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Testing Set-Point Theory in a Swiss National Sample: Reaction and Adaptation to Major Life Events

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Abstract

Set-point theory posits that individuals react to the experience of major life events, but quickly adapt back to pre-event baseline levels of subjective well-being in the years following the event. A large, nationally representative panel study of Swiss households was used to examine set-point theory by investigating the extent of adaptation following the experience of marriage, childbirth, widowhood, unemployment, and disability. Our results demonstrate that major life events are associated with marked change in life satisfaction and, for some events (e.g., marriage, disability), these changes are relatively long lasting even when accounting for normative, age related change.

Keywords

happiness; subjective well-being; life events; adaptation; Swiss Household Panel

Subjective well-being (SWB) is defined as an individual's subjective evaluation of his or her own quality of life. Subjective well-being includes an affective component – the amount of positive and negative emotions experienced by an individual—and a cognitive component – an individual's evaluation of one's own life circumstances, which is typically assessed using global measures of life satisfaction (Busseri & Sadava, 2011; Diener, 1984; Diener, Emmons, Larsen & Griffin, 1985). Given the high value placed on SWB, and the great lengths individuals will go to achieve high levels of SWB (Lyubomirsky, Sheldon, & Schkade, 2005), understanding the factors that are associated with SWB is an important empirical concern.

Intuition might suggest that life circumstances are the most important predictors of SWB, and that changes in life circumstances are associated with large, lasting changes in SWB. However, research shows that the associations between life circumstances and SWB are relatively small, that SWB is moderately heritable and stable over time, and that individual differences in SWB are associated with personality traits (Diener, Suh, Lucas, & Smith, 1999). *Set-point theories* that were developed to explain this pattern of findings posit that an individual's subjective well-being fluctuates around a stable set-point (see Diener, Lucas, & Scollon, 2006, for a review). According to these theories, individuals may experience

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temporary increases and decreases in well-being in response to major life events, but they will quickly adapt and their SWB will inevitably return to its genetically determined baseline level (Lykken & Tellegen, 1996). Because of this, some have argued that attempts to change life circumstances in order to elicit change in SWB will undoubtedly result in failure (Lykken & Tellegen, 1996).

Set-point theories imply that events that we work hard to achieve (e.g., marriage, establishing a career) will have virtually no lasting positive influence on our well-being. Perhaps more importantly, these theories suggest that there is not much we need to do to help the people who have experienced a particularly negative event such as widowhood or disability, because they will soon adapt to their new life circumstances. Despite the importance of these implications, research that has explored influences of life events on well-being has been limited. Much of the initial research literature examining the predictors of SWB relied on cross sectional studies (see Diener, 1984; Wilson 1967 for reviews). These studies generally indicated that life circumstances and other demographic characteristics were relatively poor predictors of SWB (e.g., Campbell, Converse, & Rodgers, 1976; Okun & George, 1984). In addition, most major life events are relatively rare, and finding large numbers of individuals who have experienced certain events can be challenging. As such, much of the initial cross sectional research included relatively small samples of participants. These cross sectional studies are also limited by the fact that one cannot determine whether within-person changes have occurred because information about individuals' pre-event levels of SWB is not known. These issues make the interpretation of existing cross-sectional studies on life events difficult to interpret.

To address these issues, more recent research has used large, nationally representative panel studies to explore whether changes in life circumstances are associated with corresponding changes in SWB. This type of study design offers several important advantages over cross-sectional studies and even over typical longitudinal analyses. First, these studies are longitudinal and include very large samples that span many years. For example, the German Socio-Economic Panel Study (GSOEP) has been used in several past studies examining reaction and adaptation to life events (e.g., Galatzer-Levy, Bonanno, & Mancini, 2010; Lucas, 2007b; Frey & Stutzer, 2004) and includes a nationally representative sample of close to 40,000 people living in Germany who have been assessed at yearly intervals for up to 26 years. Second, the prospective nature of these studies allows researchers to directly compare estimates of pre-event levels of life satisfaction to life satisfaction levels following the event in question, eliminating the possibility that post-event changes in life satisfaction are due to average differences in baseline life satisfaction prior to the event (i.e., selection effects). Third, these studies minimize the possibility of demand characteristics affecting results, because participants are not recruited based on the fact that they experienced a particular event. When examining relatively rare life events researchers usually recruit participants because they have already experienced such event. However, this recruitment strategy makes the purpose of the study known to participants, which can influence participants' responses (Smith, Schwarz, Roberts, & Ubel, 2006). However, in large, nationally representative samples, participants are not recruited based on the experience of any particular event, and any questions related to a particular event are a mere fraction of a wide range of variables drawing from multiple domains.

Generally, past research that has examined the impact of life events on subjective well-being using large panel studies has shown that events vary in the extent to which they are associated with lasting changes in life satisfaction. For instance, there is evidence that getting married for the first time is associated with a substantial boost in life satisfaction, followed by a gradual adaptation back to baseline levels (Lucas, Clark, Georgellis, & Diener, 2003). In contrast, unemployment is associated with lasting changes in life satisfaction that persist even after the unemployed person finds a new job (Lucas, Clark, Georgellis, & Diener, 2004). Similarly, Lucas (2007b) used two nationally representative panel studies to demonstrate that lasting declines in life satisfaction result from the onset of long-term disability. A study by Lucas (2005) examining reaction and adaptation of life satisfaction following divorce also showed a similar pattern. The onset of divorce was associated with a marked decrease in life satisfaction, and complete adaptation to pre-marriage baseline levels did not occur. In sum, past research suggests that lasting changes in subjective well being can occur after the experience of life events. Contrary to the predictions of set-point theories, adaptation back to baseline levels of subjective well being is not necessarily inevitable.

The research discussed above has primarily examined the effects of life events on subjective well-being using the GSOEP. Although the GSOEP sample has many desirable characteristics, one must be cautious not to draw definitive conclusions based on results garnered from a single data source. Different panel studies may use different methodology, particularly in the way in which variables of interest are measured and operationalized. As such, it is possible that these simple differences in methodology result in differing results across datasets when exploring the relationships between the same constructs. Finally, there may also be many subtle cultural differences among nations that impact both the mean level of subjective well-being in the nation and the degree to which life events affect subjective well-being among individuals within a nation's population, even among highly similar western nations. Replication across additional samples would strengthen our confidence in the results of the studies that used the GSOEP data.

A recent paper by Yap, Anusic, and Lucas (2012) used the British Household Panel Survey (BHPS) to examine the extent to which the experience of four major life events (marriage, childbirth, unemployment and widowhood) predicted changes in life satisfaction following the event. The extent to which each of these events relate to changes in life satisfaction had been previously examined in the GSOEP (e.g., Lucas, 2007a; Dyrdal & Lucas, 2013) and this paper was the one of the first to examine this set of events outside of this German dataset. One of the goals of Yap et al.'s (2012) study was to replicate the findings found in previous literature surrounding the effects of various life events on life satisfaction. The findings of this study largely replicated prior work examining reaction and adaptation to major positive and negative life events in the GSOEP, however a few differences emerged. Extending this line of research to datasets drawn from other nations is theoretically important and necessary for understanding the impact of life events on subjective well-being.

Another important limitation of much of the past literature examining reaction and adaptation to life events is that it does not take into account normative changes in happiness

that may occur with age. For instance, Deaton (2008) found that life satisfaction declines with age in many nations. In relatively wealthy western nations however (e.g., United States, Canada), Deaton found evidence that life satisfaction followed a U-shaped trajectory, falling in early adulthood and then rising as one passes middle age. Indeed, other research has replicated these results, finding evidence for a U-shaped well-being trajectory across the life span in diverse populations from many areas of the world (e.g., Baird, Lucas, & Donnellan, 2010; Blanchflower & Oswald, 2008). The existence of these normative, age related changes in well-being can affect the interpretation past findings. For instance, Lucas et al. (2003) found that happiness levels after marriage are similar to what they were before marriage. However, if normative changes exist, then this stability from pre to post-marriage may actually reflect a protective effect of marriage whereby those who marry are protected from the normative decline that would have occurred in early adulthood.

The Current Study

The main goal of this study was to evaluate adaptation and set-point theories of SWB by examining the extent to which individuals adapt to several major life events in a prospective longitudinal study of Swiss households. The Swiss Household Panel (SHP) is a nationally representative, longitudinal study of households in Switzerland. To our knowledge, this study has not been used to examine the effects of major life events on subjective well being. Thus, the central goal of the current paper is to examine whether the results of the past body of work examining reaction and adaptation to marriage, childbirth, divorce, widowhood, disability and unemployment in the Germany and Great Britain (e.g., Drydal & Lucas, 2012; Lucas, 2005; 2007b; Lucas et al., 2003; 2004; Yap et al., 2012) are consistent in this nationally representative Swiss sample. Individuals' reaction and adaptation to marriage, childbirth, widowhood, disability and unemployment were examined in this study since each of these life events has been linked to changes in individuals' levels of life satisfaction in past research using similar procedures (e.g., Dyrdal & Lucas, 2013; Lucas, 2007a; Yap et al., 2012).

Another novel contribution of this study was that it was one of the first to separate within-person changes in life satisfaction over time that were due to the experience of a life event from normative, age-related changes in life satisfaction. That is, we evaluated whether life events were associated with changes in life satisfaction over and above normative changes that would have occurred even if a person did not experience any such life events. Thus, this study aims to provide answers to two questions: whether people are more or less happy after a major life event than before the event, and whether people are more or less happy after a major life event than they would have been had they not experienced that event, but experienced only normative changes in well-being over time.

Method

The Swiss Household Panel (SHP) is a nationally representative, longitudinal study of households in Switzerland. Annual data collection began in 1999, and the latest wave of data included in this analysis was collected in 2012. The SHP sampled households using stratified random sampling of different regions of Switzerland (see Budowski et al., 2001,

for further details regarding the study and its sampling procedures). The SHP also included a refreshment sample in 2004. All members of selected households 14 years of age or older were asked to participate in the study. Overall, the SHP includes over 19,000 individuals from 7,500 households that have participated in at least one wave.

Sample selection of groups who experienced a major life event

To examine the effect of life events of well-being we selected subsamples of people who experienced one of five major life events during the course of the study: marriage, birth of the first child, widowhood, unemployment, or disability. For the marriage sample we selected individuals who indicated that they were not married when they began participating in the study, got married during the course of the study, and stayed married for the duration of the study. The childbirth sample included individuals who indicated that they did not have any children when they began participating in the study and then reported that their first child was born during the course of the study. We excluded individuals who had more than one child (e.g., twins) when they first became parents. In the widowhood sample we included individuals who began the study married, became widowed, and subsequently did not remarry during the course of the study. We excluded people who were separated or divorced before becoming widowed in order to obtain the most accurate estimate of baseline life satisfaction. For the unemployment sample we selected individuals who indicated that they were not unemployed at the start of the study, and who experienced at least one bout of unemployment during the course of the study.[1] The disability sample comprised individuals who did not indicate they were disabled at the start of the study, became disabled sometime during the course of the study, and remained disabled for the duration of the study.[2] We coded people who indicated they were not working for reasons of disability as disabled in our sample. We restricted each sample to individuals who provided life satisfaction data in at least one wave prior to experience of the event and at least one wave following the event. Sample sizes, age and gender composition, and the average number of waves of data before and after the event are shown in Table 1.

Selection of comparison groups

We also selected five comparison groups of individuals who did not experience a major life event. The marriage comparison group included people who reported they were single and never married in each wave of their participation in the survey. People in the childbirth comparison group reported having no children throughout the duration of the study. The widowhood comparison group comprised people who reported being married at each wave of the study. The comparison group for the unemployment sample included people who never experienced an unemployment bout during their participation. Finally, the disability comparison group consisted of people who never indicated that they could not work due to a disability.

[1]Data from the final wave (collected in 2012) was only available as a beta version and did not include data about employment status. Thus, selection of group who experienced unemployment (and the related comparison group) excluded this final wave of data.

[2]It is worth noting that the method for selecting our disability sample in this study differs from the method used in past research by Lucas (2007b) in the GSOEP and BHPS. In these past studies, analyses were restricted to people who not only stayed disabled for the rest of the time they participated in the study, but also who stayed in the study for at least three years after onset of disability.

To make the groups more comparable, we used propensity score matching techniques to identify comparison groups that were similar on important demographic characteristics at the start of the study (Gelman & Hill, 2009). First, we predicted whether each person experienced an event (using a variable coded as 1 in the event group and 0 in the comparison group) from gender (effect coded), centered age, centered age squared, education (effect coded), and household income (transformed using natural log function and centered). This gives each individual a propensity score that reflects the probability that a person with some set of particular demographic characteristics will experience an event while in the study. At the next step, event and comparison groups are matched so that they have similar average propensity scores. This ensures that the groups are on average similar on demographic variables used to compute propensity scores. Matching was done using the matching function of the arm package (Gelman et al., 2011) of the R Statistical Software (R Development Core Team, 2010). The demographic characteristics of the matched event and comparison groups are presented in Table 2.

Outcome Variable

Life satisfaction was measured using a single question that asked participants to rate how satisfied they were with their life in general on a Likert scale from 0 (*not at all satisfied*) to 10 (*completely satisfied*). This variable was assessed from 2000 (wave 2) onwards. Thus, our analyses included data from 13 waves of data collection, (2000–2012).

Analytic Approach

Traditional approach to testing the set-point theory is to compare happiness levels after a major life event to happiness levels before the event (e.g., Lucas, 2007b). Models that reflect this approach can inform us about whether the experience of life events is associated with lasting changes in happiness. For example, we could examine whether people are happier after marriage than they were before marriage. Similar happiness levels before and after an event would suggest that people's happiness is not permanently affected by a life event, and that they eventually return to their set-point happiness levels. The main disadvantage of this approach is that it does not take into account normative changes in happiness that may occur even in the absence of an event. For example, a decline in life satisfaction following an event may reflect incomplete adaptation to the event, but it could also reflect age-related declines that have been observed to occur during adulthood (Deaton, 2008). Although the traditional models can help us understand life satisfaction trajectories before and after major life events, they confound change due to the events with change due to other developmental processes.

In this paper we examine life satisfaction trajectories prior to and following five major life events using traditional approaches to testing set-point theory, and test whether life events are associated with lasting changes in well-being. In addition, we use a novel approach to testing set-point theory in which we account for normative, age-related changes in well-being over time. This latter set of analyses can inform us about the extent to which post-event life satisfaction is different from what it would have been if the event did not take place. We proceed by first discussing the structure of the model used in traditional approaches to testing set-point theory. Then we discuss our modifications to this model that

allow us to account for normative changes in well-being. We estimated all models using the lme4 package (Bates & Maechler, 2010) of the R Statistical Software (R Development Core Team, 2010).

Traditional nonlinear model—Previous research has suggested that life satisfaction follows a non-linear trajectory in the years surrounding a major life event (Yap et al., 2012). Namely, life satisfaction tends to hover around a fairly stable level some years before the event, but starts to change at some point before the event as people anticipate the upcoming event. It reaches its highest (or lowest) point in the year of the event, and then changes again after until it reaches a new stable level. Ideally, this pattern can be captured by truly non-linear models that estimate a baseline level of life satisfaction before the event followed by a gradual change that leads to an apex in the year of the event, and then a gradual change to a new stable asymptote level.

Nonlinear models divide the time course into two time periods – before and after the life event – and estimate five parameters at the within-person level. In the left panel of Figure 1 we provide an example of trajectory that would be captured by the nonlinear model, with a visual depiction of within-person parameters. The most important parameters are baseline asymptote, peak change, and asymptote change. The baseline asymptote reflects the average pre-event life satisfaction before it begins to change in response to the event. The peak change estimate reflects the average life satisfaction change from baseline in the year of the event. The asymptote change parameter reflects the average life satisfaction change from pre-event baseline to the new stable level of life satisfaction after the event. The peak change and asymptote change parameters can be interpreted as difference scores (relative to baseline).

Nonlinear models estimate two additional parameters: pre-event rate of change and post-event rate of change. These parameters model the nonlinear change in life satisfaction that occurs from the stable level of life satisfaction prior to the event to life satisfaction in the year of the event, and the nonlinear change that occurs from the year of the event to when life satisfaction reaches the new stable level in the years that follow (see Yap et al., 2012 for more details). Although these parameters are important for modeling change in life satisfaction over time, they are less important for tests of the set-point theory.

At the between-person level we allowed for random variation in the baseline asymptote, peak change, and asymptote change parameters. Thus, our model assumes that there are individual differences in how happy people are before the event as well as the degree to which their happiness changes in the year of the event and the years that follow. The equation and the R script for estimating this model is detailed in Appendix A.

Modeling normative changes—One limitation of the traditional approach to testing the set-point theory is that it does not take into account normative changes in happiness that may occur with age. That is, the observed change in life satisfaction in the years surrounding a life event may be accounted for by normative, age related changes, and similar change would have been observed even if individuals did not experience the event. Thus, the main purpose of our second set of analyses was to test whether experiencing a life event is

associated with changes in happiness above and beyond normative changes over time. In order to examine the question of whether people are more or less happy after an experience of a life event than they would be if they did not experience that event, we need to separate changes in happiness due to the event from normative changes in happiness that would have occurred even in the absence of the event. Thus, in the next set of analyses, we include a group of people who did not experience the life event in order to help separate normative changes that occur in both groups from event-related changes that occur only in the event groups.

For this goal, we estimated nonlinear models once more, this time including both people who experienced a life event and a matched comparison group for that event. Visual examples of the nonlinear model that includes comparison groups and normative changes can be seen in the right panel of Figure 1. For both event and comparison groups we modeled a linear trajectory for life satisfaction to allow for any time-related changes that are not due to the experience of the event.[3] This was modeled as yearly change, and was estimated using the number of years that the participant had been in the study as the time variable. All models also included a group effect that reflects any pre-existing differences between the people who went on to experience the event and those who did not experience the event. Such group differences may indicate selection effects (e.g., happier people are more likely to marry), or expectation effects of the event on happiness (e.g., people in committed relationships that eventually lead to marriage are happier). The group variable was coded as 0 for the event group and 1 for the comparison group.

In addition, for the event group we also estimated average changes in life satisfaction from this overall trajectory. Specifically, we estimated five additional parameters which roughly correspond to the parameters in the basic nonlinear models described above. One major difference is that instead of the baseline asymptote the model now estimated what we refer to as the first year parameter. This parameter is somewhat more complicated to interpret, and it reflects the predicted life satisfaction for the event group in the first year of study if the event had not yet started to have an effect on well-being. Thus, if the baseline asymptote falls within the timeframe of the study, then the first year estimate simply reflects the predicted mean life satisfaction in the first year of study. If, however, the baseline asymptote is extrapolated beyond the available data, then the first year estimate is the predicted average life satisfaction of the event group if they did not go on to experience the event, but experienced the same normative changes in happiness and had same pre-existing differences from the comparison group (i.e., the y-intercept of the lighter line in the right panel of Figure 1). The other important difference between the models that included normative changes and those that did not is that the peak change and asymptote change parameters in the models with normative trends are now estimated relative to how happy the event group would be if they did not experience the event (taking into account normative changes in life satisfaction and pre-existing group differences between event and comparison groups). Like the basic nonlinear models, these models also estimate pre- and post-event rates of change, which are necessary to properly model change over time but their interpretation is less important for

[3]Although age often has curvilinear effects, the life events we examined in this paper often occur within a constrained age range. In this case, for the simplicity of the models and their interpretation, a linear trend is a useful simplification.

the purposes of this paper. The model also included random terms for the first year, peak change, and asymptote change parameters, in order to allow for individual difference in pre-event life satisfaction and any changes in life satisfaction that are associated with the experience of the event. The equation and the R script for estimating nonlinear models with normative changes are outlined in Appendix B.

Results

In our presentation of results, we first describe the results of the traditional nonlinear models. These results are presented in Table 3 and pictured in the upper panel of Figure 2. These analyses can answer questions about whether each life event is associated with lasting change in people's current levels of happiness, and provide a basic replication of previous research on life events that used similar methodology. We then describe the results of the modified models that include comparison groups and take into account normative changes in life satisfaction over time. These results are presented in Table 4 and in the lower panel of Figure 2. This set of analyses can inform us whether people who experience a life event are any more or less happy in the long run than they would have been if they had not experienced the event.

To provide a common metric for interpretation of results, we computed the between-person standard deviation in the entire sample of individuals who provided life satisfaction data (N = 15,106). To do so we estimated an intercept-only multilevel model to obtain an estimate of mean life satisfaction and within and between standard deviations in life satisfaction in the overall sample. Results indicated that the mean life satisfaction was 8.04, the within-person standard deviation was 1.02, and the between-person standard deviation was 1.06. In presentation of our results we use the overall between-person standard deviation as a metric for evaluating effect sizes. For example, if an average boost in life satisfaction following an event is 1.06 points, we would interpret it as a boost of 1.0 standard deviation.

Marriage

Previous studies have found that people receive a brief boost in life satisfaction around the time they get married, but that this boost is not long lasting and people return to their pre-marriage levels in the years afterwards (Lucas et al., 2003; Yap et al., 2012). Our analyses replicated the short-term boost in well-being. Average life satisfaction at baseline was 8.08 and it increased by 0.29 points (a change of 0.27 standard deviations from baseline) over the years leading up to marriage. However, the model predicted that long-term levels of life satisfaction after marriage would be 0.55 points (0.52 standard deviations) lower than pre-marriage levels. Although Figure 2 suggests that this model describes the available data well within the timeframe of the study, this result should be interpreted with caution because the figure also suggests that within the timeframe of the study post-marriage levels of life satisfaction are not dramatically different than pre-marriage levels.

The problem with the estimate is that the model extrapolates based on the rate of change (and the change in rate of change) in life satisfaction around the time of marriage. If the rate of change after marriage is quite slow, then the asymptote may be estimated to occur many years later—even many more years than people are actually in the study. Indeed, the

predicted post-event asymptote level of 7.53 (8.10 – 0.55) would be reached only after 53 years of marriage. Nonetheless, the model correctly predicts life satisfaction for the available data. For example, the model predicts life satisfaction at 3.6 years after the marriage year (the average time that participants are in the study following marriage) to be 8.07, and 11 years after the marriage year (the maximum post-marriage interval for which we have data) to be 7.83. Neither of these two estimates are very far from the baseline asymptote estimate of 8.08. Thus, the model suggests that people's life satisfaction levels after marriage are not much different from their pre-marriage baselines.

To explore this issue further, we conducted a follow-up test that was based on a simpler model that compares pre-marriage and post-marriage levels. In order to get more accurate estimates of actual baseline and long-term life satisfaction, we omitted the year before marriage, the year of marriage, and the following year from the estimates of these two parameters. This strategy has been used in the past to remove any short-term changes in life satisfaction that occur around the time of the event from long-term estimates prior and after the event (e.g., Lucas et al., 2003). This model estimates average life satisfaction at baseline (the intercept), during the reaction period (the three years surrounding the year of marriage), and during the adaptation period (all subsequent years of marriage). Thus, the model specifies that life satisfaction at the within-person level is a function of the intercept, change during the reaction period (represented as a dummy variable coded 1 in the year before, year of, and year after marriage, and 0 otherwise), and change during the adaptation period (represented as a dummy variable coded as 1 in all years that were at least two years post-event, and 0 otherwise). We used linear multilevel regression to estimate this model and specified a random component to all three of these parameters at the between-person level. The estimates were as follows: baseline = 8.12 (SE = 0.04, $p < .05$), reaction = 0.20 (SE = 0.04, $p < .05$), adaptation = −0.01 (SE = 0.05, *ns*). This suggests that post-marriage levels are indeed not different from pre-marriage levels. This case illustrates that asymptotes that are estimated to occur outside of the range of observed years of participation must be interpreted cautiously.

Thus, our results suggest that people experience a brief boost in happiness as they get married, but they do not seem to be any happier after marriage than they were while they were single. However, it is still possible that marriage has a lasting positive effect on well-being. This would be the case if people's life satisfaction would have decreased over time (e.g., due to normative, age-related changes) if they did not get married. By including a comparison group of people who did not get married in the analyses, we can separate changes in life satisfaction that are due to marriage from any age-related changes. The results of these analyses are presented in Table 4.

These results suggest that the average life satisfaction of individuals who eventually married was 8.05 in their first year of participation in the study. The nonsignificant group estimate suggests that the people who remained single for the duration of the study did not report significantly different starting life satisfaction levels than those who went on to get married. The yearly change estimate shows a declining trend in life satisfaction over time (0.04 points per year) that is common to both groups. After accounting for these normative changes in life satisfaction, we observed a short-term boost (the peak change estimate) that indicated

that people who got married reported life satisfaction levels of 0.52 points (0.49 standard deviations) higher in the year of marriage than where they would have been at if they remained single but continued to experience same normative changes as before marriage (i.e., the same changes that the people in the comparison group continued to experience). The model furthermore suggests that this boost in life satisfaction around the time of marriage is temporary, as the nonsignificant asymptote change parameter implies that married people are no happier in the long run than they would be if they had remained single. However, as Figure 2 shows, people do appear to be happier in marriage than they would have been if they had not married, which is evidenced by the gap between the solid black and gray lines during the post-event period. Indeed, the although the model estimate for asymptote change is not statistically significant, it is estimated that people report life satisfaction 0.25 points (0.24 standard deviations) higher in marriage than what they would have reported had they remained single but continued to experience normative changes in well-being over time. This difference is not trivial; rather, the nonlinear model may be difficult to estimate because the rate of change in life satisfaction following marriage is relatively slow and separating it from normative change may pose problems. Indeed, a simplified reaction-adaptation model that includes comparison group provides a similar estimate of difference between people's actual post-marriage life satisfaction levels and their predicted levels if they had remained single (0.26 points), yet this difference is significant when the simpler model is used ($SE = 0.06$, $p < .05$). Together, the results of these models suggest that although people are not happier after marriage, they appear to be somewhat happier than they would have been if they had remained single because people in general tend to experience small age-related declines in well-being over time. These findings highlight the importance of accounting for normative changes in life satisfaction when examining the impact of life events on well-being.

Childbirth

Previous research by Dyrdal and Lucas (2010) and Yap et al. (2012) showed that people reported increases in well-being around the time of birth of their first child, but that they returned to their baseline levels in the years that followed. We replicated the short-term boost that accompanies childbirth. Our results indicated that average life satisfaction of future parents is 8.02 before the birth of their first child. Life satisfaction increases in the years prior to childbirth and is 0.36 points (0.34 standard deviations) higher in the year of childbirth than at baseline. In the years that follow life satisfaction declines. However, in contrast with previous findings, our results suggest that long-term life satisfaction of parents is 0.20 points (0.19 standard deviations) lower than what it was at baseline. Importantly, the post-event asymptote was predicted to occur within a reasonable time-frame (11 years), which means that these results are quite plausible. In addition, as Figure 2 shows, the estimated asymptote matches well with actual mean levels in the years after the event.

The above analysis suggests that well-being declines in the long run after the birth of a child. However, it is possible that this decline reflects normative decline in well-being that that occurs around the time that most people have their first child, but that is unrelated to childbirth. We tested this idea with models that included a comparison group of people who were similar to those who became parents, but who remained childless over the course of the

study. The results of this model are shown in Table 4. There were no group differences in happiness – people who went on to have a child were no more or less happy than those who did not. We observed a linear decline in life satisfaction of 0.02 points per year that was common to both parents and nonparents. The results indicated that parents reported their life satisfaction to be 0.44 points (0.42 standard deviations) higher in the year in which their first child was born then what the model estimated their life satisfaction would be at that time if they had remained childless but continued to experience normative changes in well-being. Importantly, their long-term life satisfaction was not significantly different than what it would be if they had remained childless. Thus, the decline in well-being following childbirth that we observed in our initial analysis that simply compared pre- and post-childbirth levels seems to reflect normative declines in well-being rather than declines due to childbirth. Taken together, it appears that although parents are less happy after the birth of their first child than in the years prior, they are not any less happy than they would be if they had remained childless.

Widowhood

Research on widowhood has repeatedly demonstrated that this event is associated with long-lasting negative effects on well-being (Anusic & Lucas, in press; Lucas et al., 2003; Yap et al., 2012). Our results replicated this robust finding. People's life satisfaction dropped by 1.35 points (a decrease of 1.27 standard deviations) in the year of their spouse's death. Furthermore, although people adapted somewhat to widowhood, their levels remained significantly lower than their pre-widowhood levels (a difference of 0.60 points or 0.57 standard deviations). Thus, widowhood seems to be associated with lasting changes in life satisfaction over time, relative to pre-loss life satisfaction levels.

The main limitation of the above models is that the observed drop in life satisfaction may reflect a true effect of widowhood on life satisfaction or it may reflect normative declines that occur in very late in life (e.g., Baird et al., 2010). The inclusion of the comparison group of non-widowed individuals of similar demographic background is useful to separate these different sources of change. As Table 4 shows, the group effect were not statistically significant in the analyses of widowhood, although it was substantially larger than the group effect from marriage and childbirth analyses. Yearly change parameter, which reflects normative changes in well-being was once again significant, with a drop of 0.03 points per year. According to this model, individuals who lost their spouse reported a drop of 1.16 points (1.10 standard deviations) from their predicted life satisfaction trajectory (if their spouse had still been alive) in the years surrounding the loss. After controlling for normative changes in life satisfaction, their post-widowhood levels were not significantly different from where they would have been if they did not experience widowhood. Thus, in contrast to the results from the BHPS (Yap et al. 2012), this study suggests that declines in well-being that follow widowhood reflect, for the most part, aging effects rather than true effects of spousal loss. However, we should also note that the sample of widowed individuals used in the analyses with comparison groups was relatively small ($N = 157$), and thus we had relatively low power to detect this effect (a drop of 0.18 points or 0.17 standard deviations). It is possible that at least some of the decline is due to loss of spouse in addition to normative decline.

Unemployment

Unemployment has previously been associated with short- and long-term within-person declines in well-being (Lucas et al., 2004; Yap et al., 2012). Our results are consistent with these findings. People's life satisfaction dropped by 0.56 points (change of .53 standard deviations) during the unemployment bout, and remained 0.36 points (0.34 standard deviations) lower than the pre-unemployment levels, even after the unemployment bout was over. Thus, people report lower well-being many years after the unemployment bout is over than before they were unemployed.

To separate effects of unemployment on life satisfaction from the normative declines that may occur over time, we look to the model that estimates normative changes using the comparison group of individuals who did not report being unemployed during the study. First, we should note that this model estimated a significant group difference: people who went on to become unemployed reported lower well-being at the start of the study than those who did not experience an unemployment bout during the course of the study. Yearly change estimate was also significant in this model, with an estimated drop of 0.04 points in life satisfaction for year. According to this model, people who experienced an unemployment bout reported life satisfaction that was lower during the period of unemployment than where it would have been if they had stayed employed (a difference of 0.40 points, or 0.38 standard deviations). In contrast, the difference between long-term levels of life satisfaction post-unemployment bout was not significantly different than the estimated long-term levels had the unemployment bout not occurred. Moreover, the estimate of this difference was relatively small (0.03 points, or 0.03 standard deviations). Thus, our results suggest that the drop in life satisfaction from pre- to post-unemployment observed in the traditional models can be largely attributed to normative changes rather than the experience of unemployment itself.

Disability

Associations of disability and life satisfaction have previously been examined in the GSOEP and the BHPS by Lucas (2007b) who found that disability was associated with long-lasting lower well-being levels. We replicated this finding in the SHP. People's well-being levels dropped by 0.86 points (0.82 standard deviations) in the year they first reported not being able to work due to disability. Their life satisfaction levels remained lower than their baseline levels in the years that followed by 0.38 points (0.36 standard deviations). These results suggest that disability is associated with long-lasting within-person declines in well-being.

The next model can estimate whether the observed declines in life satisfaction in people who experienced a disability persist after accounting for the normative age-related changes. The results suggested suggest that this is indeed the case. People reported life satisfaction in the year of onset of disability that was 0.75 points (0.70 standard deviations) lower than it would have been had they not experienced the disability. Furthermore, their new stable level of life satisfaction was on average 0.39 points (0.36 standard deviations) lower than baseline after accounting for normative declines in well-being. These results suggest that disability is associated with declines in well-being over and above age-related declines in life

satisfaction over time. People who experience a lasting disability report lower satisfaction even many years after the onset, compared to where they would have been if they did not experience a disability. In addition, our results suggest that people who did not report a disability during the course of the study were substantially happier to begin with than people who eventually became disabled (a difference of 0.47 points). Thus, disability seems to be associated with lower well-being long before it becomes severe enough to prevent people from being able to work.

Discussion

The findings of this study offer compelling evidence that some major life events are associated with substantial changes in one's levels of life satisfaction and that, in some instances, these changes persist in the years following the event. This is also one of the first studies to separate normative changes in well-being over time from other changes that are perhaps more directly associated with the experience of event itself. For some events, distinguishing between these different influences on well-being over time makes a difference in how we interpret the findings in the context of set-point theory. For example, simply looking at life satisfaction before and after marriage suggests that, consistent with the set-point theory, people return to their baseline levels shortly after getting married. This finding is robust and has been replicated in studies that have looked at the BHPS and GSOEP. However, in the absence of marriage, well-being steadily declines, and the fact that we observe post-marriage life satisfaction levels that are about the same as the pre-marriage levels suggests that marriage may protect from these declines in well-being. Thus, in contrast to predictions of the set-point theory, our results suggest that marriage is associated with lasting departures from normative well-being trajectories that would have occurred if people remained single.

The importance of accounting for normative changes in well-being can be discerned from our work with other life events as well. For example, declines in well-being that follow childbirth and unemployment can also be accounted for by normative changes over the lifespan. On the other hand, we found that disability is uniquely associated with drops in well-being, over and above declines that would have otherwise occurred. These findings are generally consistent with the work that has been done with the BHPS and GSOEP (Dyrdal & Lucas, 2013; Lucas, 2007a; Yap et al., 2012).

Limitations and Future Directions

One potential limitation of this study involves the use of a single item measure of life satisfaction, which is typically used in large-scale panel studies such as the SHP. The criticisms of single item measures generally concern breadth and reliability. One concern is that single-item measures are simply too narrow to capture the relevant aspects of a particular construct. However, life satisfaction is a relatively narrow construct that reflects a person's evaluation of her or his own life, which can be captured in a single item. In fact, established multi-item measures generally tend to use simple rewordings of the same general idea that is conveyed by the single item (e.g., Satisfaction With Life Scale (SWLS), Diener et al., 1985). Moreover, the single-item measures tend to correlate strongly with measures

that use multiple items, such as the SWLS (r = .75; Kobau, Sniezek, Zack, Lucas, & Burns, 2010). Regarding concerns about reliability, past research that have used longitudinal methods to estimate reliability of the single-item life satisfaction measure have found it to be at par with other measures used in psychology (reliability = .73, Lucas & Donnellan, 2011). Overall, the advantages of large longitudinal studies that can capture human development in the real-world context outweigh any concerns about the use of single-item life satisfaction measures.

As with most longitudinal studies, selective attrition may limit the conclusions we draw from our data. It is possible that there are important differences between the individuals who participate in this study for long periods of time and those who discontinue participation early on. Although the findings of the present study cannot be accounted for by attrition since these results reflect within-person effects, it is possible that these within-person effects would not be observed in the individuals who dropped out of the study.

Further, this study relies on secondary data analysis. A limitation to the use of preexisting datasets like the SHP to examine these and other research questions is the lack of control one has over design of the study, timing of assessments, item content, and availability of study variables. Indeed, these limitations may decrease the precision of measurement in a study. Despite the relevance of other potential information to our research questions, we are also not able to examine many potential moderators our findings if the information is not available in the dataset. This trade-off is inherent in any study employing secondary data analysis, but any costs associated with this trade off are vastly outweighed by the benefits of using such a large longitudinal dataset. It is likely that it would not be possible to examine these relatively rare life events in large numbers of people without using panel studies such as the SHP or incurring a huge burden on time and financial resources.

A final potential limitation of this study involves our method for selecting matched comparison groups for each analysis. We matched comparison and event groups along major demographic characteristics that were available to us and that generally tend to be used in such analyses: age, gender, education, and household income. It remains possible that there are other demographic, personality, or attitudinal variables that were not included in these analyses to select our comparison group, and these variables may account for important differences between comparison and event groups. However, our approach provides valuable information about how life events affect normative life satisfaction trajectories that was virtually nonexistent in previous literature on set-point theories.

Studies of the impact of life events on well-being have consistently shown that there is considerable variability in the degree to which individuals react and adapt to major changes in their lives. Thus, identifying factors that account for the variability in the degree to which individuals react and adapt to life events remains an important area for future research to consider. Past research has examined personality traits as a potential moderator of adaptation to life events, but the results have been mixed. Some past studies have found evidence for personality moderators of adaptation to life events (e.g., Boyce & Wood, 2011; Boyce, Wood, & Brown, 2010), but these studies typically have looked at this question on an event-by-event and trait-by-trait basis. More comprehensive studies that examine multiple life

events and multiple traits simultaneously in a single study are advantageous because they allow one to examine whether there are consistent trends in the moderating effects of personality across multiple positive and negative life events. We recently conducted such a study with the BHPS (Yap et al., 2012) and found no evidence that personality is consistently associated with differences in how individuals react and adapt to positive and negative life events. Although the latest waves of the SHP have included measures of Big Five personality traits (Agreeableness, Conscientiousness, Extraversion, Neuroticism, Openness to Experience), more waves of data following the measurement of personality are needed in order to have large enough samples to examine the moderating effects of personality in the SHP. Thus, it would be beneficial for future research to examine the moderating role of personality on reaction and adaptation to life events in the SHP as more waves of data become available.

Future research should also further examine patterns of change in life satisfaction with experience of multiple or repeated life events. In our sample, 17% of participants experienced multiple live events and even less experienced the same event repeatedly (e.g., 12% of the unemployed sample experienced more than one period of unemployment). Previous research has suggested that the extent of reaction and adaptation may change with repeated experience of an important life event (Luhmann & Eid, 2009). This research should be extended to examine how these patterns hold up after accounting for normative changes in life satisfaction that would have occurred in the absence of these events.

Finally, we suggest that future research should also evaluate the impact of a larger variety of life events on SWB. Developing a wider catalog of events that people do and do not adapt is necessary before hypotheses can be tested about the characteristics that distinguish events that are associated with lasting change from events to which people generally adapt. Past research has offered some theories about what these characteristics may be. For example, Frederick and Loewenstein (1999) have suggested the degree to which an event reflects changing or worsening condition over time affects the ability of people to adapt to events. In particular, they suggest that events that reflect a one time chronic change (e.g., death of a family member, loss of a limb) are easier to adapt to than events that involve changing conditions over time (e.g., unemployment and financial hardship). With more information about the events people do and do not adapt to, researchers would be better able to evaluate theories like these, which would lead to a better understanding of what predicts adaptation to major life events.

This body of research has clear implications for public policy concerned with improving societal quality of life. For instance, knowledge about the particular events and life transitions that are associated with the most detriment to well-being (and transitions that are not associated with lasting changes in well-being) may allow policy makers to allocate resources and efforts to where they are most needed and design targeted public policies protecting against well-being declines specific to the most serious events. Further research aimed at understanding the specific processes that underlie changes in well-being following life events will also have great importance in developing policy, as knowledge about these processes will inform policy makers about the specific factors that produce declines in well-being. In turn, public policies can be designed to target the processes that are particularly

detrimental to well-being. For instance, in order to design effective policies to protect against declines in well-being associated with disability, one must know the processes that drive these declines. For example, if these declines stem from a loss of income due to inability to work, then public policy should likely focus on financial support for these people in order to maximally protect their well-being. However, if research found that the driving force behind these declines were a perceived lack of agency or inability to do the activities one would like to do, then public policy concerned with protecting these people's well-being may derive the greatest benefit from emphasizing accessibility, and increasing accessibility across wider aspects of everyday life.

Conclusion

This paper examines how the experience of various positive and negative life events affect subsequent life satisfaction in a large national sample of individuals living in Switzerland. Overall, this study largely replicates past findings from studies using the GSOEP and BHPS and suggests that individuals react positively to marriage and childbirth and negatively to widowhood, unemployment and disability. We provide further evidence that life events are associated with substantial changes in life satisfaction, in some cases these changes can be relatively long lasting, and these effects are robust across various national datasets.

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Appendix A. Nonlinear Model Equation and R Script for the Traditional Nonlinear Model

The equation for the basic nonlinear model is a piecewise function specified as:

$$\text{Life Satisfaction} = \begin{cases} \text{BA} + \text{PC} * (1/(1-\text{R}_{\text{before}}))^{\text{yearEvent}} & \text{if yearEvent} < 0 \\ (\text{BA}+\text{AC}) + (\text{PC}-\text{AC}) * (1-\text{R}_{\text{after}})^{\text{yearEvent}} & \text{if yearEvent} >= 0 \end{cases}$$

Where *BA* = baseline asymptote, *PC* = peak change, *AC* = asymptote change, R_{before} = pre-event rate of change, R_{after} = post-event rate of change, *yearEvent* = 0 in the year that the event occurred, and otherwise reflects the number of years from the event year (i.e., −2, −1, 0, 1, 2).

The R script to estimate the nonlinear model is:

```
# required library for nlmer
library(lme4)
# equation
iLifeEventsNL <- function(yearEvent, bef, aft, BA, Rbefore, PC, AC, Rafter) {
# yearEvent is a sequence variable – it is 0 in the year of the event, and
otherwise reflects the
number of year from the event (i.e., −2, −1, 0, 1, 2)
# bef is a dummy variable coded as 1 if yearEvent < 0, and 0 if yearEvent >=
0
# aft is a dummy variable coded as 0 if yearEvent < 0, and 1 if yearEvent >=
0
# BA is the baseline asymptote (before the event)
# Rbefore is the pre-event rate of change
# PC is the peak change (from pre-event baseline) in the year of the event
# AC is the asymptote difference (difference between post-event asymptote
and baseline
asymptote)
# Rafter is the post-event rate of change
bef * (BA + (PC)*(1/(1-Rbefore))^yearEvent) +
aft * ((BA+AC) + (PC-AC)*(1-Rafter)^yearEvent)
}
# gradient
```

```
iLifeEventsNLG <- deriv(body(iLifeEventsNL)[[2]], namevec=c("BA", "Rbefore",
"PC", "AC",
"Rafter"), function.arg=iLifeEventsNL)
# starting values
mSvals <- c(BA=8.079, Rbefore=.380, PC=.288, AC=-.550, Rafter=-.089) #
marriage
cSvals <- c(BA=8.022, Rbefore=.225, PC=.361, AC=-.204, Rafter=.358) #
childbirth
wSvals <- c(BA=8.192, Rbefore=.537, PC=-1.351, AC=-.603, Rafter=.781) #
widowhood
unSvals <- c(BA=7.947, Rbefore=.534, PC=-0.562, AC=-.364, Rafter=.733) #
unemployment
disSvals <- c(BA=7.818, Rbefore=.425, PC=-.864, AC=-.382, Rafter=.135) #
disability
# regression
marNL <- nlmer( ls ~ iLifeEventsNLG(mSeq, mBef, mAft, BA, Rbefore, PC, AC,
Rafter) ~ (BA
+ PC + AC | pid), data=marData, start=mSvals, verbose=T) # marriage
childNL <- nlmer( ls ~ iLifeEventsNLG(cSeq, cBef, cAft, BA, Rbefore, PC, AC,
Rafter) ~ (BA +
PC + AC | pid), data=childData, start=cSvals, verbose=T) # childbirth
widNL <- nlmer( ls ~ iLifeEventsNLG(wSeq, wBef, wAft, BA, Rbefore, PC, AC,
Rafter) ~ (BA
+ PC + AC | pid), data=widData, start=wSvals, verbose=T) # widowhood
unempNL <- nlmer( ls ~ iLifeEventsNLG(unSeq, unBef, unAft, BA, Rbefore, PC,
AC, Rafter) ~
(BA + PC + AC | pid), data=unempData, start=unSvals, verbose=T) #
unemployment
disNL <- nlmer( ls ~ iLifeEventsNLG(disSeq, disBef, disAft, BA, Rbefore, PC,
AC, Rafter) ~
(BA + PC + AC | pid), data=disData, start=disSvals, verbose=T) # disability
# ls = life satisfaction
# pid = personality identification number, unique to each participant
```

Appendix B. Nonlinear Model Equation and R Script for the Nonlinear Model with Normative Trends

The equation for the nonlinear model that includes the comparison group and models normative trends in life satisfaction is a piecewise function specified as:

$$\text{Life Satisfaction} = \left\{ \begin{array}{l} \text{yearStudy} * \text{YC} + \text{FY} + \text{PC} * (1/(1 - \text{R}_{\text{before}}))^{\text{yearEvent}} \text{ if yearEvent} < 0 \\ \text{yearStudy} * \text{YC} + (\text{FY} + \text{AC}) + (\text{PC} + \text{AC}) * (1 - \text{R}_{\text{after}})^{\text{yearEvent}} \text{ if yearEvent} >= 0 \end{array} \right\} \text{for event group}$$

$$\text{yearStudy} * \text{YC} + \text{FY} + \text{G} \} \text{ for comparison group}$$

Where *YC* = yearly change, *FY* = first year, *PC* = peak change, *AC* = asymptote change, R_{before} = pre-event rate of change, R_{after} = post-event rate of change, *yearStudy* = number of years in the study, with the first year in the study coded as 0, *yearEvent* = 0 in the year that the event occurred, and otherwise reflects the number of years from the event year (i.e., −2, −1, 0, 1, 2).

The R script to estimate the nonlinear model is:

```
# required library for nlmer
library(lme4)
# equation
iLifeEventsNLc <- function(yearEvent, yearStudy, bef, aft, event,
comparison, YC, FY, Rbefore,
PC, AC, Rafter, G) {
# yearEvent is a sequence variable – it is 0 in the year of the event, and
otherwise reflects the
number of year from the event (i.e., −2, −1, 0, 1, 2)
# yearStudy indicates number of years in the study, coded as 0 in the first
year of participation
# bef is a dummy variable coded as 1 if yearEvent < 0, and 0 if yearEvent >=
0
# aft is a dummy variable coded as 0 if yearEvent < 0, and 1 if yearEvent >=
0
# event is a dummy variable coded as 1 in the event groups, and 0 in the
comparison groups
# comparison is a dummy variable coded as 1 in the comparison groups, and 1
in the event
groups
# YC is the normative yearly change in life satisfaction common to both
groups
# FY is the average life satisfaction in the first year of participation for
the event group
# Rbefore is the pre-event rate of change
# PC is the peak change (from predicted life satisfaction if the event had
not occurred) in the
year of the event, in the event group
# AC is the asymptote difference (difference between post-event asymptote
and predicted life
satisfaction level if the event had not occurred) in the event group
# Rafter is the post-event rate of change
# G is a dummy variable for group, coded as 0 in the event groups, 1 in the
comparison groups
yearStudy * YC +
event *
```

```
(bef * (FY + (PC)*(1/(1-Rbefore))^yearEvent) +
aft * ((FY +AC) + (PC-AC)*(1-Rafter)^yearEvent)) +
comparison *
(FY + G)
}
# gradient
iLifeEventsNLcG <- deriv(body(iLifeEventsNLc)[[2]], namevec=c("YC", "FY",
"Rbefore",
"PC", "AC", "Rafter", "G"), function.arg=iLifeEventsNLc)
# starting values
mcSvals <- c(YC=-.041, FY=8.050, Rbefore=.319, PC=.519, AC=.250, Rafter=.
162, G=.050) #
marriage
ccSvals <- c(YC=-.019, FY=8.003, Rbefore=.260, PC=0.440, AC=-.025, Rafter=.
371, G=-.015)
# childbirth
wcSvals <- c(YC=-.034, FY=8.102, Rbefore=.665, PC=-1.163, AC=-.177, Rafter=.
713, G=.270)
# widowhood
uncSvals <- c(YC=-.040, FY=7.925, Rbefore=.545, PC=-0.398, AC=-0.031,
Rafter=.733,
G=.302) # unemployment
discSvals <- c(YC=-.020, FY=7.766, Rbefore=.445, PC=-0.745, AC=-0.385,
Rafter=.303,
G=.470) # disability
# regression
mcNL <- nlmer( ls ~ iLifeEventsNLcG(mSeq, lin, mBef, mAft, event,
comparison, YC, FY,
Rbefore, PC, AC, Rafter, G) ~ (FY + PC + AC | pid), data=marMatchedData,
start=mcSvals,
verbose=T) # marriage
ccNL <- nlmer( ls ~ iLifeEventsNLcG(cSeq, lin, cBef, cAft, event,
comparison, YC, FY,
Rbefore, PC, AC, Rafter, G) ~ (FY + PC + AC | pid), data=childMatchedData,
start=ccSvals,
verbose=T) # childbirth
wcNL <- nlmer( ls ~ iLifeEventsNLcG(wSeq, lin, wBef, wAft, event,
comparison, YC, FY,
Rbefore, PC, AC, Rafter, G) ~ (FY + PC + AC | pid), data=widMatchedData,
start=wcSvals,
verbose=T) # widowhood
uncNL <- nlmer( ls ~ iLifeEventsNLcG(unSeq, lin, unBef, unAft, event,
comparison, YC, FY,
Rbefore, PC, AC, Rafter, G) ~ (FY + PC + AC | pid), data=unMatchedData,
```

```
start=uncSvals,
verbose=T) # unemployment
discNL <- nlmer( ls ~ iLifeEventsNLcG(disSeq, lin, disBef, disAft, event,
comparison, YC, FY,
Rbefore, PC, AC, Rafter, G) ~ (FY + PC + AC | pid), data=disMatchedData,
start=discSvals,
verbose=T) # disability
# ls = life satisfaction
# pid = personality identification number, unique to each participant
```

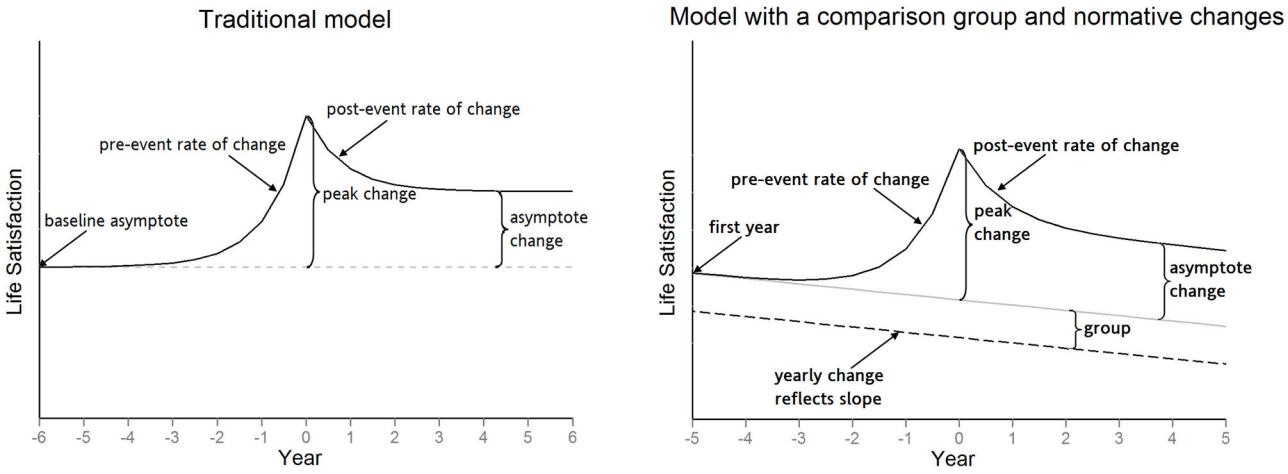

Figure 1.

Examples of the traditional nonlinear model (left panel) and the model that includes a comparison group and models normative changes of life satisfaction over time (right panel). All within-person model parameters are shown. Solid black lines represent predicted life satisfaction trajectories for people who experienced a life event; the dashed black line shows the trajectory of the comparison group. The solid gray line shows what the trajectory of people who experienced an event would be if they had not experienced the event but had the same initial life satisfaction. Year 0 is the year in which the event occurred.

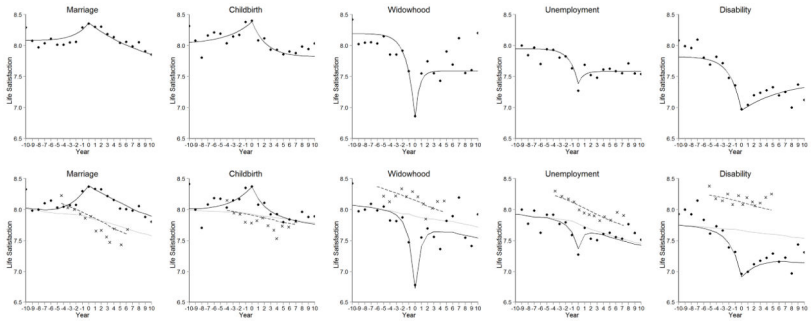

Figure 2.

Top panel: Estimated life satisfaction trajectories from the traditional models, for people who experienced a major life event during the study. Dots show mean life satisfaction in the data. Year 0 is the year of marriage. Bottom panel: Estimated life satisfaction trajectories for the event groups (solid black lines) and the comparison groups (dashed black lines). Gray lines represent what the predicted life satisfaction trajectories would be for people who experienced a life event if they did not experience that event but had same initial level of life satisfaction and experienced normative life satisfaction change over time. Year 0 is the year in which the event occurred. The lines are not straight because year of event varies across people. Dots show mean life satisfaction of the married group in the data. Exes show mean life satisfaction of the comparison group in the data. Comparison group data were plotted by matching each year of participation in the study (in the comparison group) with the average number of years from marriage for that year of participation (in the marriage group).

Table 1

Information about groups who experienced a major life event.

	N	Gender (% women)	Age *M* (*SD*)	Age range	Pre-event waves	Post-event waves
Marriage	556	51%	32.6 (7.0)	20–76	3.9	4.6
Childbirth	559	52%	34.0 (5.8)	19–77	3.5	5.2
Widowhood	195	82%	69.0 (12.2)	33–92	5.3	4.1
Unemployment	516	62%	34.0 (14.4)	15–67	3.4	5.8
Disability	608	65%	60.7 (17.1)	15–91	4.5	4.1

Table 2

Demographic composition of the event and comparison groups: means (and standard deviations) for age (in years) and household income (in Swiss francs), proportions for gender and education.

	Event	Comparison
Marriage		
Gender (% women)	52%	50%
Age	28.0 (7.3)	28.3 (7.5)
Education		
Incomplete compulsory school	4%	3%
Compulsory school, elementary vocational training	9%	8%
Domestic science course, 1 year school of commerce	1%	1%
General training school	1%	0%
Apprenticeship (CFC, EFZ)	35%	36%
Full-time vocational school	4%	4%
Bachelor/maturity	13%	12%
Vocational high school with master certificate, federal certificate	4%	4%
Technical or vocational school	2%	2%
Vocational high school ETS, HTL, etc.	8%	9%
University, academic high school, HEP, PH, HES, FH	20%	20%
Household income	143,412 (184,998)	146,374 (277,970)
N	505	505
Childbirth		
Gender (% women)	52%	50%
Age	29.9 (6.1)	30.3 (6.1)
Education		
Incomplete compulsory school	0%	0%
Compulsory school, elementary vocational training	5%	3%
Domestic science course, 1 year school of commerce	1%	1%
General training school	1%	2%
Apprenticeship (CFC, EFZ)	37%	37%
Full-time vocational school	4%	4%
Bachelor/maturity	14%	14%
Vocational high school with master certificate, federal certificate	6%	6%
Technical or vocational school	2%	1%
Vocational high school ETS, HTL, etc.	8%	9%
University, academic high school, HEP, PH, HES, FH	22%	23%
Household income	135,071 (150,112)	132,298 (96,472)
N	509	509
Widowhood		
Gender (% women)	80%	79%
Age	62.6 (12.8)	62.8 (13.4)
Education		

	Event	Comparison
Incomplete compulsory school	2%	0%
Compulsory school, elementary vocational training	20%	18%
Domestic science course, 1 year school of commerce	8%	10%
General training school	4%	4%
Apprenticeship (CFC, EFZ)	36%	38%
Full-time vocational school	8%	6%
Bachelor/maturity	4%	4%
Vocational high school with master certificate, federal certificate	7%	8%
Technical or vocational school	3%	2%
Vocational high school ETS, HTL, etc.	2%	3%
University, academic high school, HEP, PH, HES, FH	6%	6%
Household income	97,244 (131,980)	99,142 (146,872)
N	157	157
Unemployment		
Gender (% women)	63%	62%
Age	30.1 (14.0)	29.9 (14.2)
Education		
Incomplete compulsory school	22%	24%
Compulsory school, elementary vocational training	19%	19%
Domestic science course, 1 year school of commerce	3%	2%
General training school	1%	1%
Apprenticeship (CFC, EFZ)	24%	25%
Full-time vocational school	4%	4%
Bachelor/maturity	11%	9%
Vocational high school with master certificate, federal certificate	3%	2%
Technical or vocational school	2%	1%
Vocational high school ETS, HTL, etc.	5%	5%
University, academic high school, HEP, PH, HES, FH	7%	8%
Household income	116,323 (59,655)	117,921 (70,519)
N	467	467
Disability		
Gender (% women)	61%	60%
Age	54.7 (16.6)	54.7 (16.3)
Education		
Incomplete compulsory school	3%	4%
Compulsory school, elementary vocational training	25%	25%
Domestic science course, 1 year school of commerce	6%	7%
General training school	1%	0%
Apprenticeship (CFC, EFZ)	35%	34%
Full-time vocational school	6%	7%
Bachelor/maturity	7%	8%
Vocational high school with master certificate, federal certificate	4%	3%

	Event	Comparison
Technical or vocational school	3%	2%
Vocational high school ETS, HTL, etc.	4%	3%
University, academic high school, HEP, PH, HES, FH	6%	6%
Household income	89,324 (54,816)	91,458 (54,361)
N	500	500

Table 3

Estimates (and standard errors) of the traditional models for groups that experienced one of the life events.

	Marriage	Childbirth	Widowhood	Unemployment	Disability
Baseline asymptote	8.08* (0.05)	8.02* (0.08)	8.19* (0.11)	7.95* (0.07)	7.82* (0.09)
Peak change	0.29* (0.06)	0.36* (0.09)	−1.35* (0.17)	−0.56* (0.08)	−0.86* (0.11)
Asymptote change	−0.55* (0.19)	−0.20* (0.10)	−0.60* (0.14)	−0.36* (0.07)	−0.38* (0.19)
Pre-event rate of change	0.38* (0.10)	0.23* (0.06)	0.54* (0.05)	0.53* (0.06)	0.43* (0.03)
Post-event rate of change	0.09* (0.02)	0.36* (0.06)	0.78* (0.10)	0.73* (0.07)	0.14* (0.01)
N (people)	556	559	195	516	608
N (waves)	4,736	4,868	1,832	4,731	5,228

Note:

* $p < .05$

Table 4

Estimates (and standard errors) of the models that included comparison groups of people who did not experience the life event. Group: 0 = event, 1 = comparison.

	Marriage	Childbirth	Widowhood	Unemployment	Disability
First year	8.05* (0.07)	8.00* (0.10)	8.10* (0.12)	7.93* (0.06)	7.77* (0.08)
Peak change	0.52* (0.08)	0.44* (0.11)	−1.16* (0.17)	−0.40* (0.08)	−0.75* (0.11)
Asymptote change	0.25 (0.14)	−0.03 (0.14)	−0.18 (0.17)	−0.03 (0.07)	−0.39* (0.13)
Pre-event rate of change	0.32* (0.07)	0.26* (0.08)	0.67* (0.07)	0.55* (0.06)	0.45* (0.03)
Post-event rate of change	0.13* (0.03)	0.37* (0.08)	0.71* (0.09)	0.73* (0.06)	0.30* (0.03)
Yearly change	−0.04* (0.00)	−0.02* (0.01)	−0.03* (0.01)	−0.04* (0.01)	−0.02* (0.01)
Group	0.05 (0.09)	−0.02 (0.11)	0.27 (0.16)	0.30* (0.08)	0.47* (0.11)
N (people)	1,010	1,018	314	934	1,000
N (waves)	7,091	7,495	2,583	7,320	7,871

Note:

* $p < .05$