (Fig. 1B) at two levels of age: one standard deviation below and

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one standard deviation above the mean. For the simple slope analyses, we used changes in expected SLE from T1 to T3 as the outcome variable to simplify the visualization of the results. As shown in Figure 1A, future self-views at T1 were significantly related to changes in SLE when age was one standard deviation below the mean (B =1.11, p = .01) but not when it was one standard deviation above the mean (B = -.28, p = .48). On the contrary, as Figure 1B shows, preparations for aging were significantly related to changes in SLE when age was one standard deviation above the mean (B = 1.57, p = .03) but not when it was one standard deviation below the mean (B = -1.31, p = .05).

Discussion

People's estimations of time left to live and subjective life expectancy are motivating forces related to several outcomes across life, including behavioral choices, planning, health, and mortality. In the current study, we longitudinally investigated how the effects of behavioral and psychological predictors of SLE are differentially related to changes in SLE across the adult lifespan. While more positive future self-views were related to higher stability of perceived remaining lifetime for younger adults, they did not influence changes in the SLE of older adults. The opposite pattern was visible for preparation for later life: While more preparation predicted a higher stability of perceived remaining lifetime for older adults, it was not related to changes in the perceived remaining lifetime for younger adults.

As expected, future self-views were positively related to SLE changes. Participants who imagined themselves more positively as older adults at T1 reported greater stability in their expected remaining years left to live 10 years later. This supports previous findings linking views on aging to positive developmental outcomes in later life [5, 6]. The effect, however, was moderated by participants' age: Thinking about one's future as an older person increases SLE for younger adults, but not for older adults, indicating that future self-views are especially important for age- and mortality-related considerations when people are younger. Younger people cannot yet draw from many personal aging experiences (e.g., transitioning into caregiving, [11]) to inform their considerations about how long they might live and thus, they seem to extrapolate from their views on aging, which are informed by vicarious experiences and societal as well as personal age

stereotypes [3]. Thus, promoting realistic, positive views on aging is relevant across the lifespan and especially in younger years, as they can be used as a blueprint for aging when only few personal aging experiences are available yet [12].

While we did not find a main effect of preparations for aging on SLE changes, self-reported engagement in preparation for late life was predictive for older adults and mitigated the decline in their expected remaining lifetime of over 10 years. It seems that as people get older, they experience more age-related changes and are given more opportunity structures to engage in preparatory behaviors that directly bear on these age-related experiences, for instance by concretely planning later-life living arrangements or attending regular health-checkups; thus, these behaviors have a positive influence and expand their time horizons. Engaging in preparatory behaviors might increase feelings of control and the perception of resources to deal with age-related changes and challenges, thus increasing perceived longevity. These findings mirror recent studies investigating predictors of willingness to live under impairments, which were also related to future-oriented thoughts in younger people and more concrete preparatory actions for older adults [13].

Thus, one limitation of our study is that we only assessed participants' expectations about how long they might live and not how long they actually want to live and under which circumstances [13]. As some might associate a very long life with loss of autonomy, frailty, and care dependence, an increase in life expectancy might not necessarily have only positive effects on quality of life in old age, and needs to be understood in a differentiated way. It would also be interesting to expand the study of SLE to very old adults and determine which variables could increase the perception of remaining lifetime when the end-of-life is approaching. We also do not know how exactly people estimate their SLE, and whether the accuracy of this estimation increases with chronological age. Thus, the meaning and consequences of SLE in different phases of life need further investigation [3]. In addition, all variables of our study were assessed via self-report. It is therefore unclear whether SLE and preparation for aging reflect realistic estimates of longevity and actual preparation. However, the effects of SLE on well-being and developmental regulation may be independent of whether it is an accurate estimate of life expectancy. In conclusion, more positive future self-views

and more preparation for old age increase how long people think they might live and while future expectations seem to be especially influential for younger people, preparatory behaviors were more important for older participants. These findings provide a differentiated understanding of the motivational processes of time perspective in adulthood and might thus help enhance the effectiveness of interventions to increase time perspective and thus action scopes in later life.

Statements

Statement of Ethics

The research procedures were reviewed and approved by the Institutional Review Board of the Friedrich Schiller University, Jena (FSV 18/36). More details on the ethics approval, general sampling, and assessment procedures are described in [8]. Written informed consent was obtained from all participants.

Conflict of Interest Statement

We have no conflict of interests to disclose.

Author Contributions

Clara de Paula Couto: Conception and design; acquisition, analysis, and interpretation of data; drafting and reviewing the work critically for important intellectual content; final approval of the version to be published; and agreement to be accountable for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

A. E. Kornadt: Conception and design; acquisition, analysis, and interpretation of data; drafting and reviewing the work critically for important intellectual content; final approval of the version to be published; and agreement to be accountable for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

K. Rothermund: Conception and design, critical review of the work for important intellectual content, final approval of the version to be published, and agreement to be accountable for all

aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Data Availability Statement

The study was not pre-registered. The raw data supporting the conclusions of this article will be made available by the authors without undue reservation. The analytic code needed to reproduce the analyses presented in this paper, as well as the analysis outputs, are deposited at the Open Science Framework (https://osf.io/rkves/?view_only=7ef5ff663a2d49738343f4885823e217).

The current analyses are based on the Ageing-as-Future dataset [8]. While we used future self-views, subjective life expectancy, and preparation for age-related changes in other publications from the same dataset (e.g., [4]), we did not investigate the influence of preparation and future selves on SLE. Furthermore, in these previous studies, we used only the first two waves of data available at this time. Thus, the current analyses are novel.

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Table 1. Regression Analysis of Predictors of Subjective Life Expectancy at T3.

Predictors	Estimates	CI	p
(Intercept)	7.01	$4.76 - 9.27$	**<0.001*****
SLE (T1)	0.52	$0.45 - 0.59$	**<0.001*****
Subj. Health (T1)	-0.04	-	0.876
Future Self-Views (T1)	0.96	$0.39 - 1.52$	**0.001****
Preparations for Aging (T1)	0.43	-	0.421
Age (T1)	-0.38	$-0.45 - -$	**<0.001*****
Future Self-Views (T1) × Age (T1)	-0.07	$-0.10 - -$	**0.001****
Preparations for Aging (T1) × Age (T1)	0.11	$0.03 - 0.18$	**0.004****
Observations	481		
R^2 / R^2 adjusted	0.863 / 0.861		

Note. SLE = Subjective Life Expectancy; Subj. Health = Subjective Health Status.

Unstandardized estimates are reported. All predictors involved in the interactions are

centered. For SLE (at T1, predictor, and at T3, dependent variable), higher values indicate

perceiving more remaining years of life. For all other predictors, higher values indicate

higher agreement/older age. Significant values are in bold. *p < .05; **p < .01; ***p < .001

Figure Legends

Fig. 1 Interaction between Future Self-Views at T1 (A), Preparations for Aging at T1 (B) and Age at T1 in Predicting Change in Subjective Remaining Life Expectancy from T1 to T3.

Note for Fig. 1: Predictors are mean-centered in all analyses. Δ SLE T3-T1 = Change in subjective life expectancy from T1 to T3. Δ SLE T3-T1 was computed by summing the mean difference of SLE at T3 and SLE at T1 ($M_{\text{SLE T3 - SLE T1}}$) to the residuals of SLE at T3 predicted by SLE at T1. Higher values indicate an increase in the perceived remaining lifetime from T1 to T3. Slopes for Preparations for Aging (one-tailed).