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Changes in Life Satisfaction When Losing One’s Spouse:

Individual Differences in Anticipation, Reaction, Adaptation, and Longevity in the German Socio-Economic Panel Study (SOEP)

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**Abstract**

Losing a spouse is among the most devastating events that may occur in people’s lives. We use longitudinal data from 1,224 participants in the German Socio-Economic Panel Study (SOEP) to examine (1) how life satisfaction changes with the experience of spousal loss; (2) whether socio-demographic factors and social and health resources moderate spousal loss-related changes in life satisfaction, and (3) whether extent of anticipation, reaction, and adaptation to spousal loss are associated with mortality. Results reveal that life satisfaction shows anticipatory declines about two and a half years prior to (anticipation), steep declines in the months surrounding (reaction), and lower levels after spousal loss (adaptation). Older age was associated with steeper anticipatory declines, but less steep reactive declines. Additionally, younger age, better health, social participation, and poorer partner health were associated with better adaptation. Higher pre-loss life satisfaction, less steep reactive declines and better adaptation were associated with longevity. The discussion focuses on the utility of examining the interrelatedness among anticipation, reaction and adaptation to further our understanding of change in life satisfaction in the context of major life events.

Words: 180

**Key words:** Anticipation of Major Life Events; Bereavement; Hedonic Treadmill; Subjective Well-Being; German Socio-Economic Panel Study, SOEP

**Changes in Life Satisfaction When Losing One’s Spouse:**

**Individual Differences in Anticipation, Reaction, Adaptation, and Longevity in the German Socio-Economic Panel Study (SOEP)**

Spousal loss is among those major life events that may shape individuals’ developmental trajectories (Baltes & Nesselroade, 1979; Diener et al., 2006; Holmes & Rahe, 1967). Spousal loss is a relatively common phenomenon, particularly for women in old age. For example, in the U.S. some 13 million Americans are widowed at any given time (Elliott & Simmons, 2011) and in Germany 57% of individuals aged 80 and older are widowed ([Noll, Habich, & Schupp, 2008](#_ENREF_1)). Several studies convincingly demonstrated that losing a spouse is, on average, associated with dramatic declines in life satisfaction (Bonanno et al., 2002; Lee & DeMaris, 2007; Lucas et al., 2003; Ong, Fuller-Rowell, & Bonanno, 2010) and is predictive of physical health declines and earlier death (Elwert & Christakis, 2008; Schulz & Beach, 1999; Stroebe, Schut, & Stroebe, 2007). Although the majority of people appear to be able to adjust to the loss, there are substantial individual differences in the extent to which individuals adapt to spousal loss (Bonanno, Westphal, & Mancini, 2011; Carr & Utz, 2002; Infurna & Luthar, in press).

Our study seeks to advance insight into the effects of spousal loss in three ways: First, we explore the specific time course of changes in life satisfaction in relation to spousal loss. Second, we examine how socio-demographic factors as well as social and health resources moderate changes in life satisfaction in relation to spousal loss. Third, we examine the unique and shared predictive effects of spousal loss-related changes in life satisfaction on mortality. To do so, we capitalize on the strengths of longitudinal data from a subset of bereaved participants in the German Socio-Economic Panel (SOEP) – a widely used long-running panel study that covers the full age range of adulthood.

**Change in Life Satisfaction with Spousal Loss**

In the larger context of psychological research on life satisfaction, the hedonic treadmill model (Brickman & Campbell, 1971) has emerged as an overarching model to examine whether major life events, such as spousal loss, influence changes in well-being in adulthood and old age. The hedonic treadmill model postulates that event-related changes in well-being encompass reaction and adaptation (Diener et al., 2006; Frederick & Loewenstein, 1999; Lucas, 2007a). Empirical reports focusing on spousal loss are largely consistent with a distinction between reaction and adaptation. For example, Lucas and colleagues (2003) found that individuals typically exhibit sharp declines in life satisfaction in the year surrounding spousal loss (reaction; – 0.86 *SD*), with individuals typically reporting sustained lower levels of life satisfaction following spousal loss and evidence to suggest that life satisfaction takes up to eight years to return back to pre-loss levels (adaptation). Similar results have been observed with other facets of subjective well-being, such as depressive symptoms, anxiety, as well as positive and negative affect (Carr et al., 2000; Lee & DeMaris, 2007; Wade & Pevalin, 2004). For example, Ong and colleagues (2010) observed that compared to a matched control group, individuals who experienced spousal loss exhibited significant declines in positive emotions across a three-year period following spousal loss.

Conceptual models and empirical research on spousal loss and bereavement suggest that changes in functioning as a result of losing a spouse may be observable before the loss and may involve a certain extent of anticipation. The major approaches in this area agree that the months or years prior to the spousal loss are characterized by pre-emptive changes (anticipation; see Glaser & Strauss, 1968; Kastenbaum & Costa, 1977), followed by mourning and grief in the time surrounding spousal loss (reaction), and culminating in a transformation involving both disengagement and connection (adaptation; Boerner & Heckhausen, 2003). There are typically substantial between-person differences in such changes (Boerner & Wortman, 2007; Bonanno, 2004; Infurna & Luthar, in press; Wortman & Silver, 1989), with empirical evidence suggesting gender differences in the ramifications of widowhood, which are typically the result of differences in the availability of resources (see Stevens, 1995). For example, men are more likely to show more profound declines in psychological well-being (see Carr, 2004; Naess, Blekesaune, & Jakobsson, 2015; Williams, 2003), with possible explanations including men’s dependence on their wives for emotional support and the maintenance of social contacts with others and women’s generally stronger support networks (see Lee & DeMaris, 2007). We aim to integrate and substantiate these conceptual models by directly modeling the specific time course of changes in life satisfaction through hypothesized stages (e.g., anticipation, reaction, and adaptation), which promises to go above and beyond previous research that has solely focused on modeling the reaction and adaptation (Lucas et al., 2003).

Initial empirical evidence suggests that individuals may show declines from baseline levels of well-being prior to spousal loss (Kastenbaum & Costa, 1977; Lichtenstein, Gatz, Pedersen, Berg, & McClearn, 1996; Ong et al., 2010), but this research has been limited to only one or two observations before spousal loss. In the present study, we aim to explore the existence of pre-emptive changes in life satisfaction that we characterize as anticipatory. The anticipatory period signifies the process of changes in life satisfaction (declines or stability) preceding spousal loss that may begin months or even years prior to the death event (Carr & Utz, 2002). One would expect large between-person differences in the timing of the anticipatory period, ranging from several years before losing one’s spouse (e.g., when dealing with a long-term illness of the spouse) to no anticipatory changes at all. In particular, we propose that anticipation could reflect either an adaptive process of proactive coping or a compromising process of resource depletion. Regarding anticipation as a proactive process individuals may adjust their goals and disengage from goals associated with the spouses survival (Boerner & Heckhausen, 2003; Haase, Heckhausen, & Wrosch, 2013; Heckhausen, Wrosch, & Schulz, 2010). For example, individuals may recognize that their partner’s health is deteriorating and use goal disengagement strategies to distance themselves from unrealistic goals (e.g., an exotic vacation with the spouse; healing the illness) and through goal re-engagement select and strive for more attainable goals with the spouse (e.g., spend time together at home; manage the pain) and goals in other domains (e.g., work or own health). This would operate to re-direct one’s resources to manage stressful circumstances more effectively (Wrosch, Amir, & Miller, 2011) and serve an adaptive purpose following spousal loss through less reaction and better recovery. Second, anticipatory changes could be the result of individuals having few resources in the social, psychological, and health domains that protect against decrements due to spousal loss (e.g., vulnerability; Charles, 2010). Stressors and burdens associated with possible caregiving responsibilities may constrain one’s emotion regulation capacities (Aneshenshel et al., 1995; Charles, 2010), resulting in lower levels and declines in life satisfaction preceding spousal loss.

**Timing of Spousal Loss-Related Change in Life Satisfaction**

What is largely lacking in current research on spousal loss is the specification of the duration and the interrelatedness of change patterns such as anticipation, reaction, and adaptation. The timing and measurement of observations may play a role in examining the patterning of change in life satisfaction before and after spousal loss. Recent research shows that the specificity of the time metric (e.g., months versus years) may impact the amount of change that is observed empirically. For example, Uglanova and Staudinger (2013) observed that using granular time intervals (i.e., yearly) may mask the change that accompanies negative life events and that analyses based on three-month intervals provided additional specificity for examinations of change in life satisfaction in relation to major life events (see also Frijters et al., 2011).

To attain greater specificity in the timing and interrelatedness of anticipation, reaction, and adaptation, we apply latent-basis growth models (see McArdle, 2009; Ram & Grimm, 2007) to longitudinal data from the SOEP (Wagner, Frick, & Schupp, 2007; Headey, Muffels, & Wagner, 2010). Latent-basis growth models permits description of and better articulation of non-linear patterns of change in each hypothesized stage (see Burke, Shrout, & Bolger, 2007) and for examining whether there are between-person differences in those non-linear patterns of change. This will be done by isolating the observations for each stage and estimating each stage using latent basis parameters and including factors to examine whether they moderate such changes (see Myrskylä & Margolis, 2014). Rather than imposing a specific functional form on the shape of change, the algorithm quantifies the pattern of change to emerge from the raw data (more details in the methods section; see Fortunato, Gatzke-Kopp, & Ram, 2013 for application at other time scales).

**Individual Differences in Change in Life Satisfaction with Spousal Loss**

Research has repeatedly demonstrated that there are large between-person differences in how individuals anticipate, react, and adapt to life-altering events (Boerner & Wortman, 2007; Mancini et al., 2011; Wortman & Silver, 1989; Zautra, Hall, Murray, & the Resilience Solutions Group, 2008). Spousal loss represents one of significant life adversities that can have substantial effects on many areas of life and tremendous individual variability in these effects, with some individuals succumbing and showing declines in functioning, whereas others are resilient and able to recover from adversity (e.g., Bonanno, 2004; Netuveli, Wiggins, Montgomery, Hildon, & Blane, 2008). The evidence is mixed as to the degree to which individuals are able to adapt or recover from spousal loss. The research on resilience most often uses measures of distress and mental health and shows that the majority do not develop mental health problems. Initial research showed that most individuals are resilient, by showing stable, high levels of well-being (see Mancini et al., 2011). However, more recent research suggests that most individuals show profound declines in well-being and mental health, but are able to recover or (almost) return back to previous levels of functioning (i.e., recovery; see Infurna & Luthar, in press; Stone, Evandrou, & Falkingham, 2013; Wade & Pevalin, 2004). Following conceptual notions of resilience that various factors are likely independent predictors of better functioning following spousal loss and to understand the heterogeneity of individual change in life satisfaction surrounding spousal loss, we examine whether socio-demographic factors and social and health resources moderate the extent of changes within anticipation, reaction, and adaptation. In times of great life distress, people typically draw upon resources to help protect against losses in domains, such as life satisfaction, and these resources may operate differently during the various stages. Social resources include one’s social network integration and the quality of social relationships (Aldao, 2013; Antonucci, 2001). Health resources broadly include presence of chronic illness, functional limitations, and self-perceptions of health, as well as spousal health. Furthermore, socio-demographic factors likely moderate change in life satisfaction with spousal loss and will also be a focus in this study.

**Anticipation**. We hypothesize that age, participant health status, and spousal health will likely moderate changes in life satisfaction during anticipation. Older age may result in an anticipatory period that involves strong declines in life satisfaction preceding spousal loss. Very old adults may have fewer resources to draw upon to mitigate new burdens encountered with widowhood (e.g., losses in key domains of cognitive, physical, and social functions; Gerstorf, Smith, & Baltes, 2006; Jopp & Smith, 2006). Furthermore, individuals who suffer from disabling conditions often report poor life satisfaction, presumably a result of already challenged self-regulatory capacities (Charles, 2010; Infurna, Gerstorf, Ram, Schupp, & Wagner, 2011; Lucas, 2007b) that would be further taxed by spousal loss. Functional limitations of the partner may increase the risk of providing assistance and care on a regular basis, which could make death more likely and thus predictable, resulting in anticipatory declines.

**Reaction.** We hypothesize that age, gender, social resources, and spousal health will have the most salient moderating effect on reaction. Experiencing spousal loss in young adulthood or midlife may result in larger decrements in life satisfaction because more joint time is lost and it is an unexpected and off-time event (Neugarten & Hagestad, 1976). In a similar vein, older adults may be better at accepting their partners and one’s own worsening health and death, and therefore, are less likely to experience declines in life satisfaction. Research on gender differences in bereavement-related change in life satisfaction suggests that women report stronger increases in depressive symptoms in the years surrounding spousal loss (Carr, 2004; Lee & DeMaris, 2007). Social resources, such as social network integration and supportive relationship may protect against the negative impact of losing a spouse. A social network that involves more supportive, emotionally meaningful relationships with a larger pool of individuals to go to, to help cope and protect against declines in life satisfaction (Bonanno, 2004; Stroebe, Zech, Stroebe, & Abakoumin, 2005). Spousal health is viewed as a proxy for the surviving spouse to possibly be involved in a caregiving role due to a disability or chronic illness of their loved one. The caregiving literature shows that placement and passing of the care recipient often times results in event-related increases in the caregiver’s life satisfaction and other pertinent psychological resources due to absence of caregiving-related duties and decreases in caregiver burden (Gaugler, Pot, & Zarit, 2007; Schulz et al., 2003, 2004).

**Adaptation.** We postulate that gender, education, social resources, and health resources will serve a vital role in providing individuals the opportunity to recover following spousal loss. Men have been found to report more profound declines in psychological well-being (see Carr, 2004; Naess, Blekesaune, & Jakobsson, 2015; Williams, 2003), which could be due to women being better integrated and having more supportive social relationships beyond the spousal bond. More educated people may be more likely to return back to their previous levels of functioning because they tend to know and use more adaptive and compensatory strategies (Adler et al., 1994). For example, educational attainment is associated with psychosocial resources of perceived control that individuals can utilize in stressful contexts to buffer against declines in life satisfaction (Aneshensel, Botticello, & Yamatoto-Mitani, 2004; Lachman & Weaver, 1998). Social integration and having supportive social relationships may help individuals find comfort in being with others, resulting in improvements in life satisfaction following spousal loss (Bisconti, Bergeman, & Boker, 2006; Stroebe et al., 2005). For example, social support may buffer against adverse physiological processes that underlie lower levels of life satisfaction (Stroebe, Stroebe, Abakoumkin, & Schut, 1996). Poorer individual health may limit one’s ability to adapt and recover one’s life satisfaction (Wiest et al., 2014), whereas poor spousal health may lead to quicker recovery or adaptation due to a greater expectation of spousal loss (Bonanno et al., 2002).

**Mortality Following Spousal Loss**

Spousal loss often has long-term health implications (Schulz & Beach, 1999; Stroebe et al., 2007), including increased mortality (Elwert & Christakis, 2006; Roelfs et al., 2012; Stroebe et al., 2007). We examine whether life satisfaction levels and changes preceding (anticipation), surrounding (reaction) and following (adaptation) spousal loss are associated with mortality. Previous research suggests that both levels of and changes in various personality and psychological factors can have health consequences (Infurna, Ram, & Gerstorf, 2013; Mroczek & Spiro, 2007; Zhang, Kahana, Kahana, Hu, & Pozuelo, 2009).

Levels of life satisfaction prior to spousal loss are a proxy for better overall functioning across domains, including health (Pressman & Cohen, 2005). Similar to previous research from panel surveys, we would expect that higher levels of life satisfaction prior to spousal loss promote longevity (Danner et al., 2001; Wiest, Schüz, Webster, & Wurm, 2011; Zhang et al., 2009). Declines in life satisfaction that precede spousal loss (i.e., anticipatory changes) may provide a protective function for mortality through prompting individuals to partake in adaptive and coping strategies to maintain one’s health following spousal loss (Heckhausen et al., 2010). Conversely, anticipatory declines may be a proxy for poorer underlying health, resulting in an increased likelihood of mortality following spousal loss. Too steep declines in life satisfaction with spousal loss (reaction) may have serious consequences for everyday functioning and living (Lyubormirsky et al., 2005). Conversely, no changes in life satisfaction surrounding spousal loss could be a sign of low emotional flexibility, which can have negative health consequences as well (Carstensen et al., 2011). Following spousal loss, sustained lower levels of life satisfaction as indexed by less/no adaptation may have detrimental effects on health due to its association with health behavior regulation and biological functioning (Steptoe, Wardle, & Marmot, 2005; Wiest et al., 2014; Williams, 2004).

**The Present Study**

Our objective is to examine: (1) how life satisfaction changes with the experience of spousal loss; (2) whether socio-demographic factors and social and health resources moderate spousal loss-related changes in life satisfaction, and (3) whether extent of anticipation, reaction, and adaptation to spousal loss are associated with mortality. We first expect that changes during the months and years preceding spousal loss will reflect an anticipation period (years –5 to –1 prior to spousal loss), characterized by declines in life satisfaction. Furthermore, based on previous evidence (see Lucas et al., 2003), we expect that individuals, on average, will experience steep declines in life satisfaction in the months surrounding spousal loss (reaction), but will (almost) return back to previous levels in the years following (adaptation; years 1 to 5 following spousal loss). Second, focusing on between-person differences and factors that moderate change in life satisfaction with spousal loss, we hypothesize that socio-demographic factors and social and health resources will serve different functions during anticipation, reaction, and adaptation. Third, we expect that higher levels of life satisfaction prior to spousal loss and greater ability to adapt will be associated with longevity.

**Method**

We examined these hypotheses using data from 28 waves (1984 – 2011) of the SOEP (Headey et al., 2010). Comprehensive information about the design, participants, variables, and assessment procedures in the study is reported in Wagner et al. (2007). Details relevant to the present analysis are given below.

**Participants and Procedure**

The SOEP is a nationally representative annual panel study of private households and their inhabitants initiated in 1984. The SOEP covers ~50,000 residents of Germany, including immigrants and resident foreigners. Potential participants were randomly selected from a set of randomly selected locations in Germany. Within each household, all family members older than 16 years of age were eligible for personal participation. Relatively high initial response rates (between 60% and 70%) and low longitudinal attrition (about 15% for the second wave and less than 5% yearly attrition across various subsamples) provide for an overall sample that is representative of the population living in private households (Kroh et al., 2008). Data were primarily collected via face-to-face interviews and self-administered mail questionnaires.

For the present study, we analyzed data from the 1,224 participants who (a) were married at the outset of the study, (b) had a spouse who also participated in the SOEP, (c) who experienced spousal loss over the course of the study, (d) did not re-marry following spousal loss over the course of the study, and (e) provided data on our measures of interest. Participants in this subsample were, on average, 65.35 years of age at spousal loss (*SD* = 12.46, range 25 – 100), had attained, on average, 10.74 years of education (*SD* = 2.07, range 7 – 18), and 71% were women. We note that previous research in the SOEP has shown that spousal loss is predictive of sample attrition. Because spousal loss is a predictor of sample attrition, the results obtained can be regarded as conservative tests of our research question. Our results potentially underestimate the amount of well-being loss because those who suffer the most are the ones who are most likely to drop out.

**Measures**

**Life satisfaction:** Participants’ reported on their life satisfaction annually, answering the question “How satisfied are you with your life, all things considered?”, using a 0 (*totally unsatisfied*) to 10 (*totally satisfied*) rating scale. This item is considered a measure of cognitive-evaluative (as opposed to emotional) aspects of well-being and has been used widely in psychological research (for details, see Fujita & Diener, 2005; Gerstorf, Ram, Estabrook, et al., 2008).

**Spousal loss.** Spousal loss was determined by responses to the question “Has your family situation changed since the beginning of year *X* (e.g., 2002)?” in the category “spouse/partner has died.” If the individual indicated that their family situation changed since the beginning of year *X*, then they were asked a follow-up question regarding the month this event occurred. Timing of spousal loss was defined as the month and year the participant reported their spouse/partner died. Spouse/partner month and year of death information was used to re-align yearly reports of life satisfaction in the 60 months prior to and 60 months following spousal loss – a time period that, theoretically, spans the duration of anticipatory, reactive, and adaptive stages. Following procedures applied by Uglanova and Staudinger (2013), we appropriated the monthly data into three-month (quarterly) intervals (e.g., –60 to –58 months, –57 months to –55 months and so on). For example, if an observation was at 59 months prior to spousal loss, this was grouped in the –60 to –58 month bin. Similarly, changes for the month of spousal loss (LS0) are embedded within the estimated changes associated with LS03 because this ‘window’ covers the 0-3 months following spousal loss. Table 1 shows life satisfaction observations 60 months prior to and 60 months following spousal loss. We analyzed our data in quarterly intervals as compared to yearly intervals because (1) previous research shows that this time interval provides the most efficient tradeoff of sample size and occasions given the incompleteness in the data (i.e., covariance coverage; Uglanova & Staudinger, 2013), and (2) maintains the ability to align data with respect to the timing of spousal loss. Participants, on average, provided 8.61 life satisfaction observations (*SD* = 1.72, range 2 – 11) within the 120 months of interest.

**Moderators.** The socio-demographic and social and health resource variables that were examined as potential moderators of anticipation, reaction, and adaptation are shown in Table 2 (along with descriptives). *Social participation* was measured using a 4-item index given regularly in the SOEP that assessed frequency of involvement in or attendance at social networking and community activities, including politics, honorary activities in clubs/groups, sports, and attendance of cultural events (see Infurna et al., 2011, Headey et al., 2010). The scale is highly similar in structure to other instruments used to assess social participation (see Parslow, Jorm, Christensen, & Mackinnon, 2006). Participants answered each item on a scale from 1 (*each week*) to 4 (*never*). Responses were reverse coded and averaged to obtain an index with higher scores indicating greater social participation. Repeated observations of an individual’s social participation obtained in all the available period prior to spousal loss were averaged, so that social participation scores indicate the level of social resources individuals bring to spousal loss. *Disability status* of both the individual and the spouse were derived from a single item asking each year whether the respondent was “officially certified as having a reduced capacity to work or being severely handicapped” (for details, see Infurna et al., 2011; Lucas, 2007b). Thus, disability indicators were based on self-reports, but referred to official certifications. These repeated assessments were used as a time-invariant measure that indicates whether the individual or spouse was disabled at any point prior to spousal loss. In follow-up analyses, the pattern of findings did not differ when we included length of disability prior to spousal loss or whether the person of focus became disabled during the five years (60 months) prior to spousal loss as a moderator. Of the 1,224 individuals who experienced spousal loss in our sample, 758 were not disabled and 466 were disabled prior to spousal loss. Of the 1,224 spouses who died, 593 were not disabled and 631 were disabled prior to death.

**Mortality.** Mortality status and year of death for deceased participants who lost their spouse was obtained either (a) by interviewers at the yearly assessments (i.e., from household members or, in the case of one-person households, neighbors) or (b) from city registries. Of the 1,224 participants included in our analysis, 324 (26%) have died. On average, deceased participants were 71.36 years of age at the time of spousal loss (*SD* = 10.26, range 31– 94) and died 8.64 years later (*SD* = 5.15, range 2 – 24). We did not have access to cause of death information and therefore, our mortality analyses focus on all-cause mortality. Research by Elwert and Christakis (2008) shows that mortality following the event of spousal loss does not vary substantially by causes of death, suggesting that there is no increased likelihood of one cause of death over another.

**Analysis Procedures**

**Multi-phase latent basis growth model.** To examine interindividual differences in the hypothesized pattern of change, we used a multi-phase latent basis growth model (see Ram & Grimm, 2007; Singer & Willet, 2003). Figure 1 graphically illustrates the structural equation model that we applied to our data (top panel) and how it maps onto hypothesized spousal loss-related changes in life satisfaction (bottom panel): level (months –60 to –49), anticipation (months –48 to –4), reaction (months –3 to +3), and adaptation (months +4 to +60).

The repeated measures of life satisfaction (squares in Figure 1) were modeled as a function of the four latent growth factors (larger circles; level, anticipation, reaction, and adaptation), and a set of unique/error factors (smaller circles along the bottom, assumed to have homogeneous variance). The factor loadings connecting each growth factor to the yearly measures of life satisfaction (arrows connecting larger circles to smaller squares) were estimated in a manner similar to confirmatory factor analysis and indicate the shape of the trajectory of life satisfaction (see e.g., Fortunato et al., 2013; Ram & Grimm, 2007).

An individual-specific intercept factor score quantifies the expected *level* of life satisfaction prior to spousal loss, g0*i*. *Anticipation* scores (g1*i*) and the parameters of the vector *A*1[*t*] indicate the extent of change in life satisfaction in the years preceding spousal loss(year –48 months to month –4). *Reaction* scores (g2*i*) and the parameters of the vector *A*2[*t*] indicate the extent of short-term change in the months surrounding spousal loss (month –3 to month +3). *Adaptation* scores (g3*i*) and the parameters of the vector *A*3[*t*] indicate the extent of recovery in life satisfaction in the years following spousal loss (month +4 to month +60). The factor means (not depicted in figure) describe level and extent of anticipation, reaction, and adaptation for a prototypical widower and the factor variances (small double-headed arrows on each other the larger circles) indicate the extent of between-person differences in each component of the change process.

In subsequent analyses, the models were expanded in two ways. First, to further examine the interrelatedness of the anticipation, reaction, and adaptation, we tested a mediation model where the correlations amongst these factors were replaced by regressions. The reaction factor (g2) was regressed on the anticipation factor (g1) and the adaptation factor (g3) was regressed on the anticipation and reaction factors. From the parameters we then determined, using the Sobel test (Sobel, 1982), whether reaction mediated the association between anticipation and adaptation. Second, we regressed socio-demographic factors and social and health resources on level (g0), anticipation (g1), reaction (g2), and adaptation (g3) to examine the extent to which these between-person difference factors moderated each component of the change process.

All models were estimated using *MPlus* (Muthén & Muthén, 1998–2014), with incomplete data accommodated under missing at random assumptions at the within-person level, and, to retain longitudinal data, missing completely at random at the between-person level (Little & Rubin, 1987; set-ups provided in Ram & Grimm, 2007).

**Survival analysis.** In a final step, we outputted the estimated factor scores from the (unconditional) multiphase growth model, and used Cox proportional hazard regression models (Cox, 1972) to model the hazard for the event of mortality in the post-spousal loss period (SAS PROC PHREG, see Allison, 1995) as a function of these factor scores, socio-demographic factors, and social and health resource variables.

**Results**

**Change in Life Satisfaction with Spousal Loss**

In a preliminary step, we calculated the intraclass correlation, which was .41, indicating that 41% of the total variance in life satisfaction was between-person variance and 59% was within-person variance. The repeated measures of life satisfaction thus appeared to contain both substantial amounts of between-person differences and within-person variation over time; this suggests that individuals are more likely to differ from themselves over time than their average differs from that of other persons.

Results from the multi-phase latent basis growth model examining changes in life satisfaction in relation to spousal loss are shown in Table 3. Each column displays the latent basis coefficients (i.e., parameters of *A*k[*t*] indicate the shape of the trajectory), which specify the proportion of change that has occurred up to that point for each phase of the process: anticipation, reaction, and adaptation. Figure 2 shows the model implied trajectory of life satisfaction across the study period (black line) for the prototypical participant (average score for each moderator), overlayed on model implied trajectories for a subsample of 50 participants (gray lines). Life satisfaction was characterized by average levels at months –60 to –49 (µ*g0* = 7.06, *p* < .05). For *anticipation*, during the months and years preceding spousal loss (months –48 to –4), individuals typically experienced declines in life satisfaction (µ*g1* = – 0.77, *p* < .05, *d* = – 0.43). The mean of the *anticipation* factor indicates that during the time interval of –48 months to –4 months prior to spousal loss, the average amount of decline in life satisfaction was –0.77 points on a 0 to 10 scale. For *reaction*, on average, individuals experienced a sizeable decrease in life satisfaction in the six months surrounding spousal loss (µ*g2* = – 1.09, *p* < .05, *d* = – 0.60). The latent basis coefficient for –3 months prior to spousal loss was not reliably different from zero (A2[–03] = 0.07), suggesting that reaction does not occur in the 3 months preceding spousal loss, but only in the three months following spousal loss A2[+3] = –1.09). Following spousal loss, the average pattern of change was characterized by gradual increase post reaction (A3[*t*] increase from 0.20 at 6 months to 0.98 at 36 months post loss). However, on average life satisfaction levels did not approach pre-loss levels (Baseline level µ*g0* = 7.06 versus level at 60 months post-loss = 6.68, –.38 lower, *d* = – 0.21), indicating there is not full recovery (*adaptation,* µ*g3* = 1.47, *p* < .05, *d* = 0.81). This suggests that from 3 months to 5 years following spousal loss, life satisfaction went up, on average, 1.47 points, which is still lower than the 1.86 points that it dropped from 5 years prior to spousal loss to 3 months following spousal loss (µ*g1* =–0.77 + µ*g2* = –1.09 = 1.86).

Finally, the estimated correlations in Table 3 indicate how anticipation, reaction, and adaptation were interrelated (in this sample). The correlation of anticipation with reaction and adaptation was *rg1g2* = – .43 (*p* < .05) and *r g2g3* = .09 (*p* > .05), respectively. This suggests that exhibiting stronger anticipatory declines in life satisfaction was associated with less reactive declines, but was not related to extent of adaptation. The correlation between reaction and adaptation was *rg2g3* = – .76 (*p* < .05), suggesting that stronger declines in life satisfaction immediately surrounding the spousal loss were associated with more extensive adaptation. Furthermore, the correlations of level with anticipation, reaction, and adaptation were *rg0g1* = – .25 (*p* < .05), *rg0g2* = – .16 (*p* < .05), and *rg0g3* = – .08 (*p* > .05), respectively, suggesting that levels of life satisfaction 5 years prior to spousal loss was associated with extent of change during anticipation and reaction, but not during adaptation. Individuals who are at lower levels of life satisfaction at the baseline are less likely to show further declines in life satisfaction with spousal loss, but with no implication for what happens during post-loss recovery.

We tested an additional model that replaced the correlations among anticipation, reaction, and adaptation with regressions (i.e., regress reaction on anticipation, regress adaptation on anticipation and reaction). This was done to determine whether reaction mediated the effect of anticipation on adaptation. We found that anticipation predicted reaction (*a* = –0.67, *se* = 0.10, *p* < .01), suggesting that stronger declines in life satisfaction during anticipation were associated with less steep declines in reaction. We also found that both anticipation (*c’* = –0.38, *se* = 0.07, *p* < .01) and reaction (*b* = –0.75, *se* = 0.06, *p* < .01) predicted adaptation, such that stronger declines in life satisfaction during anticipation and reaction were associated with better adaptation or quicker recovery of life satisfaction following spousal loss. The Sobel test confirmed that reaction mediated the effect of anticipation on adaptation (estimate = 5.91, *p* < .01).

**Individual Differences in Change in Life Satisfaction with Spousal Loss**

With the variance components and predicted trajectories in Figure 2 (gray lines) suggesting that there were meaningful between-person differences in the extent of anticipation (*σ2g1* = 2.02, *p* < .05), reaction (*σ2g2* = 4.79, *p* < .05), and adaptation (*σ2g3* = 3.41, *p* < .05) to spousal loss, we proceeded to examine whether socio-demographic factors and social and health resources moderated the extent of change. Results are shown in Table 4. Participants who were older (*β11* = – 0.02, *p* < .05) were more likely to exhibit declines in life satisfaction preceding spousal loss (*anticipation*). Participants who were older (*β21* = 0.03, *p* < .05) and reported lower levels of social participation (*β24* = – 0.70, *p* < .05) were more likely to exhibit less steep declines in life satisfaction in the months surrounding spousal loss (*reaction*). Lastly, younger age (*β31* = – 0.03, *p* < .05), greater social participation (µ*34* = 0.65, *p* < .05), not being disabled (µ*35* = – 0.61, *p* < .05), and partner disability (µ*36* = – 0.36, *p* < .05) were each associated with better adaptation following spousal loss (*adaptation*). Figure 3 illustrates the age differences, indicating that participants who were older (black line) when their spouse died tended to report higher life satisfaction to begin with, but also experienced stronger declines in life satisfaction preceding spousal loss (*anticipation*), whereas younger participants (red line) were more likely to experience stronger declines in life satisfaction in the months immediately surrounding spousal loss (*reaction*), but were more likely to recover in the years thereafter (*adaptation*).

**Longevity Following Spousal Loss**

In a final model, we examined whether level, anticipation, reaction, and adaptation were associated with post-loss longevity. We outputted the factor scores for each individual from the model in Table 3 and used those estimated factor scores as predictors in a Cox regression model of mortality risk, controlling for socio-demographics, and social and health resources. Results from Table 5 indicate that pre-spousal loss levels, reaction, and adaptation were each associated with longevity. Higher levels of life satisfaction prior to spousal loss, less steep declines in life satisfaction in the months surrounding spousal loss, and better adaptation were each associated with an increased likelihood of longevity following spousal loss. The parameter estimates in Table 5 are interpreted in regards to how each one-unit increase in the factor of interest is associated with mortality risk. For example, the parameter estimate for reaction was 0.84, each one-point less steep of decline in life satisfaction surrounding spousal loss from the mean of – 1.09 (e.g., reaction estimate = – 0.09) was associated with a 16% decreased likelihood of mortality. Finally, each one unit higher level in adaptation (e.g., adaptation estimate = 2.47), signifying better or quicker recovery, was associated with a 21% decreased likelihood of mortality. Figure 4 illustrates the expected differences in mortality risk between individuals who exhibited more extensive adaptation (solid line; lower likelihood for mortality following spousal loss), and individuals who exhibited less extensive adaptation (dashed line; higher likelihood for mortality following spousal loss). Additional factors that were related to decreased mortality risk were younger age, being a woman, social participation, and partner disability.

**Discussion**

The objective was to examine (1) how life satisfaction changes with the experience of spousal loss; (2) whether socio-demographic factors and social and health resources moderate spousal loss-related changes in life satisfaction, and (3) whether extent of anticipation, reaction, and adaptation to spousal loss are associated with mortality. We observed that changes in life satisfaction in relation to spousal loss were characterized by a multi-stage pattern. On average, life satisfaction began to decline two and a half years preceding spousal loss (*anticipation*), steeply dropped during the 6 months surrounding spousal loss (*reaction*), with individuals’ life satisfaction recovering, but not returning back to pre-loss levels (*adaptation*). We also found substantial heterogeneity in the extent of changes in life satisfaction. Older adults were less likely to report declines in life satisfaction in the months surrounding spousal loss (*reaction*), whereas younger age was associated with better recovery following spousal loss (*adaptation*). Better health, partner disability (indicative of possible caregiving role prior to spousal loss), and greater social participation were additionally associated with better adaptation following spousal loss. In a final step, we found that higher levels of life satisfaction 5 years prior to, less steep declines surrounding spousal loss (reaction), and better adaptation in the five years following were each associated with increased longevity. Our discussion focuses on the interrelatedness of the time course through which life satisfaction changes with spousal loss, factors that moderate between-person differences, and pathways through which life satisfaction influences longevity following spousal loss.

**Change in Life Satisfaction with Spousal Loss**

Our aim was to provide an interpretation of the theories on spousal loss and bereavement by modeling change in life satisfaction using 3-month intervals to decipher the specific time course that life satisfaction may follow when experiencing spousal loss, anticipation, reaction, and adaptation. For reaction, our findings are similar to previous research showing that spousal loss typically results in substantial declines in life satisfaction (Lucas et al., 2003; Lee & DeMaris, 2007; Ong et al., 2010; Wiest et al., 2014). For adaptation, we observed that, on average, individuals recovered, but their life satisfaction did not reach the levels reported five years prior to spousal loss. Our findings are similar to previous research showing adaptation to spousal loss within panel surveys may take up to eight years (Burke et al., 2007; Lucas et al., 2003; Wiest et al., 2014).

A novel contribution of our study to the larger context of the hedonic treadmill model and how life satisfaction changes as a function of major life events is that individuals may *anticipate* the incidence of an event. Anticipation of a major life event is characterized by changes in functioning preceding the event (could be months or years) and not just in the months surrounding and years following. Previous conceptual models on spousal loss and bereavement have discussed possible anticipatory changes, but have been vague in when this may begin. Kastenbaum and colleagues (1977) discussed that anticipatory grief may begin *years* leading up to death of a loved one. Our focus was to directly model anticipation that has previously been theorized and go above and beyond previous research that has solely focused on the reaction and adaptation stages (Lucas et al., 2003; Wiest et al., 2014). To move in this direction, we used multi-phase latent basis growth models and modeled change in life satisfaction over 3-month intervals (as opposed to annual intervals). We were able to provide evidence to suggest for pre-emptive (anticipatory) changes in life satisfaction around two and a half years prior to spousal loss, with a more substantial drop of life satisfaction in the months surrounding spousal loss. We note that we had to a priori specify the parameters of our model for anticipation and that there are large between-person differences as to when this period may begin. Anticipation can either be adaptive (i.e., proactive self-regulation, bracing oneself) or maladaptive (passive depleted resources before loss even happens). Stronger declines in life satisfaction prior to spousal loss were associated with less steep declines in life satisfaction as a result of spousal loss (reaction) and better adaptation or recovery of life satisfaction following spousal loss.

In accordance with the line of reasoning that considers anticipation of major life events being an active process, the Motivational Theory of Life-Span Development (Heckhausen et al., 2010) discusses that as a developmental deadline is approaching or in this case, a major life event, individuals may engage in various strategies to optimize development leading up to and/or following the event. As discussed in the introduction section, an anticipatory strategy may serve this optimizing function. Anticipation may be a proactive process that involves the re-directing of one’s resources to manage stressful circumstances more effectively and may serve an adaptive purpose following spousal loss through less reaction and thus easier recovery (Heckhausen et al., 2010; Wrosch et al., 2011). In the case of spousal loss, substantial declines in life satisfaction leading up to spousal loss (anticipation) may protect an individual against further declines surrounding spousal loss (reaction) and thereafter (adaptation). Our empirical results are in line with these hypotheses; we found that stronger declines preceding spousal loss was associated with better recovery/adaptation following spousal loss and this was mediated via less strong reactive declines in life satisfaction in the months surrounding spousal loss.

This study is only an initial step in the direction of broadening our view of developmental change in relation to major life events by incorporating and directly modeling an anticipatory period and its implications for later recovery. It is upon future research to evaluate further whether anticipatory changes are salient in other major life events, such as chronic illness and its functional implications. For example, previous research has shown that although life satisfaction shows substantial changes surrounding disability, the data and results suggest that disability may be foreshadowed by decreases in life satisfaction in the years preceding the event (Lucas, 2007a). Direct modeling anticipatory changes in life satisfaction preceding major life events and using more fine-grained time intervals (e.g., monthly versus yearly) will allow researchers to examine the course of life satisfaction (and other domains) change in relation to major life events more thoroughly.

**Individual Differences in Life Satisfaction Change with Spousal Loss**

Similar to previous conceptual work and empirical reports on resilience to significant life adversity (Boerner, Wortman, & Bonanno, 2005; Bonanno, 2004; Wortman & Silver, 1989), we found that there were large between-person differences in extent to which life satisfaction changed in relation to spousal loss. This was in line with our expectations that individuals may follow different paths towards resilience and recovery to spousal loss with most individuals displaying substantial declines (Infurna & Luthar, in press; Netuveli et al., 2008; Stone et al., 2013). To address this, we examined whether social and health resources and socio-demographic factors moderated such changes. Age of the participant moderated life satisfaction change during anticipation, reaction, and adaptation. First, individuals who were older experienced steeper anticipatory declines in life satisfaction preceding spousal loss. One interpretation is that at higher ages, the death of a spouse/partner may be drawn out or expected, resulting in more gradual life satisfaction declines in the years leading up to spousal loss (Bonanno & Kaltman, 1999). Second, younger age at the time of spousal loss, on average, was associated with steeper declines in life satisfaction in the months surrounding spousal loss. Greater life satisfaction declines with spousal loss in younger ages may be the result of not having a model for mastering the loss, plans for future with spouse can no longer be realized, and in the case of having young children, the difficulty of raising the children with one parent (Carr, House, Wortman, Nesse, & Kessler, 2001). Lastly, younger age was associated with better adaptation or quicker recovery following spousal loss. Individuals in young adulthood and midlife may have more resources to draw upon to promote life satisfaction, have a more extended future life perspective, and may therefore bounce back more quickly following spousal loss. We note that the experience of spousal loss in young adulthood, midlife, and old age is likely to be qualitatively different. As shown in Figure 3, there may also be initial level differences in life satisfaction between participants who were older and younger at the time of spousal loss.

We observed that better individual health, poorer partner health, and greater social participation each moderated life satisfaction change during the adaptation stage. First, individuals who were disabled were less likely to experience recovery of life satisfaction following spousal loss. This could be a result of their self-regulation system already being at its limits and not having the resources to recover from life satisfaction declines with spousal loss (Charles, 2010; Infurna, Gerstorf, & Ram, 2013; Lucas, 2007b). Second, partner disability was linked to better adaptation or quicker recovery following spousal loss. Partner disability may be a proxy for the surviving spouse being involved in caregiving related tasks that may constrain and undermine emotion regulation capacities (Charles, 2010), and bereavement may operate as a relief (Schulz et al, 2003). Third, greater social participation prior to spousal loss is an important resource individuals can draw upon to recover from spousal loss in terms of life satisfaction levels more quickly returning back to previous levels (Isherwood, King, & Luszcz, 2012; Zautra et al., 2008). Social participation may operate through various pathways, including cognitive appraisal, coping strategies, and health behaviors. Individuals who are more embedded in their social network may be better able to recover from spousal loss through decreasing feelings of social loneliness that can help alleviate and compensate for loss of a spouse (Stroebe et al., 1996). Social participation may also operate via having the necessary coping strategies more readily available to buffer against the impact of the stressful life event and move forward in terms of finding a sense of meaning and purpose in life (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). Furthermore, our measure of social participation included sport activity and this may help individuals maintain their health and social interactions in the face of spousal loss, leading to better life satisfaction (Shahar, Schultz, Shahar, & Wing, 2001).

**Mortality Following Spousal Loss**

Our objective was to assess whether one’s life satisfaction in the context of spousal loss has mortality implications. Reporting higher levels, less steep reactive declines surrounding spousal loss, and one’s ability to adapt were each associated with longevity. Our findings are consistent with previous research from longitudinal surveys that have observed higher levels of life satisfaction may operate as a protective resource against mortality and be indicative of better overall health (Carstensen et al., 2011; Danner et al., 2001; Wiest et al., 2011; Zhang et al., 2009). Levels of life satisfaction prior to spousal loss may be linked to longevity through psychosocial functioning and better overall health. First, feeling greater joy over life relates to perceiving that one’s actions, behaviors, and efforts can shape life circumstances to attain desirable outcomes (Infurna et al., 2011; Lyubomirsky et al., 2005). Second, higher levels of overall life satisfaction is protective against declines in health through partaking in more health-promoting behaviors and buffering against the negative effects of stress on biological functioning (Pressman & Cohen, 2005). Focusing on the reaction stage, maintenance of one’s life satisfaction, despite spousal loss was protective against mortality and may be indicative of resilience in the face of this potentially traumatic event (Bonanno et al., 2011; Mancini et al., 2011). Too steep of life satisfaction declines after spousal loss may lead to declines in one’s engagement and frequency of partaking in activities that sustain one’s subjective well-being and overall health (Lyubomirsky, & Layous, 2013). Furthermore, too steep of declines may negatively impact one’s biological systemic integrity (e.g., broken heart syndrome; Wittstein et al., 2005), leading to increased likelihood of morbidity and mortality (Steptoe & Kivimäki, 2012).

Similar to previous research, we observed that individuals who were able to adapt to or recover from spousal loss attained greater longevity (Wiest et al., 2014). Remaining at low levels of life satisfaction for an extended period of time may result in long-term dysfunction. Adaptation may be linked to longevity through engaging with one’s social network, health behaviors, and compensatory strategies. First, quicker recovery following spousal loss may be a proxy for individuals utilizing their social network resources to buffer against the negative impact of spousal loss (Antonucci, 2001; Berkman, Glass, Brisette, & Seeman, 2000). Second, spousal loss can result in declines in health-promoting behaviors and deterioration of nutritional status (Shahar et al., 2001; Wilcox et al., 2003); one’s ability for life satisfaction to recover following spousal loss can enable individuals to maintain participation in health-promoting behaviors and better cardiovascular and immune system functioning (Pressman & Cohen, 2005; Steptoe et al., 2005; Wrosch & Schulz, 2008). Similarly, positive affect and life satisfaction may be associated with one’s ability to engage in adaptive goal (dis)engagement strategies following spousal loss, leading to increased likelihood of longevity (Haase, Poulin, & Heckhausen, 2012; Wrosch, Schulz, & Heckhausen, 2004). We were not able to test the specific mechanisms involved in how life satisfaction is associated with longevity following spousal loss. Future studies are needed involving both panel surveys and subgroups who experienced widowhood to evaluate the proposed mechanisms underlying such associations.

**Limitations and Outlook**

We note several limitations of our study. First, we acknowledge that there are a myriad of other potential moderators, both in terms of personality and social and health resources that we were unable to examine due to non-availability of data. For example, previous work has shown that higher levels of perceived control and emotional support are associated with more positive life satisfaction in the years following bereavement (Aneshensel et al., 2004). Also, developmental heuristics of optimized goals choice and effective goal engagement and disengagement, as well as purpose and meaning in life and personality traits may help individuals to anticipate and adapt to widowhood (Heckhausen et al., 2010; Boyce & Wood, 2011; King & Hicks, 2009). In a similar vein, financial resources, such as a high(er) income and labor force participation, as well as supportive social relations can potentially help individuals be resilient to spousal loss. The lack of financial resources and supportive social relationships can impose additional stressors and complicate adaptation to spousal loss. Second, we do not have a sufficiently large number of respondents with cause of death information (SOEP started only in 2009 with collecting cause of death information; see Infurna et al., 2014). It is likely that cause of death for spouses differed by age, gender, and education, possibly leading to differences in the stages of change in life satisfaction with spousal loss. Future research thus should examine whether cause of death of spouse and caregiving characteristics and burden has implications for the life satisfaction and survival of the spouse. Third, there are limitations in our statistical models and pattern of observations in life satisfaction. In particular, we modeled change in life satisfaction based on three-month intervals in that each person was not measured every three months and we do not have data in the three “missing” observations between each yearly assessment. We also *imposed* where the start and end of each stage was and that each person was required to follow the same (nonparametric) functional form within a stage (e.g., we did not test multiple-group models based on age, gender, and education differences). Additional work and data are needed to understand if and how the timing of transitions between, length, and pattern of change of each phase may differ across individuals. Fifth, an additional route to extend our statistical models further would be by articulating and testing specific non-linear functions of change (e.g., exponential; see Wiest et al., 2014) rather than the freely estimated form used in our study. This would require more precise articulation of what the patterns of change look like in each stage, what equilibrium is and the appropriate time scale that these patterns emerge (see Grimm, Ram, & Hamagami, 2011). Lastly, research examining life satisfaction change in relation to major life events has largely used a single item measure of life satisfaction. Other components of well-being, including positive affect and negative affect may show a differential pattern, with stronger changes in the time surrounding the event (reaction) and a quicker return back to previous levels following the event (adaptation).

In sum, spousal loss results in substantial declines in life satisfaction that can be characterized by anticipation, reaction, and adaptation, with large between-person differences in the extent of change experiences. Intriguingly, anticipation was found to buffer the reaction to spousal loss and thus benefit long-term adaptation. Older adults are more likely than adults in young adulthood and midlife to experience greater declines in life satisfaction prior to spousal loss, but less steep declines in the months surrounding spousal loss, and younger persons adapt more quickly to this major life event. Social participation is associated with better adaptation in the years following spousal loss. Furthermore, our study showed that life satisfaction levels prior to, as well as reaction and adaptation to spousal loss are each associated with longevity. Future research should focus on (additional) personality differences in self-regulatory capacities and social resources that may moderate anticipatory, reactive, and adaptation changes associated with major life events and the pathways through which changes in life satisfaction are associated with longevity.

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| Table 1  *Descriptive Statistics for Life Satisfaction in Relation to Spousal Loss* | | | | | |
|  |  | Time to/from Spousal Loss (months) | Number of Observations | *M* | *SD* |
| Level |  | –60 – –58 | 209 | 6.74 | 2.01 |
|  |  | –57 – –55 | 252 | 7.18 | 1.82 |
|  |  | –54 – –52 | 254 | 7.00 | 1.77 |
| Level |  | –51 – –49 | 220 | 6.84 | 1.92 |
| Anticipation |  | –48 – –46 | 211 | 6.83 | 1.92 |
|  |  | –45 – –43 | 275 | 6.92 | 2.03 |
|  |  | –42 – –40 | 247 | 6.96 | 1.92 |
|  |  | –39 – –37 | 249 | 6.90 | 1.99 |
|  |  | –36 – –34 | 276 | 6.93 | 1.88 |
|  |  | –33 – –31 | 278 | 6.99 | 1.90 |
|  |  | –30 – –28 | 266 | 6.83 | 1.87 |
|  |  | –27 – –25 | 304 | 6.76 | 2.01 |
|  |  | –24 – –22 | 260 | 6.54 | 2.15 |
|  |  | –21 – –19 | 310 | 6.84 | 1.97 |
|  |  | –18 – –16 | 314 | 6.77 | 1.97 |
|  |  | –15 – –13 | 309 | 6.69 | 1.96 |
|  |  | –12 – –10 | 252 | 6.30 | 2.07 |
|  |  | –9 – –7 | 335 | 6.57 | 2.07 |
| Anticipation |  | –6 – –4 | 305 | 6.30 | 2.10 |
| Reaction |  | –3 – 0 | 405 | 6.10 | 2.15 |
| Reaction |  | 0 – 3 | 328 | 5.19 | 2.31 |
| Adaptation |  | 4 – 6 | 330 | 5.48 | 2.22 |
|  |  | 7 – 9 | 299 | 5.80 | 2.09 |
|  |  | 10 – 12 | 270 | 5.74 | 2.27 |
|  |  | 13 – 15 | 291 | 6.13 | 1.97 |
|  |  | 16 – 18 | 304 | 6.36 | 2.13 |
|  |  | 19 – 21 | 250 | 6.41 | 1.89 |
|  |  | 22 – 24 | 249 | 6.38 | 1.99 |
|  |  | 25 – 27 | 288 | 6.39 | 2.02 |
|  |  | 28 – 30 | 265 | 6.54 | 2.01 |
|  |  | 31 – 33 | 227 | 6.36 | 1.75 |
|  |  | 34 – 36 | 259 | 6.71 | 1.88 |
|  |  | 37 – 39 | 237 | 6.74 | 1.80 |
|  |  | 40 – 42 | 252 | 6.55 | 2.02 |
|  |  | 43 – 45 | 208 | 6.64 | 1.94 |
|  |  | 46 – 48 | 178 | 6.67 | 1.94 |
|  |  | 49 – 51 | 216 | 6.55 | 2.03 |
|  |  | 52 – 54 | 226 | 6.57 | 1.88 |
|  |  | 55 – 57 | 169 | 6.88 | 1.87 |
| Adaptation |  | 58 – 60 | 160 | 6.94 | 1.68 |
| *Note. N* = 1,224 participants provided 10,537 observations. Participants, on average, provided 8.61 (*SD* = 1.72, range 2 – 11) life satisfaction observations over this time period. | | | | | |

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| Table 2  *Means, Standard Deviations, and Intercorrelations Among Moderators Included in the Present Study* | | | | | | | | |
|  | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Age at spousal loss (25 – 100 years) | 65.35 | 12.46 | – |  |  |  |  |  |
| 2. Women (%) | 0.71 | 0.45 | –.08\* | – |  |  |  |  |
| 3. Education (7–18 years) | 10.74 | 2.07 | –.09\* | –.18\* | – |  |  |  |
| 4. Social participation (1 – 4) | 1.40 | 0.44 | –.14 | –.12\* | .36\* | – |  |  |
| 5. Disability: Individual (1 = disabled) | 0.38 | 0.49 | .14\* | –.14\* | –.09\* | –.04 | – |  |
| 6. Disability: Partner (1 = disabled) | 0.52 | 0.50 | 09\* | .08\* | –.07\* | –.07\* | .12\* | – |
| *Note. N* = 1,224. Men: *N* = 353; Women: *N* = 871.  \**p* < .05. | | | | | | | | |

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| Table 3  *Fixed and Random Effects and Latent Basis Estimates for Examining Change in Life Satisfaction to/from Spousal Loss* | | | | | | | | | |
|  |  | Specific Time Course of Change in Life Satisfaction | | | | | | |  |
|  |  | Level, *g0* |  | Anticipation, *g1* |  | Reaction, *g2* |  | Adaptation, *g3* |  |
| Pattern of Change (Latent Basis) |  |  |  |  |  |  |  |  |  |
| Factor loadings for change factors Ak[t] |  | LS–60 = 1.00 |  | LS–48 = 0.19\* (0.08) |  | LS–03 = 0.07 (0.05) |  | LS06 = 0.20\* (0.06) |  |
|  |  | LS–57 = 1.00 |  | LS–45 = 0.17\* (0.08) |  | LS03 = 1.00 |  | LS09 = 0.33\* (0.06) |  |
|  |  | LS–54 = 1.00 |  | LS–42 = 0.16 (0.08) |  |  |  | LS12 = 0.36\* (0.06) |  |
|  |  | LS–51 = 1.00 |  | LS–39 = 0.09 (0.08) |  |  |  | LS15 = 0.68\* (0.06) |  |
|  |  | LS–48 = 1.00 |  | LS–36 = 0.15 (0.08) |  |  |  | LS18 = 0.71\* (0.07) |  |
|  |  | LS–45 = 1.00 |  | LS–33 = 0.17\* (0.08) |  |  |  | LS21 = 0.77\* (0.07) |  |
|  |  | LS–42 = 1.00 |  | LS–30 = 0.32\* (0.08) |  |  |  | LS24 = 0.75\* (0.06) |  |
|  |  | LS–39 = 1.00 |  | LS–27 = 0.25\* (0.08) |  |  |  | LS27 = 0.79\* (0.06) |  |
|  |  | LS–36 = 1.00 |  | LS–24 = 0.60\* (0.09) |  |  |  | LS30 = 0.86\* (0.07) |  |
|  |  | LS–33 = 1.00 |  | LS–21 = 0.47\* (0.08) |  |  |  | LS33 = 0.77\* (0.07) |  |
|  |  | LS–30 = 1.00 |  | LS–18 = 0.53\* (0.08) |  |  |  | LS36 = 0.98\* (0.06) |  |
|  |  | LS–27 = 1.00 |  | LS–15 = 0.33\* (0.08) |  |  |  | LS39 = 0.90\* (0.07) |  |
|  |  | LS–24 = 1.00 |  | LS–12 = 0.75\* (0.09) |  |  |  | LS42 = 0.89\* (0.07) |  |
|  |  | LS–21 = 1.00 |  | LS–09 = 0.82\* (0.08) |  |  |  | LS45 = 0.97\* (0.08) |  |
|  |  | LS–18 = 1.00 |  | LS–06 = 1.00 |  |  |  | LS48 = 1.01\* (0.07) |  |
|  |  | LS–15 = 1.00 |  |  |  |  |  | LS51 = 0.88\* (0.07) |  |
|  |  | LS–12 = 1.00 |  |  |  |  |  | LS54 = 0.95\* (0.08) |  |
|  |  | … |  |  |  |  |  | LS57 = 1.06\* (0.08) |  |
|  |  | LS60 = 1.00 |  |  |  |  |  | LS60 = 1.00 |  |
|  |  |  |  |  |  |  |  |  |  |
| Change Factor |  |  |  |  |  |  |  |  |  |
| Factor means (*SE*) |  | µ*g0* = 7.06\* (0.06) |  | µ*g1* = –0.77\* (0.08) |  | µ*g2* = –1.09\* (0.11) |  | µ*g3* = 1.47\* (0.13) |  |
|  |  |  |  |  |  |  |  |  |  |
| Factor variances and correlations |  |  |  |  |  |  |  |  |  |
| Level, *g0* |  | 2.26\* (0.13) |  |  |  |  |  |  |  |
| Anticipation, *g1* |  | –.25\* |  | 2.02\* (0.27) |  |  |  |  |  |
| Reaction, *g2* |  | –.16\* |  | –.43\* |  | 4.79\* (0.47) |  |  |  |
| Adaptation, *g3* |  | –.08 |  | .09 |  | –.76\* |  | 3.41\* (0.54) |  |
|  |  |  |  |  |  |  |  |  |  |
| Fit Statistics |  |  |  |  |  |  |  |  |  |
|  |  | CFI = 0.95; RMSEA = 0.02 | | | | | | |  |
| *Note. N* = 1,224. Number of observations = 10,537. Residual variance = 1.57, *SE* = 0.03. LS*t* = Life Satisfaction observation at *t* months in relation to spousal loss. ICC = .41. pseudo-R2 = 0.36. CFI = Comparative Fit Index. RMSEA = Root-Mean-Square Error of Approximation. \**p* < .05. | | | | | | | | | |

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| Table 4  *Fixed and Random Effects and Latent Basis Estimates for Examining Change in Life Satisfaction to/from Spousal Loss: The Effect of Socio-Demographic and Social and Health Resources* | | | | | | | | | |
|  |  | Specific Time Course of Change in Life Satisfaction | | | | | | |  |
|  |  | Level, *g0* |  | Anticipation, *g1* |  | Reaction, *g2* |  | Adaptation, *g3* |  |
| Pattern of Change (Latent Basis) |  |  |  |  |  |  |  |  |  |
| Factor loadings for change factors Ak[t] |  | LS–60 = 1.00 |  | LS–48 = 0.20\* (0.08) |  | LS–03 = 0.08 (0.05) |  | LS06 = 0.21\* (0.06) |  |
|  |  | LS–57 = 1.00 |  | LS–45 = 0.18\* (0.08) |  | LS03 = 1.00 |  | LS09 = 0.32\* (0.06) |  |
|  |  | LS–54 = 1.00 |  | LS–42 = 0.16 (0.08) |  |  |  | LS12 = 0.36\* (0.06) |  |
|  |  | LS–51 = 1.00 |  | LS–39 = 0.11 (0.08) |  |  |  | LS15 = 0.68\* (0.06) |  |
|  |  | LS–48 = 1.00 |  | LS–36 = 0.14 (0.08) |  |  |  | LS18 = 0.70\* (0.06) |  |
|  |  | LS–45 = 1.00 |  | LS–33 = 0.17\* (0.08) |  |  |  | LS21 = 0.75\* (0.06) |  |
|  |  | LS–42 = 1.00 |  | LS–30 = 0.32\* (0.08) |  |  |  | LS24 = 0.74\* (0.06) |  |
|  |  | LS–39 = 1.00 |  | LS–27 = 0.25\* (0.08) |  |  |  | LS27 = 0.80\* (0.06) |  |
|  |  | LS–36 = 1.00 |  | LS–24 = 0.60\* (0.09) |  |  |  | LS30 = 0.88\* (0.07) |  |
|  |  | LS–33 = 1.00 |  | LS–21 = 0.49\* (0.08) |  |  |  | LS33 = 0.74\* (0.06) |  |
|  |  | LS–30 = 1.00 |  | LS–18 = 0.54\* (0.08) |  |  |  | LS36 = 0.97\* (0.06) |  |
|  |  | LS–27 = 1.00 |  | LS–15 = 0.34\* (0.08) |  |  |  | LS39 = 0.93\* (0.07) |  |
|  |  | LS–24 = 1.00 |  | LS–12 = 0.73\* (0.08) |  |  |  | LS42 = 0.91\* (0.07) |  |
|  |  | LS–21 = 1.00 |  | LS–09 = 0.83\* (0.08) |  |  |  | LS45 = 0.95\* (0.07) |  |
|  |  | LS–18 = 1.00 |  | LS–06 = 1.00 |  |  |  | LS48 = 1.00\* (0.07) |  |
|  |  | LS–15 = 1.00 |  |  |  |  |  | LS51 = 0.90\* (0.07) |  |
|  |  | LS–12 = 1.00 |  |  |  |  |  | LS54 = 0.97\* (0.07) |  |
|  |  | … |  |  |  |  |  | LS57 = 1.05\* (0.08) |  |
|  |  | LS60 = 1.00 |  |  |  |  |  | LS60 = 1.00 |  |
|  |  |  |  |  |  |  |  |  |  |
| Change Factor |  |  |  |  |  |  |  |  |  |
| Factor means (*SE*) |  | µ*g0* = 7.06\* (0.06) |  | µ*g1* = –0.77\* (0.08) |  | µ*g2* = –1.09\* (0.11) |  | µ*g3* = 1.47\* (0.13) |  |
|  |  |  |  |  |  |  |  |  |  |
| Effects of moderators on Change Factors (*SE*) |  |  |  |  |  |  |  |  |  |
| Age |  | *β*01 = 0.02\* (0.004) |  | *β* 11 = –0.02\* (0.01) |  | *β* 21 = 0.03\* (0.01) |  | *β* 31 = –0.03\* (0.01) |  |
| Women |  | *β*02 = –0.08 (0.12) |  | *β* 12 = 0.15 (0.16) |  | *β* 22 = –0.38 (0.20) |  | *β* 32 = 0.22 (0.19) |  |
| Education |  | *β*03 = –0.02 (0.03) |  | *β* 13 = –0.01 (0.04) |  | *β* 23 = 0.05 (0.05) |  | *β* 33 = 0.001 (0.04) |  |
| Social participation |  | *β*04 = 0.68\* (0.13) |  | *β* 14 = 0.11 (0.17) |  | *β* 24 = –0.70\* (0.21) |  | *β* 34 = 0.65\* (0.20) |  |
| Disability status of individual |  | *β*05 = –0.44\* (0.11) |  | *β* 15 = –0.20 (0.15) |  | *β* 25 = 0.34 (0.19) |  | *β* 35 = –0.61\* (0.18) |  |
| Disability status of partner |  | *β*06 = –0.10 (0.10) |  | *β* 16 = –0.16 (0.14) |  | *β* 26 = 0.11 (0.18) |  | *β* 36 = 0.36\* (0.17) |  |
|  |  |  |  |  |  |  |  |  |  |
| Residual Factor variances and correlations |  |  |  |  |  |  |  |  |  |
| Level, *g0* |  | 2.09\* (0.13) |  |  |  |  |  |  |  |
| Anticipation, *g1* |  | –.26\* |  | 1.94\* (0.27) |  |  |  |  |  |
| Reaction, *g2* |  | –.16\* |  | –.41\* |  | 4.49\* (0.47) |  |  |  |
| Adaptation, *g3* |  | .07 |  | .05 |  | –.76\* |  | 2.95\* (0.54) |  |
|  |  |  |  |  |  |  |  |  |  |
| Pseudo R2 |  | .075 |  | .040 |  | .063 |  | .135 |  |
|  |  |  |  |  |  |  |  |  |  |
| Fit Statistics |  |  |  |  |  |  |  |  |  |
|  |  | CFI = 0.94; RMSEA = 0.02 | | | | | | |  |
| *Note. N* = 1,224. Number of observations = 10,537. Residual variance = 1.57, *SE* = 0.03. LS*t* = Life Satisfaction observation at *t* months in relation to spousal loss. ICC = .41. CFI = Comparative Fit Index. RMSEA = Root-Mean-Square Error of Approximation. \**p* < .05. | | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 5  *Likelihood of Longevity in the Years Following Spousal Loss as a Function of Level, Anticipation, Reaction, and Adaptation of Life Satisfaction* | | | | |
|  |  |  | HR | [95% CI] |
| Intercept |  |  | 0.84\* | [0.77, 0.92] |
| Anticipation |  |  | 0.87 | [0.76, 1.01] |
| Reaction |  |  | 0.84\* | [0.74, 0.96] |
| Adaptation |  |  | 0.79\* | [0.68, 0.92] |
| Age |  |  | 1.08\* | [1.07, 1.09] |
| Women |  |  | 0.45\* | [0.35, 0.57] |
| Years of education |  |  | 0.98 | [0.92, 1.05] |
| Social participation |  |  | 0.70\* | [0.51, 0.95] |
| Disability status: Individual |  |  | 1.13 | [0.90, 1.42] |
| Disability status: Partner |  |  | 0.78\* | [0.62, 0.97] |
|  |  |  |  |  |
| Model Fit Statistics |  |  |  |  |
| *df* |  |  | 10 | |
| χ2 |  |  | 282.81 | |
| *Note. N* = 1,224 with 324 recorded deaths in the post-spousal loss observation period. HR = Hazard Ratio. CI = Confidence Interval.  \* *p* < .05. | | | | |

**Figure Caption**

**Figure 1.** Illustrating the structural equation model (top panel) and components of change that life satisfaction follows in relation to spousal loss. Level components of life satisfaction refer to how individuals may report varying levels of life satisfaction in the several years prior to spousal loss. Anticipation reflects changes in life satisfaction in the years leading up to spousal loss. Reaction refers to how individuals may display differential rates of change with the incidence of spousal loss. Lastly, differential rates of change may be exhibited in the years following spousal loss, which is referred to adaptation; adaptation may be immediate (one year following spousal loss) or take several years. Each line in Figure 1 displays a hypothetical trajectory of change for individuals who experience spousal loss. The factor loadings for level are all set to 1. The factor loadings for anticipation, reaction, and adaptation that are not labeled 1 are freely estimated.

**Figure 2***.* Model implied mean (black line) for change in life satisfaction in relation to spousal loss with predicted scores from our latent basis model from Table 3 for a subsample of 50 participants (gray lines). Population mean for 2002 SOEP sample is depicted in the dotted line to illustrate how individuals’ life satisfaction compares to mean population average. Changes in life satisfaction are characterized by a multi-stage pattern. SOEP participants who experienced spousal loss, on average, reported declines in life satisfaction in the months and years preceding spousal loss (anticipation), substantial declines in the months surrounding spousal loss (reaction), and did not return back to previous levels following spousal loss (adaptation).

**Figure 3.** Illustrating the moderating role of age for change in life satisfaction in relation to spousal loss. Older age (black line) at spousal loss was associated with an increased likelihood of experiencing stronger life satisfaction declines preceding spousal loss (*anticipation*) and less steep declines surrounding spousal loss (*reaction*), whereas younger age (red line) at spousal loss was associated with maintenance of life satisfaction prior to spousal loss (*anticipation*), steeper declines surrounding spousal loss (*reaction*), and quicker recovery in the years thereafter (*adaptation*).

**Figure 4***.* Illustrating the predictive effects of adaptation for survival following spousal loss. Adaptation refers to changes in life satisfaction in the months and years following spousal loss and whether life satisfaction levels are able to recover. More extensive adaptation following spousal loss was associated with increased likelihood of survival in the years following spousal loss.







