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Terminal decline in well-being: The role of social orientation

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Abstract

Well-being development at the end of life is often characterized by steep deteriorations, but individual differences in these terminal declines are substantial and not yet well understood. This study moved beyond the typical consideration of health predictors and explored the role of social orientation and engagement. To do so, we made use of social variables at the behavioral level (self-ratings of social participation) and the motivational level (valuing social and family goals), assessed two to four years before death. We applied single- and multi-phase growth models to up to 27-year annual longitudinal data from 2,910 now deceased participants of the nation-wide German Socio-Economic Panel Study (SOEP; age at death: $M = 74$ years; $SD = 14$; 48% women). Results revealed that leading a socially active life and prioritizing social goals in late life were independently associated with higher late-life well-being, less pronounced late-life decline, and a later onset of terminal decline. Significant interaction effects suggested that the effects of (reduced) social participation and (lowered) social goals were compounding each other. Findings also indicated that less decline in social participation was associated with shallower rates and a later onset of well-being decline. We found little evidence that valuing family goals is associated with late-life trajectories of well-being. Associations were independent of key correlates of well-being and mortality, including age at death, gender, education, disability, hospital stays, and goals in other life domains. We discuss possible pathways by which maintaining social orientation into late life may help mitigate terminal decline in well-being.

Words: 250

Keywords: Successful aging; life satisfaction; social support; longitudinal change; development; mortality; German Socio-Economic Panel Study; SOEP

Terminal Decline in Well-Being: The Role of Social Orientation

A central objective of developmental research is to describe and explain interindividual differences in intraindividual change (Baltes & Nesselroade, 1979). One of the most intriguing phenomena in this regard are changes in central areas of life, including well-being, that occur at the end of life (i.e., terminal decline; Burns, Mitchell, Shaw, & Anstey, 2014; Holt-Lunstad, Smith, & Layton, 2010; Mroczek & Spiro, 2005; Schilling, Wahl, & Wiegeling, 2013). Although individual differences in terminal decline in well-being are well documented and substantial, the particular factors contributing to such differences are not yet fully understood, particularly outside the physical health domain (for overview, see Gerstorf & Ram, 2013). The current study draws on a tradition of research implicating social orientation and social resources as fundamental components of successful aging (Rowe & Kahn, 1997) and examines whether and how social orientation is associated with differences in terminal decline in well-being. To do so, we make use of social variables at the behavioral level (self-ratings of social participation) and the motivational level (valuing social and family goals), obtained an average of two to four years before death. We apply single- and multi-phase growth models to up to 27-year annual longitudinal data from 2,910 now deceased participants of the nation-wide German Socio-Economic Panel Study (SOEP) and examine whether and how social orientation is associated with late-life well-being levels, rates of terminal decline, and delayed onset of terminal decline. To control for known correlates of well-being and mortality, all our models co-vary for age at death, gender, education, disability, hospital stays, and goals in other life domains.

Well-Being Trajectories in Adulthood and Late Life

Theories of self-regulation and a myriad of empirical reports attest to the relative stability of well-being across adulthood and into old age (Carstensen et al., 2011; Charles, Reynolds, & Gatz 2001; Diener, Lucas & Scollon, 2006; Ryff & Singer, 1998). Qualifying this overall positive picture, a growing body of research has repeatedly shown that mortality-related time-to-death models typically account for more variance in interindividual differences in late-life well-being change than age-related models and that, on average, both cognitive evaluative and emotional well-being decline rapidly in the last years of life (for overview, see Gerstorf &

Ram, 2013). To use an example from our own work, participants across three national studies in the US, Great Britain, and Germany were found to enter the terminal phase of steep well-being deteriorations an average of three to five years prior to death (Gerstorf, Ram, Mayraz, et al., 2010). To illustrate, the average decedent from the German SOEP study exhibited almost a full standard deviation (effect size units) decline in life satisfaction during the last four years of life. However, despite this overall negative picture of terminal decline in well-being, considerable individual differences exist (Burns, Byles, Magliano, Mitchell, & Anstey, 2014; Gerstorf & Ram, 2013). Although many people are exhibiting dramatic declines in well-being in the last years of their lives, there are some individuals who are able to maintain their well-being until (or very close to) the end of life.

Previous evidence shows, through proxy variables, that pathology, disability, and comorbidities, contribute to late-life well-being (Burns, Mitchell, Shaw, & Anstey, 2014; Gerstorf, Ram, Lindenberger, & Smith, 2013; Infurna et al., 2014). Interestingly, these proxies are often associated with differences in level of well-being late in life, but they are not associated with differences in rate of terminal decline. Setting limitations in statistical power aside, these findings suggest that *biological factors* such as poor health are but one of several sets of factors that shape late-life well-being. In line with the notion that terminal decline is not just biology, recent evidence demonstrates that *psychological resources* such as perceived personal control are also associated with higher levels of late-life well-being, less severe rates of terminal decline, and later onset of terminal decline (Gerstorf, Heckhausen, Ram, et al., 2014). Continuing in the quest to help vulnerable segments of the population by identifying modifiable psychosocial factors that are related to differences in terminal decline in well-being, the current study examines the role of *psychosocial functioning*, namely social orientation.

Social Orientation and Well-Being

Social relationships and activities have long been identified as key elements of successful aging (Rowe & Kahn, 1997; 2015) and there is solid evidence that they contribute to individual health and well-being (Berkman, Glass, Brissette, & Seeman, 2000; Cohen, 2004; Diener & Seligman, 2004; Uchino, 2006). For example, Antonucci (2001) concluded from her

literature overview that people who report being socially integrated also tend to report higher well-being. Conversely, social isolation was found to be associated with lower mental and physical health, especially among older adults (Dahlberg & McKee, 2014; Hawton et al., 2011; Ong, Rothstein, & Uchino, 2012). In the current study, we focus on process aspects of the Fingerman and Lang framework of social relations (2004) and specifically examine two aspects of social orientation and engagement, (a) at the behavioral level, social activities and participation and (b) at the motivational level, the importance of social and family goals.

Social activities and participation. Going back to influential notions of activity theory, according to which social involvement and activity constitute prerequisites for successful aging (Burgess, 1954; Lemon, Bengtson, & Peterson, 1972), social engagement is considered a key driver of life satisfaction in older adults. Social activity may influence well-being directly, for example, through the pursuit of kind acts and engagement in meaningful and joyful activities (Lyubomirsky & Layous, 2013). The association may also be more indirect, for example, in that social activities promote feelings of competence, physical health, and cognitive functioning (Herzog & House, 1991; Menec, 2003; Netz, Wu, Becker, & Tenenbaum, 2005), which in turn contribute to high well-being. Empirical evidence largely supports these propositions, both in cross-sectional data (Herzog, Franks, Markus, & Holmberg, 1998; Lawton, Winter, Kleban, & Ruckdeschel, 1999; Litwin & Shiovitz-Ezra, 2006) and longitudinally (Menec, 2003; Sneed & Cohen, 2013). For example, Huxhold, Fiori, and Windsor (2013) recently reported that social engagement among older adults was predictive of increases in or maintenance of life satisfaction across six years.

Social and family goals. At the level of goals, we follow Headey (2008) and distinguish broad social goals geared towards diverse social relationships and general social participation from those geared towards core family members such as spouses and children. Beginning with the former, *general social and altruistic goals* (e.g., engaging in volunteering activities; Headey, Muffels, & Wagner, 2010) are important for well-being for a several reasons. For one, social goals regarding one's ability to help other people can facilitate self-esteem, a sense of control, and feelings of competence, for example, through confirming role identities and self-concepts

(Glass et al., 1995; Herzog & House, 1991), and fostering a sense of generativity (Erikson, 1985). In a similar vein, maintaining involvement in social and political activities despite the challenges that often accompany old age may convey the self-protective impression of a certain degree of continuity with earlier phases of life (Atchley, 1989). Like broader social goals, *family-related goals* may contribute to older adults' well-being by maintaining roles, identities, and self-esteem (Mutran, 1987). Moreover, the active pursuit of family goals promotes access to a network of close confidants which was found to be a strong predictor of well-being in older populations (Litwin & Stoeckel, 2014). According to Socioemotional Selectivity Theory (SST; Carstensen, 1995, 2006; Lang & Carstensen, 2002), age-related limitations in perceived time left in life trigger a motivational shift towards a preference for close social partners (Fredrickson & Carstensen, 1990; Fung et al, 1999; Lang & Carstensen, 1994), suggesting that family-related goals are particularly important for older individuals. Taken together, the previous literature provides considerable evidence for the benefits of social goals and social participation across the life span and into old age. However, this work has largely drawn on fairly healthy, community dwelling samples and it is not entirely clear whether such effects are maintained as individuals enter the phase of terminal decline.

Social orientation and well-being at the end of life. Although the basic pattern of positive associations between social engagement and well-being is likely to continue into the final years of life, some theoretical perspectives would suggest that effects may become attenuated or more complex. With regard to social participation, for example, decades of research on cancer support groups are built upon the notion that social engagement is a key resource when facing potentially life-threatening health conditions (Rehse & Pukrop, 2003). However, some have argued that the benefits of social support are limited when stress levels are high (Taylor, 2011) as is often the case at the end of life. Moreover, maintaining high levels of social participation at all cost could represent a strain on dying individuals' increasingly limited resources and thus present a detriment to well-being (Charles, 2010). Similarly, with regard to goal priorities, the pursuit of broad and altruistic social goals at the end of life may continue to convey benefits for self-esteem and feelings of generativity, but it could also interfere with the

reorientation towards close social relationships in the face of limited time that has been proposed by socioemotional selectivity theory (Lang, 2000).

Conceivably, end-of-life trajectories in social goals and social participation may also interact with each other. According to the motivational theory of life-span development (Heckhausen, Wrosch, & Schulz, 2010), active goal pursuit is only beneficial for well-being if the goal in question is still within reach. Thus, individuals who retain high levels of general social goals but lack the resources for active social participation could fare worse than those who adaptively disengage from such goals (Heckhausen, Wrosch, & Schulz, 2013). On the other hand, there is some evidence that maintaining a sense of engagement with family and friends can benefit dying individuals' mental well-being, even if active engagement in such relationships is increasingly curtailed (Prince-Paul, 2008). Thus, it is not clear whether active social participation and the pursuit of social goals affect well-being independently from each other, compound each other, or interact in more complex ways.

The Present Study

In the current report, we examined whether and how aspects of social orientation (i.e., self-reports of engaging in social activities and prioritizing social and family goals) shape terminal decline in well-being. To this end, we applied single- and multi-phase models of change to long-term longitudinal data from now deceased participants in Germany's nation-wide SOEP study. We expected that both higher levels and more favorable trajectories in social orientation would be associated with higher late-life well-being as well as later onset and shallower rates of late life decline. We also explored possible interactions between social goals and social activities to gather insights into the complex nature of associations between these variables. Our models covaried for age at death, gender, education, disability, hospital stays, and goals in other life domains. These variables are important to take into account because, for example, older age, being a man, low education, and poor health have each been associated with lower well-being and increased mortality hazards (Antonucci, 2001; Burns et al., 2014; DeNeve & Cooper, 1998; Guralnik, 1991; Hoppmann et al., 2007; Moen, 2001).

Method

To examine our research questions, we used data from the German SOEP study that is increasingly used in psychological research (for overview, see Siedler, Schupp, & Wagner, 2011). Information about the design, participants, variables, and assessment procedures in the larger study is reported in Headey et al. (2010). A brief overview of details relevant to the present analysis is given below.

Participants and Procedure

The SOEP is a nationally representative annual longitudinal panel study of private households covering currently about 50,000 adult residents of former West and East Germany, including immigrants and resident foreigners. Potential participants were drawn at random from a set of randomly selected geographic locations in Germany. Initial response rates of 60% to 70% and relatively low longitudinal attrition (about 15 % for the second wave and less than 5% yearly attrition later) resulted in an overall sample that was shown to be representative of the population living in private households (Kroh et al., 2008) and long-term care homes in Germany (Klein, 1996). Data were predominantly collected in face-to-face interviews, and about 10% of long-term participants self-administered the questionnaires.

To examine terminal decline, we used information about mortality status and year of death for deceased participants that was obtained at the yearly interviews, either directly from the remaining household members or neighbors or from official registries. Given that death rates and ages of death of SOEP participants parallel official life tables, the SOEP has long served as a representative resource for mortality-related analyses in Germany (e.g., Brockmann & Klein, 2004; Burkhauser, Giles, Lillard, & Schwarze, 2005). Here, we analyze data from the 2,910 participants who had (i) died prior to May 2011 and (ii) had provided data on well-being, all social resource variables, and all covariates. Respondents included in our sample were born between 1894 and 1990 and died between 1991 and 2011. Acknowledging reports that terminal declines in well-being are not specific to old age (Gerstorf, Ram et al., 2010), we considered all by now deceased SOEP participants including 14% who died before age 60. Participants included in our analyses contributed an average of 11.75 ($SD = 6.19$) yearly reports to a total of

33,777 observations. The large majority of participants provided one or more well-being ratings in the last three years of life (86%) and contributed five or more annual well-being observations in total (91%).

The primary reason for study drop-out among older participants in the larger SOEP study was mortality, as opposed to other reasons such as poor health, relocation, or loss of interest (Kroh, 2014). To characterize our current analysis sample, we conducted three sets of selectivity analyses. First, as expected, when compared to still living participants ($n \approx 46,000$), the deceased subsample used here was, on average, older at their very first assessment in the SOEP, $M = 61.29$ years ($SD = 14.18$) vs. $M = 39.30$ ($SD = 17.48$), $F(1, 49,011) = 4,268.3$, $R^2 = .080$; included more men (52% vs. 49%), $\chi^2(1, N = 49,015) = 13.1$; had fewer years of education, $M = 10.88$ ($SD = 2.11$) vs. $M = 11.42$ ($SD = 2.65$), $F(1, 49,013) = 846.2$, $R^2 = .003$; and reported lower levels of life satisfaction at their first wave of assessment, $M = 7.04$ ($SD = 2.20$) vs. $M = 7.32$ ($SD = 1.90$) on a 0 to 10 scale, $F(1, 49,013) = 59.2$, $R^2 = .001$; all $ps < .001$. Second, we examined if and how deceased SOEP participants included in our analyses differed from other deceased SOEP participants who had not been included in our analyses (e.g., because of missing data on the relevant social orientation variables; $n \approx 2,100$). These analyses revealed that participants included in our subsample were younger at their first SOEP assessment, 61.29 years ($SD = 14.18$) vs. 65.64 years ($SD = 15.49$), $F(1, 5,050) = 107.0$, $R^2 = .021$; had more years of education, $M = 10.88$ ($SD = 2.11$) vs. $M = 10.49$ ($SD = 2.10$), $F(1, 4,966) = 40.9$, $R^2 = .008$; and reported higher levels of life satisfaction at their first wave of assessment, $M = 7.04$ ($SD = 2.20$) vs. $M = 6.80$ ($SD = 2.43$) on a 0 to 10 scale, $F(1, 5,050) = 69.21$, $R^2 = .003$; all $ps < .001$, whereas no differences were found for gender. Finally, examining sample attrition over time within our subsample of deceased SOEP participants, we compared those providing more data points (five and more waves: $n = 2,635$) with those providing fewer data points (four and fewer waves: $n = 275$). Analyses revealed that providing more data points was associated with younger age at T1, $M = 60.87$ years ($SD = 13.83$) vs. $M = 65.34$ ($SD = 16.62$), $F(1, 2,909) = 24.9$, $R^2 = .009$; and with higher levels of life satisfaction at the first wave of assessment, $M = 7.12$ ($SD =$

2.18) vs. $M = 6.25$ ($SD = 2.27$) on a 0 to 10 scale, $F(1, 2,909) = 39.3$, $R^2 = .013$; all $ps < .001$, whereas no differences were found for gender and education.

Measures

Well-being. Life satisfaction was measured as responses to the question “*How satisfied are you with your life concurrently, all things considered?*” (in German: “*Wie zufrieden sind Sie gegenwärtig, alles in allem, mit ihrem Leben?*”), answered on a 0 (totally unsatisfied) to 10 (totally satisfied) scale. This item, asked at yearly intervals, is considered a measure of cognitive-evaluative (as opposed to affective) well-being and has been widely used in psychological research (for measurement properties of the item, see Fujita & Diener, 2005; Lucas, Clark, Geogelis, & Diener, 2003; Headey et al., 2010). On average, deaths occurred 2.07 years ($SD = 2.66$) after the last well-being rating. For consistency with other reports, life satisfaction scores were standardized to a T metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale).

Social orientation. To index social orientation, we make use of measures that tap into social activities and participation and those that tap into the importance of general social goals and more narrow family goals. With our interest in better understanding the actual (social) resources available and the constraints people are faced with late in life, we indexed the degree of social orientation by making use of the last available observation (i.e., closest to death). In contrast, if our primary interest had been in the resources and constraints people bring into late life, we could have alternatively made use of the first wave of assessment for the social orientation variables. Results obtained in this report may thus not necessarily generalize to social orientation variables as tracked with other operational definitions and within other lifetime periods. Probable late-life declines in social resources would make our approach a more conservative test of their protective role against late-life decrements in well-being.

Participant’s *social activities and participation* were measured using items asking the frequency (1 = at least once a week, 2 = at least once a month, 3 = seldom, 4 = never) of involvement in or attendance at social networking and community activities: (a) visit cultural events such as concerts, theaters, or lectures, (b) active sport participation, (c) honorary

activities in clubs, organizations or social service, and (d) participation in citizen initiatives, parties, community politics. The scale is highly similar in structure to other measures of social participation (see Parslow, Jorm, Christensen, & Mackinnon, 2006). The social participation items that were endorsed most frequently were sport activities and honorary/cultural activities. Items were reverse coded and averaged to obtain an index with higher scores indicating more social participation. Social participation was assessed in 1985, 86, 88, 90, 92, 94, 95, 96, 97, 98, 99, 2001, 03, 05, 07, 08, 09, and 11. As above, we make use of the last available social participation rating (i.e., closest to death). These were obtained on average, 2.46 years ($SD = 2.74$) before death. Further details about measurement properties of the social activities measure as used in the SOEP can be obtained from Infurna, Gerstorf, Ram, Schupp, and Wagner (2011).

The importance of general *social goals* was measured using items asking about the importance of two altruistic non-zero-sum goals: “Various things can be important for various people. Are the following things currently ... very important/important/less important or/not at all important ... for you?”, namely (a) helping other people and (b) being involved in social and political activities. In a similar vein, importance of *family goals* was assessed by responses to two items asking how much importance (1 = not at all important to 4 = very important) the respondent attaches to the goals of (a) having a good marriage and (b) having a good relationship with children. Life goals/priorities were measured five times between 1990 and 2008 (in 1990, 1992, 1995, 2004, 2008). The last available goal importance rating was obtained an average of 4.08 years ($SD = 3.35$) before death. Further details about measurement properties and factor structure of the goal measures as used in the SOEP can be found in Headey (2008).

Covariates. A number of covariates were used to control for individual differences in non-social factors known to be related to well-being and mortality (age at death, gender, education, disability, hospital stays, and goals in other life domains). Using individuals’ most recent reports, *years of completed education* were noted as the minimum number of years an individual needed to acquire his or her particular degree. In addition, our models included two key health factors as covariates. First, *disability* was assessed at each wave with a single item asking participants whether they had been “officially certified as having a reduced capacity to

work or being severely handicapped” (for details, see Lucas, 2007). Thus, disability indicators were based on self-reports, but referred to official certifications. Our measure contrasts all participants who had been disabled at some point during the study ($n = 1,387$) and those who were not ($n = 1,523$). Second, *hospital stay last year* was indexed by responses to the question “Were you ever admitted to a hospital for at least one night in year X (e.g., 2002)?” Data for the number of hospital stays last year were taken from the last available data point from each participant. Assessments of hospital stays last year were obtained an average of 2.15 years ($SD = 2.71$) before death. Finally, to contrast the importance of social and family goals with those in other domains of life, we additionally included goal commitment ratings regarding other domains into our analyses. Specifically, we also considered material success goals (being able to buy things, being successful in one’s career), each rated using a 5-point Likert scale ranging from 1 (not at all important) to 4 (very important). Again, we used the last available goal importance rating from each participant.

Intercorrelations for the variables under study are reported in Table 1. It can be obtained that social participation, social goals, and family goals were correlated between .07 and .33, indicating that these tap into distinct aspects of social orientation. Table 1 also indicates that the covariates are interrelated with well-being at the last observation before death (e.g., $r = -.20$ for hospital stays) and with the social orientation measures (e.g., $r = .32$ between social participation and education), signifying the importance of the covariates.

Data Preparation

Using a multilevel modeling framework, growth curve models (e.g., McArdle & Nesselroade, 2003; Ram & Grimm, 2015; Singer & Willett, 2003) were used to summarize and extract information about rates of change in social participation, social goals, and family goals. Models took the following form

$$Social\ orientation_{ti} = \beta_{0i} + \beta_{1i}(time_{ti}) + e_{ti}, \quad (1)$$

where person i ’s score in a particular social orientation variable at time t , $Social\ orientation_{ti}$, is a function of an individual-specific intercept parameter, β_{0i} , and an individual-specific linear slope parameter, β_{1i} , that captures the linear rate of change per year of time, and residual error,

e_{ti} . Following standard growth curve modeling procedures, individual-specific intercepts, β_{0i} , and linear slopes, β_{1i} , (from the Level 1 model give in Equation 1) were modeled as

$$\beta_{0i} = \gamma_{00} + u_{0i}, \quad (2)$$

$$\beta_{1i} = \gamma_{10} + u_{1i},$$

(i.e., Level 2 model) where γ_{00} and γ_{10} are sample means, and u_{0i} and u_{1i} are individual deviations from those means. Using SAS PROC MIXED with restricted maximum likelihood estimation and standard missing at random assumptions (Little & Rubin, 1987), we fitted the model separately for each of the three social orientation measures. Using Bayes empirical estimates (see Littell et al., 2006), we obtained *rate of change*, β_{1i} , scores for each domain for each individual. Our objective was to reduce the longitudinal, up to 26 years, data across the three social orientation dimensions (social participation, social goals, and family goals) down to three informative scores about longitudinal change. As noted above, we used the last available (i.e., closest to death) observation before death to represent the level of social orientation.

Data Analysis

To examine our research questions, we estimated both single- and multi-phase growth models. In a first set of models, we fitted single-phase growth curve models for well-being over time-to-death to effectively model between-person differences in how individuals' well-being changed with impending mortality. This model was specified as

$$well-being_{ti} = \beta_{0i} + \beta_{2i}(timetodeath_{ti}) + \beta_{4i}(timetodeath_{ti}^2) + e_{ti}, \quad (3)$$

where person i 's well-being at occasion t , $well-being_{ti}$, is a function of an individual-specific intercept parameter, β_{0i} , individual-specific linear and quadratic slope parameters, β_{2i} and β_{4i} , and residual error, e_{ti} . Following standard multilevel/latent growth modeling procedures (Ram & Grimm, 2015; Singer & Willett, 2003), individual-specific intercepts, β_{0i} , and slopes, β_{2i} and β_{4i} , (from the Level 1 model given in Equation 3) were modeled as a function of the social orientation variables and the covariates. To facilitate model parsimony and convergence, non-significant interaction terms were trimmed, always retaining the lower order interactions where necessary (e.g., see Eq. 6 below). We note explicitly that the starting models included both level of social orientation and change in social orientation as predictors (obtained as described above)

in each (level 2) equation, and then trimmed to retain only those effects of change in social orientation that were statistically significant (i.e., change in social participation noted in Eq. 4 through 6; level was retained consistently). The final model took the following form

$$\begin{aligned}\beta_{0i} = & \gamma_{00} + \gamma_{01}(\text{age at death}_i) + \gamma_{02}(\text{women}_i) + \gamma_{03}(\text{education}_i) + \gamma_{04}(\text{disability}_i) + \gamma_{05}(\text{hospital}_i) \\ & + \gamma_{06}(\text{material success goals}_i) + \gamma_{07}(\text{social participation}_i) + \gamma_{08}(\text{social goals}_i) \\ & + \gamma_{09}(\text{family goals}_i) + \gamma_{10}(\text{social participation}_i * \text{social goals}_i) \\ & + \gamma_{11}(\text{change social participation}_i) + u_{0i},\end{aligned}\quad (4)$$

$$\begin{aligned}\beta_{2i} = & \gamma_{20} + \gamma_{21}(\text{age at death}_i) + \gamma_{22}(\text{women}_i) + \gamma_{23}(\text{education}_i) + \gamma_{24}(\text{disability}_i) + \gamma_{25}(\text{hospital}_i) \\ & + \gamma_{26}(\text{material success goals}_i) + \gamma_{27}(\text{social participation}_i) + \gamma_{28}(\text{social goals}_i) \\ & + \gamma_{29}(\text{family goals}_i) + \gamma_{30}(\text{social participation}_i * \text{social goals}_i) \\ & + \gamma_{31}(\text{change social participation}_i) + u_{2i},\end{aligned}\quad (5)$$

$$\beta_{4i} = \gamma_{40} + \gamma_{41}(\text{hospital}_i) + \gamma_{42}(\text{social participation}_i) + u_{4i}.\quad (6)$$

where the γ s are sample-level associations, and u_{0i} , u_{2i} , and u_{4i} are residual unexplained individual differences that are assumed to be multivariate normally distributed, correlated with each other, and uncorrelated with the residual errors, e_{it} . Cubic terms were also included and tested, but were not significantly different from zero and were thus not included in the final models. The time-to-death variable was centered at one year prior to death. All predictors were effect-coded/centered so that the regression parameters for these variables indicated the average trajectory and the extent of differences associated with a particular variable (rather than for a particular group). Negative parameters indicate that a given social resource (e.g., participation) or predictor variable (e.g., disability) was associated with lower levels, steeper decline, or steeper curvature.

In a second set of models, we invoked notions of terminal decline by using extensions (Cudeck & Harring, 2007; Cudeck & Klebe, 2002) of multi-phase or “spline” growth models (Ram & Grimm, 2015; Singer & Willett, 2003). To facilitate model parsimony and convergence, non-significant interaction terms, predictors, and some random effects were trimmed, always retaining the lower order interactions where necessary, and prioritizing those random effects of greatest substantive interest (e.g., terminal phase). For example, we removed the material

success goals variable (which carried no predictive value in earlier models)¹, and all predictors for rates of pre-terminal decline [Eq. 10]), and random effect for the transition point (i.e., no u_{6i} in Eq. 12). As well, convergence was facilitated by parameterizing the random effect variance-covariance matrix using (squared) standard deviations. Again, although the change in social orientation variables were trimmed, level of social orientation variables were consistently retained. The final model took the following form

$$well-being_{ti} = \beta_{0i} + \beta_{2i}(timetodeath_{ti} - k_i) + e_{ti}, \text{ when } timetodeath_{ti} < k_i, \text{ and} \quad (7)$$

$$well-being_{ti} = \beta_{0i} + \beta_{4i}(timetodeath_{ti} - k_i) + e_{ti}, \text{ when } timetodeath_{ti} \geq k_i, \quad (8)$$

where β_{0i} represents a person i 's level of life satisfaction at k_i , a person-specific transition point that indicates a shift from the pre-terminal phase to the terminal phase; rate of change in the pre-terminal phase is captured by β_{2i} , and individual-specific rates of change in the terminal-phase by β_{4i} ($timetodeath_{ti}$ is coded in negative integers). Individual differences in the intercept β_{0i} (located at the time of the transition), slopes β_{2i} and β_{4i} , and the transition point k_i were modeled as a function of the social orientation variables and covariates,

$$\begin{aligned} \beta_{0i} = & \gamma_{00} + \gamma_{01}(\text{age at death}_i) + \gamma_{02}(\text{women}_i) + \gamma_{03}(\text{education}_i) + \gamma_{04}(\text{disability}_i) + \gamma_{05}(\text{hospital}_i) \\ & + \gamma_{06}(\text{social participation}_i) + \gamma_{07}(\text{social goals}_i) + \gamma_{08}(\text{family goals}_i) \\ & + \gamma_{09}(\text{social participation}_i * \text{social goals}_i) + \gamma_{10}(\text{change social participation}_i) + u_{0i}, \end{aligned} \quad (9)$$

$$\beta_{2i} = \gamma_{20} + u_{2i}, \quad (10)$$

$$\begin{aligned} \beta_{4i} = & \gamma_{40} + \gamma_{41}(\text{age at death}_i) + \gamma_{42}(\text{women}_i) + \gamma_{43}(\text{education}_i) + \gamma_{44}(\text{disability}_i) + \gamma_{45}(\text{hospital}_i) \\ & + \gamma_{46}(\text{social participation}_i) + \gamma_{47}(\text{social goals}_i) + \gamma_{48}(\text{family goals}_i) \\ & + \gamma_{49}(\text{social participation}_i * \text{social goals}_i) \\ & + \gamma_{50}(\text{change social participation}_i) + u_{4i}, \end{aligned} \quad (11)$$

$$\begin{aligned} k_i = & \gamma_{60} + \gamma_{61}(\text{age at death}_i) + \gamma_{62}(\text{women}_i) + \gamma_{63}(\text{education}_i) + \gamma_{64}(\text{disability}_i) + \gamma_{65}(\text{hospital}_i) \\ & + \gamma_{66}(\text{social participation}_i) + \gamma_{67}(\text{social goals}_i) + \gamma_{68}(\text{family goals}_i) \\ & + \gamma_{69}(\text{social participation}_i * \text{social goals}_i) + \gamma_{70}(\text{change social participation}_i), \end{aligned} \quad (12)$$

where the γ s are sample-level associations, and u_{0i} , u_{2i} , and u_{4i} are residual unexplained individual differences that are assumed to be multivariate normally distributed, correlated with each other, and uncorrelated with the residual errors, e_{ti} . Paralleling interpretation of other

parameters, negative parameters in Equation 12 indicate that a given social resource (e.g., participation) or predictor variable (e.g., disability) was associated with spending fewer years in the terminal decline phase (i.e., being closer to zero).

All models were fit to the data using SAS Proc Mixed (single-phase models) or Proc NLMixed (multi-phase models; Littell et al., 1996), with incomplete data accommodated under usual missing at random assumptions (Little & Rubin, 1987). The predictors and covariates (e.g., age, health) represent attrition-informative variables and so helped to accommodate longitudinal selectivity for the outcome variable of well-being (McArdle, 1994). With our relatively large sample size, significance tests were evaluated at $p < .001$.

Results

Does social orientation relate to higher late-life well-being and less severe rates of decline?

In a first set of analyses, we used single-phase models of change to examine whether social orientation and the covariates relate to higher late-life wellbeing (one year prior to death) and less severe rates of decline. Results are reported in Table 2. Consistent with earlier work, we found that the typical trajectory of late-life well-being in this sample is characterized by linear decline with some acceleration. Specifically, the linear component of decline amounted to almost a full standard deviation per 10 years ($\gamma_{20} = -0.90$), which together with some concave curvature ($\gamma_{40} = -0.03$) brought the average individual to a well-being level at one year prior to death ($\gamma_{00} = 45.45$) that was half a standard deviation below the mean of the nationally representative SOEP sample in 2002 ($M = 50$, $SD = 10$). As expected, several of the covariates were associated with levels and terminal decline in well-being. Individuals who had died at older ages reported higher well-being in the year prior to death ($\gamma_{01} = 0.09$), probably a reflection of selection processes. Women were found to report lower well-being close to death ($\gamma_{02} = -1.32$). Individuals with disability had lower levels of well-being close to death ($\gamma_{04} = -3.46$) and experienced more precipitous declines ($\gamma_{24} = -0.10$). Similarly, those who had to spend one night or more in the hospital the prior year reported lower late-life well-being ($\gamma_{05} = -4.25$) and showed steeper linear ($\gamma_{25} = -0.40$) and quadratic rates of decline ($\gamma_{45} = -0.015$). Education and

material success goals were not related to individual differences in level or rates of change of well-being.

Most important for our research question, results revealed that the social orientation variables were related to individual differences in development of late-life well-being. More social participation and valuing social goals were each uniquely associated with higher well-being one year prior to death ($\gamma_{07} = 5.89$ and $\gamma_{08} = 2.28$, respectively) and less steep terminal decline ($\gamma_{27} = 0.49$, $\gamma_{28} = 0.12$, and $\gamma_{48} = -0.017$, respectively). The interaction of social participation and social goals with the level of well-being was statistically significant and negative ($\gamma_{10} = -2.87$), indicating that the combination of compromised social participation and lack of social goals was associated with particularly low well-being at one year prior to death. We also found that less decline in social participation was associated with shallower rates of well-being decline ($\gamma_{31} = 0.005$). Family goals were not related to individual differences in level or rates of change of well-being.

To illustrate our major effect of interest, Figure 1 contrasts trajectories of terminal decline in well-being between participants high and low on social participation and social goals, respectively. Using median-splits for this illustration, one can see that participants who reported living a more socially active life (left-hand Panel A) and those considering social goals relatively more important (middle Panel B) each also reported higher late-life well-being and experienced less severe terminal declines. Extrapolating back from the last available information about social orientation, group differences in well-being that existed 10 years before death were exacerbated in the year of death (for the social participation groups: from 2.05 T-score units to 6.45 T-score units or almost two thirds of a standard deviation; for the social goals groups: from 1.91 T-score units to 5.20 T-score units or about half a standard deviation). The significant interaction (right-hand Panel C) indicates that the effects of reduced social participation and lowered social goals were compounding each other. Quantifying the relations in terms of effect size, we calculated the reduction in unexplained variance in intercepts and slopes (Snijders & Bosker, 1999). Together, all the predictors accounted for 20% of between-person variance in well-being levels, 7% in linear change, and 4% in quadratic change. Of these, a sizeable portion

was unique to the social resource variables (8.2% in levels, 3.3% in linear change, and 2.4% in quadratic change).

Does social orientation relate to a later onset of terminal decline in well-being?

In a second set of analysis, we used two-phase models of change to examine whether social orientation and the covariates relate to a later onset of terminal decline in well-being. Results are reported in Table 3. The typical individual transitioned into the terminal phase at $\gamma_{60} = 4.59$ years, after which the rate of decline steepened by a factor of six, from $\gamma_{20} = 0.23$ T-score units per year to $\gamma_{40} = 1.39$ T-score units per year. Decrements during the terminal decline phase amounted to about two thirds of a Standard Deviation across the last 4.5 years of life. As expected, several of the covariates included were associated with individual differences in levels of well-being, the onset of the terminal phase, and the rate of terminal decline. Specifically, individuals who died at older ages reported slightly higher well-being at the transition point ($\gamma_{01} = 0.13$).² Older people and women transitioned into the terminal decline phase earlier ($\gamma_{61} = -0.03$ and $\gamma_{62} = -1.01$, respectively). Participants with disability and those who had to spend one night or more in the hospital last year both reported lower levels of well-being at the onset of decline ($\gamma_{04} = -2.08$ and $\gamma_{05} = -2.00$, respectively), and those with hospital stays had steeper rates of terminal decline ($\gamma_{45} = -0.47$). Both disability and hospital stays last year were associated with spending more time in the phase of terminal decline ($\gamma_{64} = -0.86$ and $\gamma_{65} = -0.22$, respectively). Education was not related to individual differences in the two-phase trajectories of well-being.

As in the previous models, social participation and social goals were each and independently associated with higher levels of well-being at the onset of decline ($\gamma_{06} = 2.17$ and $\gamma_{07} = 1.04$, respectively) and with spending less time in the terminal decline phase ($\gamma_{66} = 2.39$ and $\gamma_{67} = 0.95$, respectively). Again, significant interaction effects emerged suggesting that the combination of high social participation and social goals being more important was associated with particularly late onset of decline in well-being ($\gamma_{69} = 1.71$). We also found that less decline in social participation was associated with a later onset of well-being decline ($\gamma_{70} = 0.17$). The multi-phase model also revealed indications for the importance of family goals, being associated

with slightly higher levels of well-being at the onset of decline ($\gamma_{08} = 0.53$) and a later onset ($\gamma_{68} = 0.99$).

To illustrate, Figure 2 contrasts the onset of terminal decline in well-being between participants high and low on social participation and social goals, respectively. Using median-splits for this illustration, one can see that participants who reported living a more socially active life (left-hand Panel A) and those considering social goals relatively more important (middle Panel) each also reported higher late-life well-being and entered the phase of precipitous well-being decline later. The significant interaction (right-hand Panel C) indicates that the effects of preserved social participation and high social goals were compounding each other, being associated with particularly late onset of decline in well-being. Figure 3 illustrates how both level and change in social participation relate to late-life trajectories of well-being. Especially the combination of high social participation and less decline in social participation was associated with shallow rates of decline (left-hand Panel A) and a late onset of decline in well-being (right-hand Panel B).

We also note that the pattern of covariances indicate that SOEP participants who reported higher well-being showed less decline in the pre-terminal phase ($r = .54$), but were somewhat more vulnerable to decline in the terminal phase ($r = -.35$). Interestingly, the rates of decline in the pre-terminal phase and the terminal phase were only marginally associated with one another ($r = -.11, p = .022$). Again quantifying effect size as the reduction in unexplained variance in the parameters of interest (Snijders & Bosker, 1999), we found that together all the predictors accounted for 15% of between-person variance in well-being levels and 24.5% in the rate of terminal decline. Of these, a sizeable portion was due to unique or shared associations of the social resource variables (8.5% in levels and 18.7% in the rate of terminal decline). Because model convergence required us to remove the random effect for the transition point, we could not use this approach to quantify effect size in the onset of decline. Using the reduction in residual variance as compared with an intercept-only model as an overall effect size, the multi-phase model of change and the predictors included accounted for a total of 23% of the variance in late-life trajectories of well-being. Taken together, our results suggest that levels of social

goals and both levels of and changes in social activities and participation were each independently associated with the rate of late-life decline and the onset of late-life decline in well-being.

Discussion

The major objective of the current study was to move towards filling a distinct gap in the literature on potentially modifiable psychosocial individual difference factors that contribute to terminal decline in well-being. To do so, we applied single- and multi-phase growth models to up to 27 years of annual longitudinal data from the German Socio-Economic Panel (SOEP). Our results extend existing evidence for the psychological benefits of social engagement into the end-of-life phase and revealed that social variables at the behavioral level (self-ratings of social participation) and at motivational levels (valuing social goals) each represent uniquely important resources for late-life well-being. Living a socially active life and prioritizing social goals were independently associated with higher late-life well-being, less severe rates of late-life declines, and a later onset of terminal decline. Significant interaction effects suggested that the effects of (reduced) social participation and (lowered) social goals were compounding each other. Findings also indicated that less decline in social participation was associated with shallower rates and a later onset of well-being decline. Interestingly, we found little evidence that valuing family goals is related to late-life trajectories of well-being. Associations were independent of key correlates of well-being and mortality, including age at death, gender, education, disability, hospital stays, and goals in other life domains. We discuss possible pathways by which maintaining social orientation into late life may help mitigate terminal declines in well-being.

Late-Life Well-Being: The Role of Social Orientation

We are only at the very beginning of understanding the large individual differences in terminal decline in well-being (Baltes & Smith, 2003; Gerstorf & Ram, 2013). Many older adults experience a steep drop in well-being in the last years of life, whereas others are able to maintain well-being throughout their last years. We note that typical changes in life satisfaction at the end of life were best characterized by a multi-phase model rather than a single-phase model ($\Delta = 205$ in the Akaike Information Criterion, AIC for the full models and $\Delta = 77$ in the

AIC for the zero-order models, see Tables 2 and 3). We nevertheless consider reporting results from both models important because the two approaches shed light on different facets of the larger phenomenon, with the single-phase models focusing on longer-term trajectories of stability and change (an incremental change theory) and the multi-phase models focusing on the onset of late-life decline (a stage transition theory). Though not independent of one another, the convergence of findings across approaches adds to the credibility of our results about the importance of social resources for late-life well-being. We also consider it important to keep the single-phase model because it helps connecting the current study to the large majority of earlier reports on late-life well-being that were based on relatively few data points and thus did not allow apply multi-phase models (Berg, Hassing, Thorvadsson, & Johansson, 2011; Carmel, Shrira, & Shmotkin, 2013; Diehr, Williamson, Burke, & Psaty, 2002; Mroczek & Spiro, 2005; Palgi, Shrira, Ben-Ezra, Spalter, Shmotkin, & Kavé, 2010; Palgi, Shrira, Ben-Ezra, Spalter, Kavé, & Shmotkin, 2014; Schilling et al., 2013; Vogel, Schilling, Wahl, Beekman, & Penninx, 2012; Windsor, Gerstorf, & Luszcz, 2015).

In the current study, we have examined the role of social orientation and have opted for an approach that removed differences in central background characteristics known to modulate late-life declines. Our results indicate that well-known correlates of well-being and mortality were indeed important. For example, our operational definitions of health constraints (disability and hospital stays) were associated with lower levels of late-life well-being, steeper terminal declines, and an earlier onset of decline. We found it striking to see that associations of social participation and social goals with late-life well-being were sizeable and went beyond recognized socio-demographic and health factors. Setting third-variable explanations aside, results from our study can be taken to suggest that it would be all the more important for people's well-being late in life if they could continue to set social goals and carry on with social activities despite the often pervasive challenges they are confronted with. To illustrate, compromised well-being late in life often results from the loss of social belonging (e.g., as a consequence of widowhood and other social losses) and the increased difficulties with realizing one's social goals (e.g., as a consequence of poor functional health; Gerstorf & Ram, 2015;

Rook, Mavandadi, Sorkin, & Zettel, 2007; Windsor et al., 2015). Future, more mechanism-oriented research would need to thoroughly disentangle key questions about the temporal and causal ordering.

Social activities and participation. In line with reports from younger samples (Huxhold et al., 2014), our results suggest that continuing to participate in social activities in the last years is associated with maintaining well-being. Investing one's physical and psychological resources into socially oriented activities of a sharing or instrumental kind can be expected to be advantageous at a number of different levels. Well-being may be boosted directly by carrying out joyful activities (Lyubomirsky & Layous, 2013) or indirectly by facilitating self-esteem and a sense of control or promote physical and cognitive functioning (Leary & Baumeister, 2000; Zautra, Infurna, Zautra, Gallardo, & Velasco, in press). For example, Lövdén, Ghisletta, and Lindenberger (2005) reported that social participation precedes and predicts shallower rates of decline in perceptual speed as a measure of cognitive functioning. The authors argue that an engaged lifestyle often involves cognitive stimulation and physical activity, which in turn protect against neurophysiological and cardiovascular pathology underlying cognitive decline. By virtue of maintaining cognitive functioning into late life, it is then probably easier to maintain well-being as well.

The importance of social and family goals. Despite differences in goal contents, goals are highly important in shaping well-being and other mental health outcomes across adulthood because they form the basis for subjective evaluations of whether a person is moving in a desired direction (Austin & Vancouver, 1996; Nurmi & Salmela-Aro, 2006). Notably, goals not only contribute to well-being, but they can also reveal constraints that draw attention to the importance of strategies to make the best out of limited resources. Socioemotional selectivity theory as one of the major theories in the field proposes that a recognition that future time is limited rather than open-ended prompts motivational shifts that lead individuals to prioritize socio-emotional goals and prefer familiar social partners, which in turn helps maintain well-being (Carstensen, 2006; Carstensen et al., 2011). We acknowledge that our data did not allow contrasting these social goals with knowledge acquisition goals. Nevertheless, our results extend

these notions to the very end of life and are consistent with the idea that prioritizing social goals at the end of life is indeed associated with maintaining well-being as long as possible. Valuing and pursuing social goals may contribute to well-being by boosting feelings of competence, generativity, and belonging.

We note that it was beyond the scope and possibilities of our study to examine the specific mechanisms by which social orientation operates to help people maintain well-being at the end of life. However, insights into how social factors operate may help to design targeted interventions aimed at reshaping the social context in order to assuage terminal decline in well-being. In this respect, it is particularly interesting that the effects of compromised social participation and low endorsement of social goals appeared to compound each other. One possible interpretation would be that social deprivation combined with a giving up on social goals may be particularly vicious because it not only eliminates an important source of well-being concurrently, but in that this also reflects that the individual does not see this is something that they can change in the future. It is also possible that participants in this group may have experienced demoralization syndrome (Robinson et al., 2015), a state of existential distress in the face of progressive disease which is characterized by help- and hopelessness, lack of goals and meaning, high levels of negative emotions, and profound social isolation. The growing literature on this condition, which is estimated to affect up to a third of individuals with progressive medical conditions, may ultimately point to promising pathways for intervention.

Participants in our study were also asked to rate the importance of having a good marriage and a good relationship with their children (i.e., family-related goals). Consistent with reports from earlier phases of life (Lang, 2001; Neyer & Lang, 2003; Silverstein & Bengtson, 1994), we had expected that having good relationships with one's close family members is central for people's well-being at the end of life. For example, if people feel that their children have turned out well and have a good relationship with them, then this contributes to a sense of generativity (Erikson, 1985). It may be easier to let go and accept things the way they are when people have the impression that they have left a lasting legacy in this world. It was thus surprising to see that prioritizing family goals evinced very few statistically significant

associations with well-being after social participation and the importance of social goals were taken into account. We note that even fewer associations existed at the zero-order level when examined as a separate predictor. We can only speculate about possible reasons. One interpretation is that the response distribution was too skewed, with an average of 3.15 on a 1-to-4 response scale for the family goal items as compared with an average of 2.33 for the social goals (see Table 1). This may in part reflect a social desirability bias. Most important, however, the item and response format for family goals may not have been fine-grained enough to capture subtle, but salient individual differences in valuing family goals that distinguish between those who declined and those who maintained well-being late in life. A second interpretation is that participants who have lost their partner, never married, and/or never had (or have lost their) children were, of course, not able to answer questions regarding the importance of spouses and/or children. It was thus possible that earlier-obtained data (i.e., further away from death) were used for those who experienced late life without partner or child, whereas later-obtained data (i.e., closer to death) were used for those who experienced late life with their partner and or child. If this confound exists, it may have contributed to the lack of differentiation we had observed for the variable indicating a prioritization of partner and children. Empirically, however, it is not the case that the time elapsed in-between goal assessments and death was larger for family goals ($M = 4.11$ years, $SD = 3.38$) than for goals in the other two domains of life (material success: $M = 4.08$ years, $SD = 3.35$; social: $M = 4.08$ years, $SD = 3.35$). The probably more general point for future inquiry would be to examine how adaptive goal structures in late life look like for people for whom engagement with family is not an option (anymore).

Apart from such methodological concerns, it is of course possible that our findings accurately reflect the complexity of family relationships in later life. Family life is often a ‘mixed bag’ and represents not only a source of joy, but also of worry and tensions, stress and sorrow (Birditt, Fingerman, & Almeida, 2005; Hoppmann & Gerstorf, 2016). For example, valuing one’s partner often makes people vulnerable to declines in well-being when the partner suffers from cognitive or physical limitations (Michalowski, Hoppmann, & Gerstorf, 2014) and

relationships to both children and spouses are further complicated with the onset of caregiving responsibilities (Zarit & Reamy, 2013). In a similar vein, relationships to adult children can be ambivalent even for healthy older adults, especially when children differ in values and have not attained educational and interpersonal success (Fingerman, Chen, Hay, Cichy, & Lefkowitz, 2006; Pillemer, Munsch, Fuller-Rowell, Riffin, & Sutor, 2012). To disentangle this complexity, future research should differentiate between goals for adult children and spouses and control for caregiving responsibilities and relationship quality.

Limitations and Outlook

We note that the larger sample size available in the current study and advancements in modeling efforts allowed for a more thorough test of our research questions than was previously possible. For example, we were able to estimate models that simultaneously included associations of the social resource variables and of the covariates with all three aspects of late-life trajectories we are primarily interested in (level, rates of terminal decline, onset of decline). This had not been possible before. For example, the 1,641 participants in Gerstorf, Heckhausen, Ram, et al. (2014) only allowed estimating associations of the predictor variables with the onset of decline, but not parallel associations with level and the rate of change.

In spite of these advances, there are, of course, important limitations to our study. To begin with, we do acknowledge that many pivotal questions surrounding our results remain open, particularly those that revolve around the mechanisms underlying the role of social orientation for terminal decline in well-being. If terminal decline (in well-being) reflects some combination of late-life neuropathology (e.g., Alzheimer's Disease, Lewy Bodies), deteriorating integrity of neuro-cognitive control systems, and a breakdown of overall system coordination and integrity, then key questions are which social features (e.g., instrumental vs. emotional) operate in what ways (e.g., direct vs. indirect) to alleviate the consequences of these processes. In a similar vein, future research may benefit from disentangling whether effects observed for social participation are driven primarily by the social nature of the activity or the preserved physical fitness that is needed to lead a socially active life (Berkman et al., 2000). Even if the

underlying mechanisms can indeed be established, one of the next questions is how social indicators of quality of life can be maintained or re-established late in life.

Second, social orientation and social resources constitute a broad construct space. In the current study, we have focused on process aspects of the Fingerman and Lang framework of social relations (2004), but did not investigate specifically how facets of structure (e.g., parent-child, romantic partner, sibling, friend) or outcome operate (e.g., social support, relationship quality). Specifically, we made use of two distinct social orientations that tap into largely different aspects of that construct space, namely the social activities people pursue and the social and family goals they have and value. However, measures about further highly informative aspects of the larger construct space have not been available in our secondary data analysis. For example, loneliness, feeling part of a group, receiving instrumental and emotional support from others, or perceived available resources such as number and perceived quality of active social ties can each be expected to also play a role for late-life well-being. To illustrate, measures of social support would have allowed exploring how people at the end of life continue to actively seek out, mobilize, and handle the availability of social support (Lang et al., 1997). Beneficial features of social support include encouraging mastery attempts, providing supportive feedback, and suggesting appropriate coping responses in times of strain. Combining the results from the current study with recent reports about the importance of perceived personal control late in life (Gerstorf, Heckhausen, Ram, et al., 2014; Heckhausen et al., 2013), it would be particularly intriguing to examine how social orientation and social resources interact with (e.g., boost) perceived personal control so as to maintain well-being and health as long as possible (Antonucci, 2001; Cohen & Wills, 1985). Because measures of social orientation and those of personal control were assessed at different points in time over the by now 30 years the SOEP study has run, it was unfortunately not an option to examine social resources and personal control simultaneously in our analyses.

Third, we note that it would have been feasible to directly model how both social orientation and well-being develop in parallel at the end of life, to test other than linear approximations of change for the social resource variables, and to examine whether well-being

operates as a driving force for changes in social orientation. For example, it is possible that compromised well-being sets a downward spiral in action that prompts people to live a more and more restricted social life (e.g., because social activities are increasingly de-valued; Achterberg et al., 2003). However, limitations of our data set did not allow us to test these intriguing questions. In particular, data for the social resources were available for considerably fewer measurement occasions (e.g., no more than five waves for social goals) than for well-being (up to 27 waves). As a consequence, our modeling efforts already pushed the envelope of what is currently possible with the data at hand. We thus chose to prioritize the robustness of the models, which would have been compromised by extensions to single-step multivariate (parallel process) models. In addition, we estimated follow-up analyses that either also included quadratic rates of change for social participation or modeled change in social orientation over a time-to-death metric. The substantive pattern of results remained unchanged in these follow-up analyses (e.g., less decline in social participation with impending death was associated with shallower rates and a later onset of well-being decline). We are hesitant to present the time-to-death modeling of the social orientation variables as our main analyses because the scarce assessment schedules relative to the well-being measure would not permit considering and modeling these as parallel processes. In our view, modeling the social orientation variables with linear change over time provides a more conservative estimate and does not convey the impression of overselling our design. Our cautious interpretation and handling of changes in social orientation as obtained in our study is further supported empirically by the average changes obtained, which were found to be of minor size: yearly change on social participation = -0.005 on a 1–4 scale, $p = .0011$; on social goals = -0.015 on a 1–4 scale, $p = .0003$; and family goals = 0.002 on a 1–4 scale, $p = .76$, with no evidence for statistically significant quadratic changes.

Finally, the SOEP is a great resource that has tracked people annually for almost 30 years by now, thereby having provided considerable insights into the stability and change of central domains of functioning across adulthood. However, it does not provide information about cause of death. Thus, we could not screen out accidental and other sudden causes of death that are not preceded by a prodromal period of decline, nor could we differentiate dementias

from other chronic conditions. It is well possible that social resources are particularly important for late-life well-being when people are confronted with debilitating chronic health conditions (Hoppmann & Gerstorf, 2016). Furthermore, the annual assessment schedule approaches its limits when it comes to better understanding the very last months of life. Very little information is available about well-being and the social resources in the last 12 months of life. The current study thus sheds light onto the terminal well-being changes people experience and the resources people bring into the last year of life, but we do not know how preserved or impaired well-being and the (social) resources were in the very last months of life. Similarly, information about how people value certain life goals were obtained an average of two to four years before death. With a more frequent sampling scheme zooming into the last months, we would expect rapid average well-being declines (using proxy-reports, see Infurna et al., 2014) and probably also a more succinct pattern for the role of social orientation and social resources. A hypothesis to be tested once the appropriate data come in would be that people maintain reasonably high well-being if they can preserve their social orientation, receive the instrumental and emotional support needed, and are able to continue to pursue a minimum amount of social activities. Finally, we note that our selectivity analyses conjointly suggest that SOEP participants who had died at an older age, received less education, and started out with lower levels of well-being were less likely to remain in our study until close to death and also provided fewer assessments of life satisfaction. As a consequence, the results obtained here probably do not generalize to less positively selected population segments than those included in our report. It would also be intriguing to more closely examine possible cultural differences in how effective social resources may operate (e.g., family-focused network being as beneficial as diverse networks in China: Cheng et al., 2009).

Conclusions

The current study is one of very few reports identifying psychosocial characteristics that are associated with vulnerability for or resilience against terminal decline in well-being. Taking into account central covariates of well-being and mortality, our results indicate that social orientation is related to maintaining well-being into the very last years of life as long as possible.

Building on and extending work on earlier phases of life, our results suggest that older adults, even at the end of life, continue to play an active role in shaping their own well-being by engaging in social activities and by prioritizing social goals. Much more needs to be learned, however, about the underlying mechanisms.

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Footnotes

¹In follow-up analyses, it was possible to estimate a model that had the family goals variable replaced with the material goals variable, everything else being equal. These analyses corroborated the main findings according to which social participation and social goals were independently associated with both higher late-life well-being, less pronounced late-life decline, and a later onset of terminal decline.

²We probed for age differences by estimating two sets of follow-up analyses. One set that excluded those who died young, operationally defined as having died before age 60 ($n = 2,503$), and another set that tested for non-linear effects by including a quadratic age term as an additional predictor. The substantive pattern of results was found to remain unchanged, and the quadratic age term was not found to interact with any of the social resource indicators in predicting late-life well-being and its change. We caution against over-interpreting the finding because the lack of statistically significant differences may be due to the small sample size among those who died young.

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Table 1
Intercorrelations among study variables.

	<i>Mean</i>	<i>SD</i>	<i>Intercorrelations</i>									
	(<i>N</i> = 2,910)		1	2	3	4	5	6	7	8	9	10
Well-being												
1. Life satisfaction (T Score)	43.29	13.66		.22	.17	.03	.05	– .02	.08	– .20	– .20	.07
Social orientation												
2. Social participation (1–4)	1.28	0.45			.33	.07	– .25	– .10	.32	– .10	– .10	.19
3. Social goals (1–4)	2.33	0.55				.23	– .13	– .10	.23	– .02	– .03	.25
4. Family goals (1–4)	3.15	0.83					– .13	– .15	.06	.04	.02	.30
Covariates												
5. Age at death (20–102)	74.12	13.66						.19	– .11	.02	– .01	– .35
6. Women (0–1)	0.48	0.50							– .22	– .10	– .05	– .19
7. Education (7–18)	10.88	2.11								– .01	– .04	.14
8. disabled (0–1)	0.48	0.50									.25	– .03
9. Hospital stay last year (0–1)	0.19	0.39										– .00
10. Material success goals (1–4)	2.53	0.72										

Note. Life satisfaction, last observation before death. Intercorrelations of $r = |.06|$ or above statistically significantly different from zero at $p > .001$. Scores for life satisfaction were standardized to a T metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale).

Table 2

Single-Phase Model for Life Satisfaction over Time-to-Death, Including Social Orientation and the Covariates.

Parameter	Estimate	SE
Fixed effects		
Intercept, γ_{00}	45.45*	(0.243)
Linear slope, γ_{20}	– 0.90*	(0.045)
Quadratic slope, γ_{40}	– 0.03*	(0.002)
Age at death, γ_{01}	0.09*	(0.015)
Women, γ_{02}	– 1.32*	(0.396)
Education, γ_{03}	0.07	(0.098)
Disability, γ_{04}	– 3.46*	(0.390)
Hospital stay last year, γ_{05}	– 4.25*	(0.539)
Material success goals, γ_{06}	0.24	(0.294)
Social participation, γ_{07}	5.89*	(0.558)
Social goals, γ_{08}	2.28*	(0.394)
Family goals, γ_{09}	0.10	(0.243)
Social participation x social goals, γ_{10}	– 2.87*	(0.751)
Change social participation, γ_{11}	– 0.02	(0.016)
Linear slope x age at death, γ_{21}	– 0.003	(0.001)
Linear slope x women, γ_{22}	– 0.08	(0.034)
Linear slope x education, γ_{23}	0.01	(0.008)
Linear slope x disability, γ_{24}	– 0.10*	(0.034)
Linear slope x hospital stay last year, γ_{25}	– 0.40*	(0.103)
Linear slope x material success goals, γ_{26}	0.02	(0.026)
Linear slope x social participation, γ_{27}	0.49*	(0.098)
Linear slope x social goals, γ_{28}	0.12*	(0.034)
Linear slope x family goals, γ_{29}	– 0.05	(0.022)
Linear slope x social participation x social goals, γ_{30}	– 0.14	(0.066)
Linear slope x change social participation, γ_{31}	0.005*	(0.001)
Quadratic slope x hospital stay last year, γ_{45}	– 0.015 ^a	(0.005)
Quadratic slope x social participation, γ_{47}	0.017*	(0.005)
Random effects		
Variance intercept	86.07*	(3.275)
Variance linear slope	2.17*	(0.135)
Variance quadratic slope	0.004*	(0.000)
Covariance Intercept, linear slope	7.10*	(0.550)
Covariance Intercept, quadratic slope	0.19*	(0.025)
Covariance linear slope, quadratic slope	0.09*	(0.006)
Residual variance	64.04*	(0.552)
<i>AIC</i>	245,983	

Note. Unstandardized estimates and standard errors are presented. Intercept is centered at one year prior to death; rate of change is scaled in T-units per year as per the annual assessment schedule in the SOEP. $N = 2,910$ participants who provided 33,777 observations. Scores were standardized to a T metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale). Two-way interaction terms of the quadratic slope and of social resource variables were tested, but only those statistically significantly different from zero were retained in the final model. *AIC* = Akaike Information Criterion, a relative model fit statistic.

* $p < .001$, ^a $p = .0028$.

Table 3

Multi-Phase Model for Life Satisfaction over Time-to-Death, Including Social Orientation and the Covariates.

Parameter	Estimate	SE
Fixed effects		
Intercept, γ_{00}	49.58*	(0.204)
Pre-terminal slope, γ_{20}	– 0.23*	(0.020)
Terminal slope, γ_{40}	– 1.39*	(0.104)
Transition point, γ_{60}	– 4.59*	(0.017)
Age at death, γ_{01}	0.13*	(0.012)
Women, γ_{02}	– 0.18	(0.326)
Education, γ_{03}	0.05	(0.079)
Disability, γ_{04}	– 2.08*	(0.323)
Hospital stay last year, γ_{05}	– 2.00*	(0.406)
Social participation, γ_{06}	2.17*	(0.404)
Social goals, γ_{07}	1.04*	(0.315)
Family goals, γ_{08}	0.53^a	(0.200)
Social participation x social goals, γ_{09}	– 1.58*	(0.589)
Change social participation, γ_{10}	– 0.06*	(0.015)
Terminal slope x age at death, γ_{41}	0.00	(0.005)
Terminal slope x women, γ_{42}	0.05	(0.121)
Terminal slope x education, γ_{43}	0.01	(0.032)
Terminal slope x disability, γ_{44}	– 0.12	(0.1202)
Terminal slope x hospital stay last year, γ_{45}	– 0.47*	(0.140)
Terminal slope x social participation, γ_{46}	0.03	(0.273)
Terminal slope x social goals, γ_{47}	– 0.22	(0.204)
Terminal slope x family goals, γ_{48}	– 0.15	(0.070)
Terminal slope x social participation x social goals, γ_{49}	– 1.30	(0.522)
Terminal slope x change social participation, γ_{50}	0.00	(0.022)
Transition point x age at death, γ_{61}	– 0.03*	(0.002)
Transition point x women, γ_{62}	– 1.01*	(0.020)
Transition point x education, γ_{63}	– 0.01	(0.010)
Transition point x disability, γ_{64}	– 0.86*	(0.015)
Transition point x hospital stay last year, γ_{65}	– 0.22*	(0.062)
Transition point x social participation, γ_{66}	2.39*	(0.021)
Transition point x social goals, γ_{67}	0.95*	(0.011)
Transition point x family goals, γ_{68}	0.99*	(0.007)
Transition point x social participation x social goals, γ_{69}	1.71*	(0.018)
Transition point x change social participation, γ_{70}	0.12*	(0.001)
Random effects		
Standard deviation intercept	8.52*	(0.147)
Standard deviation Transition point	–	–
Standard deviation pre-terminal slope	0.60*	(0.022)
Standard deviation terminal slope	2.00*	(0.061)
Correlation intercept, pre-terminal slope	.54*	(0.026)
Correlation intercept, terminal slope	– .35*	(0.028)
Correlation pre-terminal slope, pre-terminal slope	– .11	(0.050)
Residual variance	63.13*	(0.546)
<i>AIC</i>	245,778	

Note. With the exception of the correlations, unstandardized estimates and standard errors are presented. Intercept centered at the Transition point; rate of change scaled in T-units per year as per the annual assessment schedule in the SOEP. $N = 2,910$ participants who provided 33,777 observations. Scores standardized to a T metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference ($M = 6.90$, $SD = 1.81$ on a 0–10 scale). AIC = Akaike Information Criterion, a relative model fit statistic.

* $p < .001$, ^a $p = .0076$.

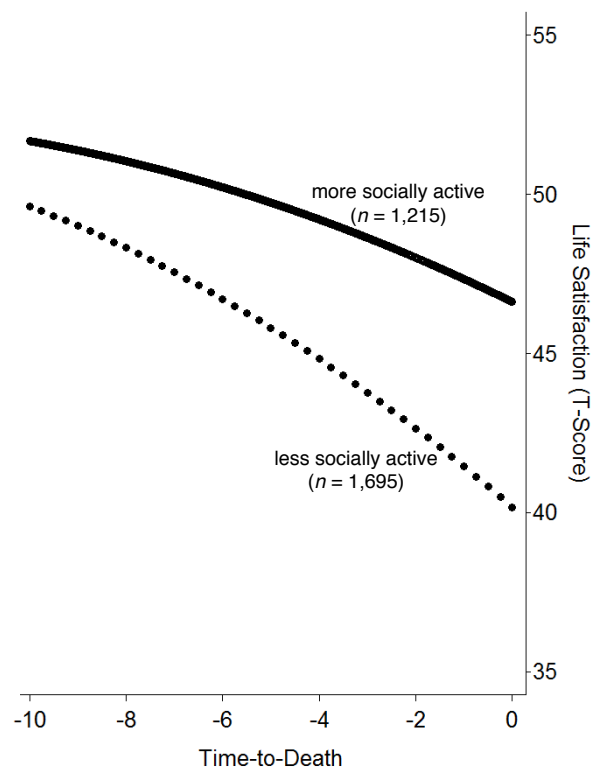
Figure Caption

Figure 1. Graphical illustration of associations between levels of social orientation and late-life trajectories of well-being, as obtained from single-phase models. Participants who reported living a more socially active life (left-hand Panel A) and those considering social goals relatively more important (middle Panel B) each also reported higher late-life well-being and experienced less severe terminal declines. Extrapolating back from the last available information about social orientation, group differences in well-being that existed 10 years before death were exacerbated in the year of death (for the social participation groups: from 2.05 T-score units to 6.45 T-score units or almost two thirds of a standard deviation; for the social goals groups: from 1.91 T-score units to 5.20 T-score units or about half a standard deviation). The right-hand Panel (C) illustrates the significant interaction according to which the effects of reduced social participation and lowered social goals were compounding each other: The combination of compromised social participation and lack of social goals was associated with particularly low well-being at one year prior to death. For illustration purposes, groups were defined using median splits. Scores for life satisfaction were standardized to a *T* metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale).

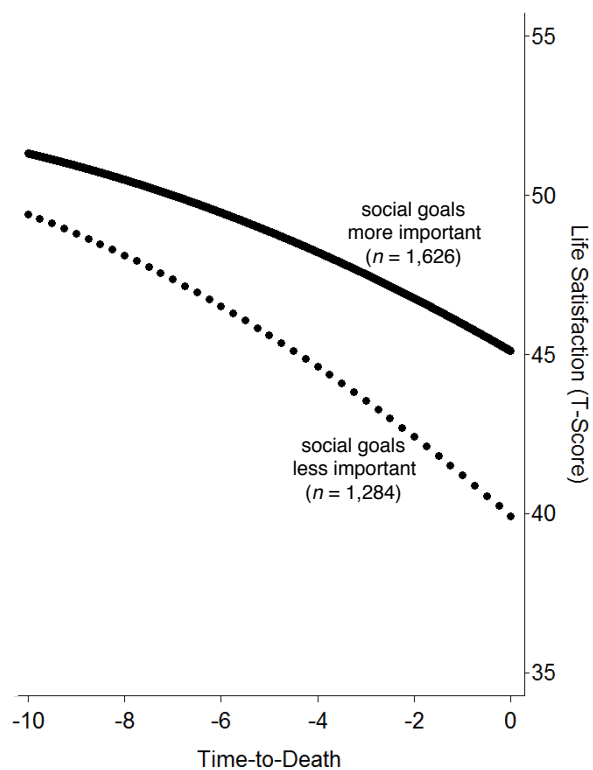
Figure 2. Graphical illustration of associations between levels of social orientation and late-life trajectories of well-being, as obtained from multi-phase models. Participants who reported living a more socially active life (left-hand Panel A) and those considering social goals relatively more important (middle Panel B) each also reported higher late-life well-being and entered the phase of precipitous well-being decline later. The right-hand Panel (C) illustrates the significant interaction according to which the effects of social participation and social goals were compounding each other: The combination of high social participation and social goals being more important was associated with particularly late onset of decline in well-being. For illustration purposes, groups were defined using median splits. Scores for life satisfaction were standardized to a *T* metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale).

Figure 3. Graphical illustration of how level and change in social participation relate to late-life trajectories of well-being, as obtained from single-phase models (left-hand Panel A) and multi-phase models (right-hand Panel B). Especially the combination of high social participation and less decline in social participation was associated with shallow rates of decline and a late onset of decline in well-being. For illustration purposes, groups were defined using median splits. Scores for life satisfaction were standardized to a *T* metric ($M = 50$; $SD = 10$) using the 2002 SOEP sample as the reference frame ($M = 6.90$, $SD = 1.81$ on a 0–10 scale).

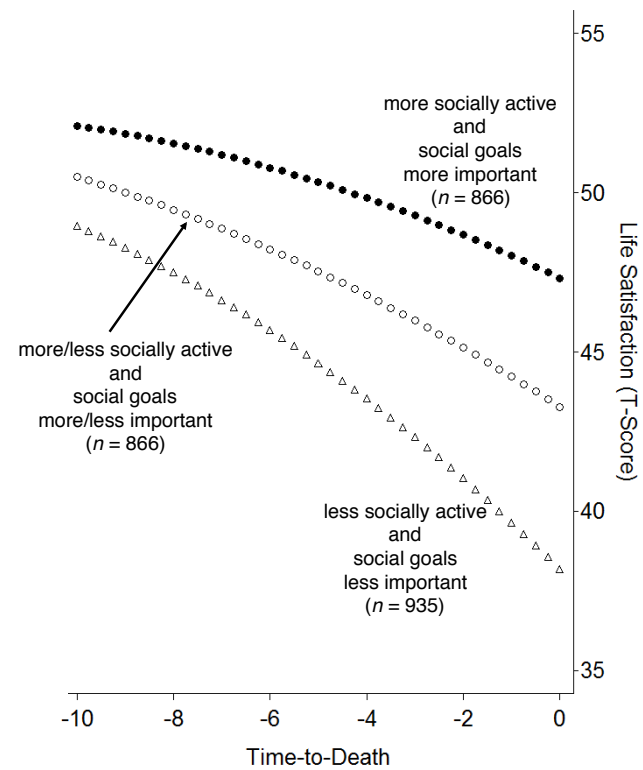
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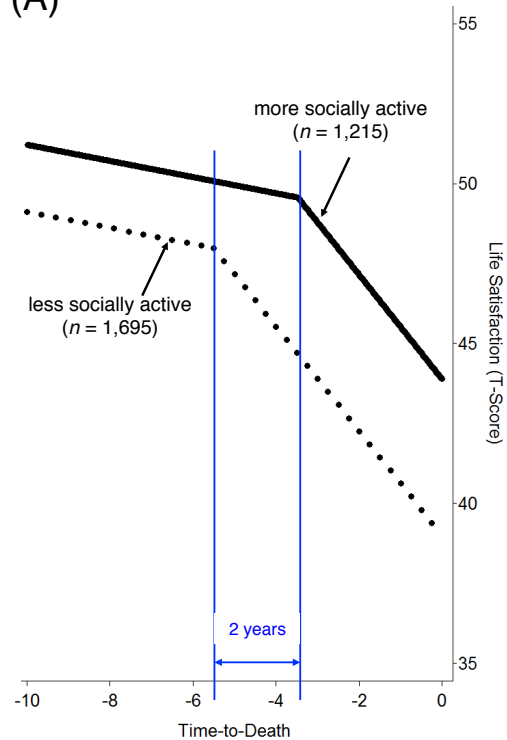
(B)



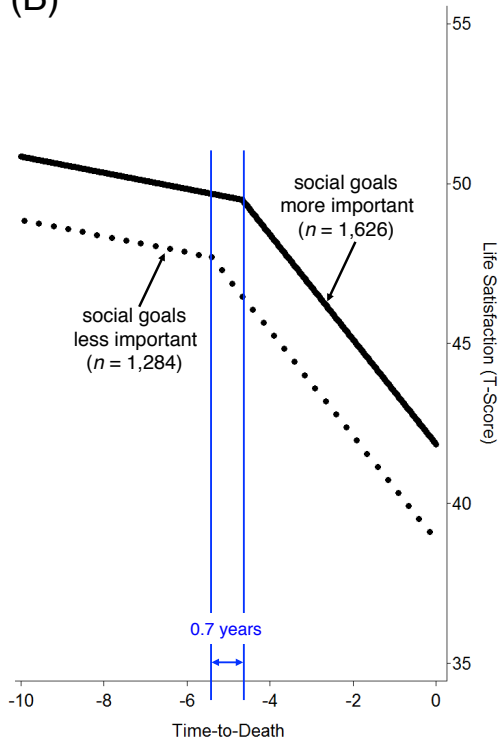
(C)



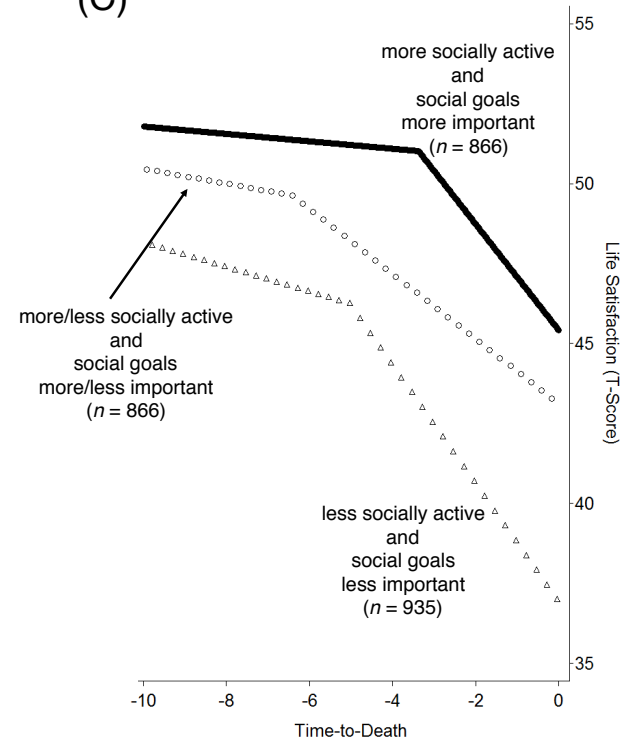
(A)



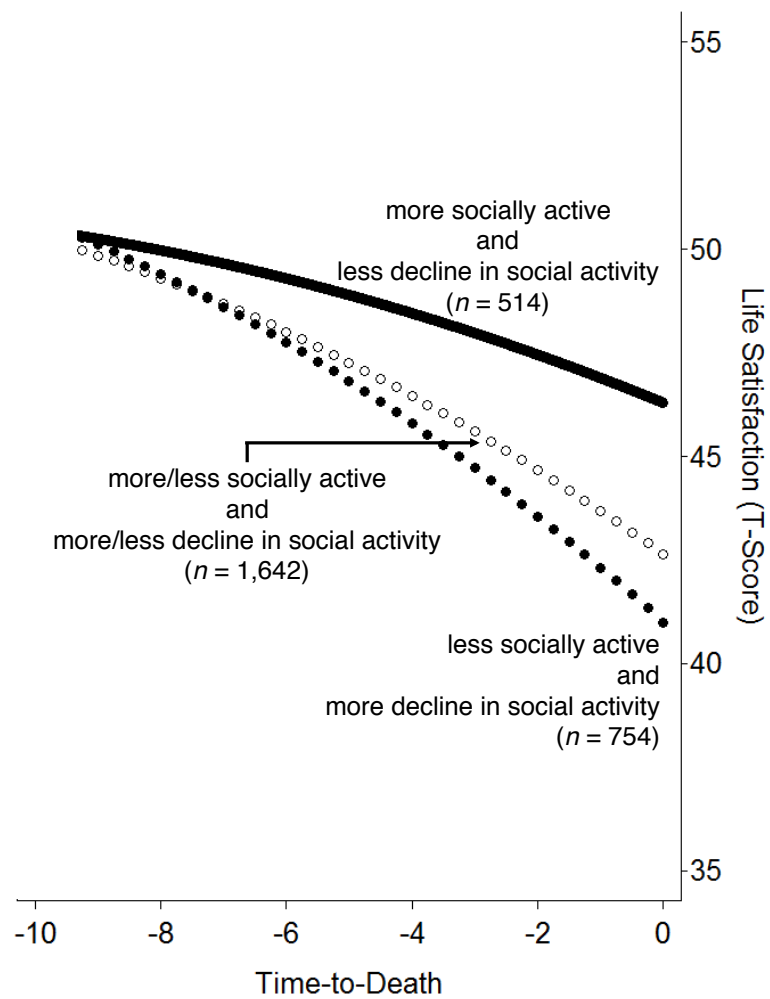
(B)



(C)



(A)



(B)

