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### **Remembering Positive and Negative Life Events: Associations with Future Time Perspective and Functions of Autobiographical Memory**

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#### **Abstract**

We examined distributions of remembered negative and positive life events across the life span in a sample of adults in middle and old age. Distributions of positive, but not negative life events showed a significant reminiscence bump, replicating earlier findings. Gender differences occurred with respect to distribution of memories of positive life events of the first four decades of life. Furthermore, we found substantial associations of number and valence of remembered life events with future time perspective and functions of autobiographical memory to create meaning, remaining significant after controlling for age and health. Therefore, number and valence of negative and positive life events across the life span reflect, to a certain extent, age and time perspective of the remembering individual.

## **Remembering Positive and Negative Life Events: Associations with Future Time Perspective and Functions of Autobiographical Memory**

The aim of the present contribution is to elaborate on the associations between remembering positive and negative life events with future time perspective and autobiographical memory. To begin, we can draw upon three well-replicated phenomena about autobiographical memories across the life span: A significant underrepresentation of memories from the first years of life (*childhood amnesia*), a significant overrepresentation of remembered events from the recent past (*recency effect*), and a significant overrepresentation of memories from young adulthood (*reminiscence bump*). This last phenomenon which will also be focused in the present study occurs for memories originating from the time period between 20 to 30 years of age, and is consistently found for participants who are in their thirties or older (Jansari & Parkin, 1996). Furthermore, Berntsen and Rubin (2002) report a bump in young adulthood in over 30-year-olds for important and happiest memories, but not for saddest or most traumatic memories.

Memories of one's life, thus, are found with differing prevalence as well as differing distributions of positive and negative life events across the life span. Various explanatory models have been offered for these phenomena which focus on the specificities of human information processing on the one hand and on the dynamics of motivational factors underlying these processes on the other hand. Three different explanations have been postulated to account for the reminiscence bump. The *cognitive perspective* suggests that an interaction between event characteristics and information processing occurs based on the proposition that especially new and distinguishable events

occur in an individual's life between the ages of 20 to 30 years (Berntsen & Rubin, 2002). Due to these characteristics, these events should be better stored and memorized afterwards than events that are less salient. A second approach – the *narrative perspective* – focuses on the importance of events occurring during this life period for the construction of one's life story. Given that identity is established during adolescence and young adulthood, life events during these life phases should therefore play a significant role in life review, and remembering these events – regardless of their affective valence – might serve the maintenance of identity and self-consistency (Filipp, 1996). A third explanation considers *life scripts*, that is, normative socially shared expectations about how to organize the life course. Using life scripts could influence the probability of remembering specific events occurring during specific periods of one's life. It is assumed that life scripts primarily account for the prevalence of *positive* life events, for example, getting married, the birth of a child, or getting a job, and this would also help to explain why there is a reminiscence bump with respect to positive but not negative life events (Berntsen & Rubin, 2002; Rubin & Berntsen, 2003). Gender-specific distributions for positive and negative events, respectively, have to our knowledge not been investigated yet. Consequently, our study aimed at exploring the distributions of remembered positive and negative life events over the life span, additionally analyzing the distributions with regard to possible gender differences.

Investigating distributions of remembered positive and negative life events over the life span requires a definition of *life events*. Life events are conceptualized here as significant life changes that influence or demand new adaptation of the individual to reestablish person environment fit (cf. Filipp, 1999; Filipp & Aymanns, 2009). The

notion “life event” involves not only typical “events” characterized to occur like a “stroke of fate”, but also time periods and nonevents (Wheaton, 1999). Life events constitute and organize autobiographical knowledge (cf. Conway & Pleydell-Pearce, 2000) and may thus serve as (temporal) landmarks that organize memory (cf. Shum, 1998) and constitute one’s life story (McAdams, 1996; cf. Habermas & Bluck, 2000).

Several conceptions describe the process of remembering and interpreting one’s life by referring to negative and positive events, among others, life review, life reflection (Staudinger, 2001), reminiscence (Webster, 1993; Wong & Watt, 1991), and autobiographical reasoning (Bluck & Habermas, 2001). Concerning memories of positive and negative events in old age, especially the concepts of “life review” and “autobiographical memory” seem to be useful. The term “*life review*” describes the selection and reconstruction of life events as well as their evaluation and interpretation (Staudinger, 2001) and is closely linked to old age, since there is wide agreement about life review as a developmental task in old age used to construct meaning and sense with respect to one’s life (Erikson, 1973), to make peace with old conflicts, and to find meaning in yet unresolved life events (cf. Butler, 1963). Research focusing on “*autobiographical memory*” traditionally investigates the recall of specific, individual memories of particular events (Bluck & Habermas, 2001) and is generally believed to serve differing functions. These comprise, among others, constituting self and identity, regulating emotions, or gathering advice for everyday problems (Bluck, Alea, Habermas, & Rubin, 2005). Another (motivational) function of autobiographical memory may be, as noted above, the construction of meaning of one’s life and yet unresolved life events (cf. *coherence*, Bluck & Habermas, 2001) and is hence comparable to the assumed functions

of life review. Functions of autobiographical memory are of particular interest in life span studies, since earlier research has shown that these vary with age. Older adults remembered autobiographical events more often to teach or inform as well as to prepare for death, in addition, older adults remembered autobiographical events less often to reduce boredom, solve problems, or to constitute identity than younger adults (Webster & McCall, 1999).

Associations between functions of autobiographical memory and number and valence of remembered life events have not yet been systematically investigated though one may assume differing functions underlying the remembering of negative and positive events. Following this line of reasoning, especially *negative* life events may require cognitive maneuvers serving the construction of meaning, given that these often are unexpected and uncontrollable and may shatter basic assumptions about the world and the self (Janoff-Bulman & Frieze, 1983). Memories of *positive* events are likely to enhance mood, thus, remembering positive life events can be associated with emotion regulation; additionally, remembering negative events may also serve emotion regulation if it is possible to contrast former bad times with current good times (Ferring & Hoffmann, 2007). Finally, remembering important life events, both of a positive or a negative quality, may also, under certain conditions, serve as a means to communicate with others and share common or specific experiences. Thus, memories of one's past may be related to the narrative function of storytelling.

Remembering positive and negative life events may, therefore, serve different functions and motives, and several personal and contextual factors may motivate and initiate these processes especially in old age. Here, we will highlight the importance of

the *future time perspective* which can be defined by two factors: (a) the temporal space or residual life time and (b) the outlook one has on his or her future with respect to one's goals and plans (Lang & Carstensen, 2002). With a limited future time perspective in old age, goals might be chosen to serve emotional needs, according to socioemotional selectivity theory (Carstensen, 1995). Nonetheless, one may also assume that with a narrower future time perspective, individuals may shift their focus from future plans and goals to looking back at one's life story, and, accordingly, may more eagerly engage in remembering events from the past.

### *Research Questions*

A first aim of our study was to explore the distributions of remembered positive and negative life events over the life span. In line with earlier research (Berntsen & Rubin, 2002), we assumed differences in emotional valence and expected a reminiscence bump in younger adulthood, during the timeframe between 20 and 30 years of age, for positive, but not for negative life events. Additionally, we were interested in possible gender-specific differences in the distributions of remembered positive and negative life events. In a second step of analysis, we wanted to investigate the interrelation between memories of negative and positive life events and several functions of autobiographical memory. A last question was dedicated to the association between remembering events and future time perspective as described by residual life time and the affective valence of one's future. The research questions were examined in a cross-sectional questionnaire study with participants in middle and older age.

## Method

### *Sample*

A total of 260 community-dwelling individuals residing in Germany participated in the study. Participants were recruited via e-mail and announcements in the local newspaper for the study on “life memories”. Some additional participants were asked directly to participate in the study. Participants were informed that participation in the study was voluntary, anonymous, and that their data would be treated confidentially and used only for scientific purposes. Each participant received a free lottery ticket from a German welfare organization for study participation.

The 260 study participants ( $n = 168$  women, 64.6%) were aged between 41 and 86 years ( $M = 57.06$ ,  $SD = 8.06$ ). A total of 225 (86.5%) participants had at least one child. The majority of the sample rated their health status on a six-point single item rating as *very good* or *good* ( $n = 162$ , 63.0 %), only  $n = 32$  participants rated their health status with *rather bad* or *bad* (12.5 %). There were no ratings on *very bad*. Further characteristics of the sample concerning professional, relationship, and educational status are presented in Table 1. Here, it gets evident that participants with a higher education were slightly overrepresented; a third of the participants (35.2%) had a university degree<sup>1</sup>.

### *Measures*

*Life events.* Contrary to most studies investigating the distribution of memories over the life span which use the word-cue method or free narratives (see Rubin & Schulkind, 1997, for an example), we decided to apply a life event list to obtain distributions of positive and negative events. One might argue that such lists only obtain the actual occurrence of selected life events and that “memories” thus represent a function of the specific list. However, other methods to elicit autobiographical memories, especially free narratives, are also subject to this kind of reactivity (e.g., influences of the

experimental or interview situation). This is convincingly demonstrated by Hepp and colleagues (2006), who showed that even traumatic life events were not consistently reported across measurement occasions. In general, reports of life events might therefore be subject to memory biases. An advantage of the life event list used here is clearly that it provides a standard procedure to elicit autobiographical memories which allows establishing comparable conditions across subjects. The instructions for the participants stated that the study would deal with stressful life events and positive life events, respectively, that possibly had life-changing impacts on the participant and that could also be located in the distant past. Lists containing positive and negative events were constructed using life event repertories that have been used in previous studies (Hobson et al., 1998). Additionally, we listed time periods, and, for the list of negative events, so-called nonevents (cf. Wheaton, 1999).

The list of negative life events consisted of 31 events that involved single events like a disease, an accident, or an operation (own or of a loved one), and time periods, for example, times of isolation or anxiety, and nonevents like childlessness (see the Appendix for the lists of positive and negative life events; see Leist, 2008, for the complete list in German); additionally, respondents could describe two further events that were not covered by the list. The list of positive life events consisted of 15 events that involved single events as well as life phases (e.g., marriage, birth of a child), and subjects could also add the description of two further events. For each negative and positive life event on the lists, participants were required to mark if and when the event had occurred.

*Functions of autobiographical memory* were operationalized in an item inventory that consisted of  $k = 3$  items taken from the *Reminiscence Functions Scale* (Webster,

1993), and  $k = 3$  items of the *Thinking About Life Experiences* (TALE; Bluck et al., 2005), and  $k = 11$  additional items formulated by the first author, based on the theoretical framework on life stories across the life span of Bluck and Habermas (2001). After the introduction “*I think back over my life in order to ...*” respondents rated the specific statements (e.g., “*to distract myself from current worries*”; “*... to understand the meaning of events of my past*”) on a four-point rating scale (*not at all true – completely true*). Principal axis factoring with varimax rotation and subsequent scale analyses were conducted for this measure. Three factor analytically derived scales were built that comprised remembering events to create meaning (*sense*;  $k = 7$  items;  $\alpha = .88$ ), to regulate emotions (*regulate*;  $k = 6$  items;  $\alpha = .73$ ), and to tell stories (*story*,  $k = 4$  items;  $\alpha = .75$ ; see Table 2 for items constituting each scale). Inspection of the scale means showed that remembering events to tell stories was the function most frequently reported (*story*,  $M = 2.63$ ,  $SD = 0.60$ ) as well as remembering events to create meaning (*sense*,  $M = 2.42$ ,  $SD = 0.72$ ). Individuals engaged less often in remembering events to regulate emotions (*regulate*,  $M = 1.77$ ,  $SD = 0.55$ ).

*Future time perspective.* Two indicators were used here. *Affective Valence of Future Time Perspective* was measured by the specific subscale of the *Time and Future Perspective Questionnaire* by Brandtstädter and Wentura (1994). This scale comprises  $k = 5$  items (*affective*, e.g., “*I look forward to my future life*”) to be answered on a four-point rating scale; the scale showed a satisfactory internal consistency of  $\alpha = .88$ .

*Residual life time (residual LT)* represented the second indicator and it was registered by a single item asking “*What do you think, how many good years do you have left?*”.

On average, participants rated their future rather positive (*affective*,  $M = 3.10$ ,  $SD = 0.58$ ); a total of 75% of the sample estimated their residual life time to be more than 15 remaining years, the sample mean being 20 remaining years ( $M = 19.63$ ,  $SD = 8.80$ ). *Residual life time* was, of course, highly negatively correlated with chronological age ( $r = -.58$ ,  $p < .001$ ); it showed a positive correlation with the *affective valence of the future time perspective* – the more life time was estimated, the more positive were the estimates of its affective valence ( $r = .37$ ,  $p < .001$ ).

## Results

### *Distributions of remembered positive and negative life events over the life span*

*Frequencies on the individual level.* Analyses are based on the reports of the life event lists and the self-generated events. Participants reported, on average, nine *negative life events* ( $M = 8.53$ ,  $SD = 4.38$ ), with a range from 0 to 21 events; referring to the total of 33 possible negative events (31 listed events and two possible additional events), this corresponds to a mean proportion of 27.3% negative events, with individual proportions ranging from 0 to 63.6 %. Participants reported, on average, 10 *positive events* ( $M = 9.58$ ,  $SD = 3.03$ ), with a range from 0 to 17 events. Referring to the total number of 17 listed positive life events (15 listed events and two possible additional events), this corresponds to a proportion of 58.8 % of the list, with a range of 0 to 100%. Number of reported positive events was negatively correlated with number of reported negative life events ( $r = -.26$ ,  $p < .001$ ). Age was related to the number of remembered positive ( $r = .21$ ,  $p < .01$ ), but not to number of remembered negative events ( $r = .10$ , *n.s.*).

*Frequencies on the event level.* The following analyses will be based on life events as cases (and not, like in the other analyses, on individuals as cases). Participants

reported in total  $k = 1,833$  positive and  $k = 1,813$  negative life events. Mean reported age at occurrence of life event was 35 years for positive events ( $M = 35.37$ ,  $SD = 13.03$ ). Mean reported age at occurrence for negative events was 41 years ( $M = 41.04$ ,  $SD = 13.06$ ). We found a significant reminiscence bump for reported positive, but not for negative life events over the life span. For negative life events, we found an increase in reported negative life events in middle age instead (see Figure 1). This difference in distribution between positive and negative life events was nicely documented in frequency statistics: While one third of all *positive* life events was reported to have occurred during the ages of 20 to 30 years ( $k = 625$ , 34.1%), another third of all *negative* life events was reported for the ages 45 to 60 years ( $k = 643$ , 35.5%).

*Age and gender differences.* The *reported ages* at the occurrence of (a) positive life events ranged from 5 to 85 years and (b) negative events ranged from 0 to 74 years (see Table 3). A t-test of mean differences on the individual level ( $N = 242$ ) clearly indicated that positive life events were located earlier in life than negative life events ( $t[241] = -12.36$ ,  $p < .001$ , with 95% confidence intervals from -7.61 to -5.52).

Men and women did not differ in the distribution of reported negative and positive life events but significant differences between the two groups were found with respect to the *reported age at event occurrence*. In order to investigate the relation between gender, age, and event distribution, a categorical age variable was constructed (with categories 10 - 19 years, 20 - 29 years, etc.) and a nominal x nominal test of frequencies showed significant differences for the number of reported positive events (Cramér's  $V = .13$ ,  $p < .001$ , for  $k = 1,500$  events). Distributions of positive events for men and women showed both a reminiscence bump in the age range 20 to 29 years.

However, (a) women reported more positive life events for this time span than as would have been expected by frequency statistics and male respondents reported less positive events than as expected, and (b) men reported more positive events for the time span between the ages of 30 and 39 years than women did. Distributions for negative events did not differ significantly (Cramér's  $V = .49$ , *n.s.*, for  $k = 1,260$  events; see Table 4 for details).

Additionally, an index reflecting the proportion of remembered negative and positive events (on the individual level,  $M = 0.97$ ,  $SD = 0.58$ ) was neither associated with age nor with gender (both *rs n.s.*). Thus, intra-individual differences in the proportion of positive and negative life events were not systematically associated with age or gender.

The present two-level data structure, that is, events nested in persons, would indicate the use of multilevel random coefficient modelling (Nezlek, 2001). By taking a multilevel approach, one could differentiate between intra- and inter-individual variance in the reported age at the occurrence of negative and positive life events. However, an analysis via HLM failed to provide reliable estimates of this model. This was probably due to the high range of reported life events (see below), making the design too unbalanced. Therefore, we used a single-level approach reporting the distributions of remembered positive and negative events across events and across persons.

#### *Functions of autobiographical memory, future time perspective, and remembered life events*

In a next step, we investigated the association of number and valence of reported life events with functions of autobiographical memory and future time perspective. To do

this we used a multivariate analysis of covariance (MANCOVA) allowing for the statistical control of potentially confounding variables, namely, age, gender, and self-reported health status. A median-split was performed for reported positive and negative life events ( $Md_{pos} = 10.00$ ,  $Md_{neg} = 8.00$ ) resulting in two independent variables (IVs) “number of positive events” and “number of negative events”; five dependent variables (DVs) were considered in the analysis, namely, *sense*, *story*, *regulate*, *affective*, and *residual life time*. In the initial analysis, age, self-reported health status, and gender were entered as covariates. Gender did not reach significance and was, therefore, excluded in the subsequent analyses presented here.

*Data screening.* Of the 260 cases used for analysis, 9 cases were dropped because of missing data concerning number of positive life events, and an additional 14 cases were dropped because of missing data on the predictors. Missing data appeared to be randomly scattered throughout predictors. No univariate or multivariate within-cell outliers were found with  $\alpha = .001$ . For the remaining 237 cases, results of evaluation of assumptions of linearity, multivariate normality, multicollinearity, homogeneity of variance-covariance matrices, or singularity were satisfactory. Sample sizes for the four cells of the design were almost equal with  $n = 68$  (low negative, low positive),  $n = 58$  (low negative, high positive),  $n = 49$  (high negative, low positive), and  $n = 76$  (high negative, high positive), so that potential bias caused by unequal cell sizes could be discounted.

*Covariances on the overall level.* MANCOVA procedure provides, in a first step, only information (a) about the overall covariation of the combined covariates with all dependent variables combined, and (b) about the overall covariation of each of the

independent variables with all dependent variables combined. On this overall level the MANCOVA revealed that the combined DVs were significantly related to the combined covariates (approximate  $F[10, 450] = 15.71, p < .001$ ). The combined DVs were also significantly related to the IV *amount of remembered negative events* ( $F[5, 224] = 3.36, p < .01$ ) and to the IV *amount of remembered positive events* ( $F[5, 224] = 5.14, p < .001$ ), but not to the interaction of the IVs,  $F < 1$ . The association of age and health status with the DVs was rather high, as indicated by the large effect size ( $\eta^2 = .26$ , 95% confidence limits ranging from .18 to .31). The associations of the DVs with the number of positive life events and number of negative life events were small to moderate (positive events:  $\eta^2 = .10$ , with 95% confidence limits from .03 to .17; negative events:  $\eta^2 = .07$ , with 95% confidence limits from .07 to .12).

*Association of covariates and DVs.* In order to further investigate the strength of relationship between the covariates and the single dependent variables, multiple regressions were run for each DV in turn, with covariates acting as multiple predictors. *Age* obtained a significant weight in the prediction of *sense* ( $B = -.02$ , confidence limits from  $-.03$  to  $-.01$ ,  $t[228] = -2.91, p < .01$ ) and *residual life time* ( $B = -.64$ , confidence limits from  $-.76$  to  $-.53$ ,  $t[228] = -10.79, p < .001$ ): Thus, with older age, individuals (a) engaged more in remembering events to make sense and (b) estimated less residual life time. *Health* showed a significant prediction of  *affective* ( $B = .24$ , confidence limits from  $.16$  to  $.32$ ,  $t[228] = 5.84, p < .001$ ) and *residual life time* ( $B = 1.69$ , confidence limits from  $.60$  to  $2.78$ ,  $t[228] = 3.05, p < .01$ ). With a poorer health status, future time perspective was rated less positive and less residual life time was estimated.

*Relation of IVs and individual DVs.* Differences in DVs in relation to reported negative and positive life events after adjustment for covariates were investigated in univariate and Roy-Bargmann stepdown analysis, with order of dependent variables and results as depicted in Table 5. Experimentwise error rate was achieved by apportionment of  $\alpha = .01$ . After adjusting for differences on the covariates, only *sense* accounted significantly for differences between those low and high in reported negative events ( $\eta^2 = .05$ , with 99% confidence limits from .002 to .135). Those high in reported negative life events engaged in remembering events more often to create meaning (adjusted  $M = 2.30$ ,  $SD = .06$ ) than those low in reported negative events (adjusted  $M = 2.62$ ,  $SD = .06$ ). Subjects low and high in reported positive events differed, after adjustment on the covariates, only on *affective* ( $\eta^2 = .07$ , with 99% confidence limits from .011 to .171). Individuals who had reported a low number of positive life events (adjusted  $M = 2.97$ ,  $SD = .05$ ) had a less positive future time perspective than individuals high in reported positive life events (adjusted  $M = 3.25$ ,  $SD = .05$ ; see Table 5 for further details). Pooled within-group correlations among the DVs are presented in Table 6.

## Discussion

### *Distributions of remembered positive and negative life events over the life span*

The present study investigated memories of positive and negative life events and situated the number and valence of these memories in relation to future time perspective and functions of autobiographical memory. In line with earlier research (Berntsen & Rubin, 2002; Filipp, 1996; Jansari & Park, 1996; Rubin & Schulkind, 1997), we found distinct distributions of reported positive and negative life events, and we could depict a reminiscence bump for positive memories. While positive life events showed a

significant bump in young adulthood, negative life events started to occur more frequently in middle age and increased in frequency with growing age. This indicates that in our sample of persons within the age range of 41 to 86 years, the probability of experiencing negative events grew with increasing age. In general, this replicates findings underlining the importance of developmental tasks, such as coming to terms with age-associated losses.

We found a gender difference with respect to the distribution of positive events over the first four decades of life: Men reported more positive life events occurring in their thirties whereas women reported more positive events than men for their twenties. In their study, Rubin, Schulkind, and Rahhal (1999) did not find any gender differences, neither in the distribution of word-cued elicited autobiographical memories nor in ratings or distributions concerning important memories. Probably due to our distinction between positive and negative life events, our approach has led to distinct results. Gender differences in the distribution of reported positive life events may reflect the fact that men and women actually differ in the onset of positive life events and that there are gender-dependent expectations for the onset of life events. Neugarten and Hagestad (1976) showed that there are norms concerning the onset of life events, like getting married or a job; for most events their onset is located in the age range from 15 to 30 years, and there are small gender differences regarding time frames for the occurrence of the events. It is therefore possible that gender-specific distributions of remembered life events are due to different time frames for men and women concerning the life-script dependent occurrence of life events. This demands further investigation: First, gender differences in the distribution of reported positive life events should be validated with other methods of

memory retrieval, for example, word-cued retrieval (e.g., Rubin & Schulkind, 1997). Second, and with respect to the destandardization of the life course (Settersten, 2003), there is a need for new evidence that age-dependent expectations or occurrence of events are still valid, that is, that the time frames have not changed significantly since findings by Neugarten and Hagestad (1976).

*Remembered positive and negative life events and life review*

In our sample we found that with increasing use of autobiographical memory to create meaning, individuals reported more negative life events. A possible explanation for this finding is that individuals who report a large number of experienced negative life events may have a need to explain and find meaning in these life events and should, therefore, engage in life review processes. Of course, this explanation can only be adequately addressed in a longitudinal research design. The number of reported life events was neither associated with autobiographical memory to regulate emotions nor to tell stories. Since, to our knowledge, no study had investigated these relationships yet, one could speculate that regulating emotions or telling stories might require autobiographical information beyond the mere number of life events and may therefore elicit distinct memory processes.

Subjects low and high in reported positive events differed, after adjustment of the covariates, only on *affective* valence of the future. In other words, individuals reporting a low number of positive life events had a less positive future time perspective than those reporting a comparatively higher number of positive life events. It is possible that a third variable caused this association; optimism or positive affectivity could yield both a high accessibility of positive events in memory and a positive valence of future time

perspective. One could even assume that the repeated experience of negative events may influence the formation of generalized expectancies in the sense of a pessimistic view of one's future which then has a specific impact on memorizing positive and negative events. Since we did not include a measure of optimism in our study, we cannot totally rule out this post-hoc explanation.

Residual life time was not significantly associated with the number of reported life events. This was probably due to a decrease in variance after holding chronological age constant. As additional analyses showed, without controlling chronological age, residual life time was significantly associated with the number of reported negative life events ( $r = -.24, p < .001$ ), but not with the number of reported positive life events.

Chronological age and self-reported health status were highly associated with functions of autobiographical memory and future time perspective. Firstly, the higher chronological age, the more individuals reported using autobiographical memory to create meaning. This finding is in line with Butler's (1963) assumption that engagement in life review processes to resolve old conflicts and to find meaning in life events increases in old age. Secondly, with higher chronological age, less residual life time was estimated. This more or less trivial finding replicates findings in earlier studies on future time perspective (e.g., Brandtstädter & Wentura, 1994; Lang & Carstensen, 2002). In our study, chronological age explained about 33% of the variance in estimated residual life time ( $r = .58, p < .001$ ). Thirdly, with better health, individuals estimated their future more positively and with more remaining years left. This is intuitively plausible: With poor health, the future does not look bright and one may reassess the length of one's remaining years.

We found an association of age and the number of remembered positive life events, but not with the number of remembered negative life events. The selective age-related differences in remembered *positive* events show that the finding is not a mere reflection of an increase in *experienced* life events over the life span. Actually, this finding fits nicely with assumptions of socioemotional selectivity theory, which assumes that over the life span, goals shift from the pursuit of knowledge to the pursuit of emotional well-being (Carstensen, 1995; e.g., Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). Older adults selectively focus on and remember better positive stimuli as compared to younger adults (e.g., Mather & Carstensen, 2005). Applied on the process of looking back over one's life, older adults should selectively focus on and remember more positive life events than younger adults.

#### *Methodological considerations*

Firstly, the reminiscence bump for positive life events might have been acquired through the list of positive life events with a greater possibility of occurrence in young adulthood and, thus, might be considered a methodological artifact. To prevent such a flaw, we were extremely careful to construct the list of positive life events to avoid favoring positive life events with a higher occurrence possibility in young adulthood. For example, we did not list the event "beginning of a job", rather we stated this as "career advancement". We also focused on events that could possibly occur in each life phase, such as "beginning of a fulfilling hobby", "move to a nice apartment/house". At this point we also like to come back to an issue mentioned earlier: Are life event lists valid accounts for the study of distributions of remembered life events over the life span? Of course, there are life events that are hardly forgotten or made up like marriage or the birth of a

child (provided the participants reported seriously). However, earlier research has shown that even traumatic events are highly inconsistently reported across measurement occasions (Hepp et al., 2006). Other prompts of the lists – like “occupational advancement”, “an extraordinary compliment” or a “major conflict with a family member” – should be unspecific enough to be subject to memory processes. And, after all, searching in memory about whether a listed life event has occurred can be considered as the process of remembering autobiographical events. So, at least partly, life event lists are subject to memory processes and can, therefore, be a valid method to investigate distributions of event memories, even though method-specific effects can certainly not be excluded. Consequently, our results – a reminiscence bump for positive, but not for negative life events – replicate earlier findings gained in the application of other memory paradigms (e.g., Berntsen & Rubin, 2002; Rubin & Schulkind, 1997). Therefore, the current findings provide a validation of previous results using a different methodological approach. In addition, our results enhance the understanding of memory processes: Even if the effects are small in size, variables associated with life review processes – functions of autobiographical memory and future time perspective – modify the accessibility of life events in autobiographical memory. Further studies could include subjective ratings of the events’ importance to withdraw from the impression the events listed might differ in their importance. On the other hand, one might argue that events considered as irrelevant might not even be remembered and therefore, a report of life events would only contain events rated as important per se.

We found a reminiscence bump for positive life events, but not for negative events, in young adulthood. Earlier research has shown that the reminiscence bump can

shift to later ages after an important transition (Schrauf & Rubin, 1998). Thus, one might argue that we should consider the frequency of nonnormative positive transitions in our sample that might shift the reminiscence bump. To address this issue, we investigated the frequencies of the marked events on the list of positive life events and found no evidence for a “bump” of certain positive events. In addition, events that were freely described by our respondents did not indicate an accumulation of certain nonnormative events. Thus, we can fairly rule out the possibility that, in our sample, important life events or transitions could have caused the reminiscence bump to shift.

### Conclusions

Our study provides new evidence for distinct distributions of remembered positive and negative life events across the life span, using a different methodology than earlier investigations. Furthermore, we show that developmental theories considering life review processes are a useful approach to investigate the remembering of negative and positive life events. Number and valence of remembered events was related to functions of autobiographical memory and future time perspective, even after controlling for chronological age and health status. In addition, gender differences could be described, indicating that there may be different time frames for males and females for positioning autobiographical events especially in young and middle adulthood. In conclusion, these findings encourage further replication while controlling for possible confounds in order to add to our knowledge of memories of life events from a life-span developmental perspective.

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## Appendix

List of positive and negative life events (translated from German)

*In my adult years, I experienced ...*

(Response format: no – yes – occurred in year... – don't know)

### **Positive life events**

Wedding

Beginning of a big love

Birth of first child

Birth of first grandchild

A special vacation

Career advancement

Unexpected financial profit

Move to a nice apartment/house

Extraordinary praise or compliment

A special ability or talent

Beginning of a fulfilling hobby

A special award or distinction (for a hobby, job training or otherwise job-related)

Execution of a special project

Fulfillment of a long-cherished wish

Periods of light-hearted cheerfulness

### **Negative life events**

Diagnosis of a serious disease/serious accident

Serious operation or hospitalization

Diagnosis of a serious disease/serious accident of one's partner

Periods of great concern about one's partner

Death of one's partner

Diagnosis of a serious disease/serious accident of a child

Periods of great concern about a child

Death of a child

Death of father

Death of mother

Death of a close relative

Death of a close friend

Periods of great concern about a family member or a friend

Major conflict with one's partner

Having been left by one's partner

Having left one's partner

Major conflict with a family member

Major conflict with a close friend

Having been betrayed by a loved one

Unwanted pregnancy

Involuntary childlessness

Serious financial problems and worries

Loss of job

Worries about job

Serious professional setbacks

Involuntary retirement

Periods of loneliness and isolation

Periods of anxiety and uncertainty

Involvement in an accident (traffic accident, work accident)

Having been victim of a criminal act (e.g., mugging, sexual harassment)

Having been a victim of a gross injustice

Footnotes

<sup>1</sup> At this point it should be mentioned that educational as well as employment status were neither associated with the number of reported negative nor positive life events (all *rs n.s.*).

*Table 1. Characteristics of the Sample (N = 260).*

Professional status	employed full-time	employed part-time	retired	housewife	not employed
	90 (35.2%)	75 (29.3%)	61 (23.8%)	20 (7.8%)	10 (3.9%)
Relationship status	married	in a relationship	single	separated/divorced	widowed
	174 (67.7%)	42 (16.3%)	11 (4.3%)	22 (8.6%)	8 (3.1%)
Educational status	no school degree	Volks-/Grundschule <sup>a</sup>	Mittlere Reife <sup>b</sup>	Abitur <sup>c</sup>	university degree
	3 (1.2%)	58 (22.7%)	80 (31.3%)	25 (35.2%)	90 (35.2%)

*Note.* Educational status: Categories represent different possibilities to successfully complete schooling

<sup>a</sup>after four years of education, <sup>b</sup>nine years of education, <sup>c</sup>13 years of education.

*Table 2. Items of the Three Scales Assessing Functions of Autobiographical Memory.*


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Introductory sentence “I think back over my life...”.	
<hr/>	
Sense	... to try to understand myself better. <sup>b</sup>
	... to understand the meaning of events of my past. <sup>c</sup>
	... when something happens to me and I want to look back to see what caused it. <sup>a</sup>
	... when I feel that if I think about something bad that happened I can learn some lesson from it. <sup>a</sup>
	... remembering my past helps me define who I am now. <sup>b</sup>
	... to make “my peace” with my past. <sup>c</sup>
	... to work up remote life events that happened a long time ago. <sup>c</sup>
<hr/>	
Story	... to tell others about my life. <sup>c</sup>
	... to have a conversation with good friends. <sup>c</sup>
	... to tell others what kind of person I am. <sup>c</sup>
	... when I want to pass some of my experiences on to others. <sup>c</sup>
<hr/>	
Regulate	... to distract myself from current worries. <sup>c</sup>
	... to enhance my mood. <sup>a b</sup>
	... when I am particularly satisfied with my life. <sup>c</sup>
	... when I feel lonely. <sup>c</sup>
	... to pass the time with nice memories. <sup>b</sup>
	... to prevent getting too coltish. <sup>c</sup>

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*Note.* Formulations by <sup>a</sup>Bluck et al. (2005). <sup>b</sup>Webster (1993). <sup>c</sup>own formulation.

*Table 3. Descriptive Statistics of Chronological Age and Reported Age at Occurrence of Positive and Negative Events in Years (N = 260; k = 1,833 and k = 1,813 Events).*

	Min	Max	M	SD	Median	Mode	Skew- ness	Kurtosis
chronological age	41.00	86.00	57.06	8.06	57.00	56.00	.33	.29
age at occurrence of positive life events	5.00	85.00	35.37	13.03	33.00	29.00	.43	-.70
age at occurrence of negative life events	0.00	74.00	41.04	13.06	42.00	56.00	-.30	-.37

*Table 4. Number of Reported Negative and Positive Life Events per Decade for Men (n = 92) and Women (n = 168).*

negative events	Reported age at occurrence of life event in years				total
	10 - 19	20 - 29	30 - 39	40 - 49	
men	33 (26.8)	76 (83.3)	128 (127.9)	156 (155.0)	393
women	53 (59.2)	191 (183.7)	282 (282.1)	341 (342.0)	867
total	86	267	410	497	1,260
positive events					
men	37 (50.5)	208 (227.6)	188 (149.3)	124 (129.6)	557
women	99 (85.5)	405 (385.4)	214 (252.7)	225 (219.4)	943
total	136	613	402	349	1,500

*Note.* Expected values in parentheses.

*Table 5. Tests of Covariates, Number of Negative Life Events and Number of Positive Life Events (N = 237).*

IV	DV	Univariate F	Stepdown F	df	Partial $\eta^2$
number of negative events	sense	11.51 <sup>a</sup>	11.51**	1/228	.05
	affective	2.29	1.20	1/227	.01
	residual LT	2.58	1.84	1/226	.01
	story	5.32	2.17	1/225	.02
	regulate	2.88	<1	1/224	.01
number of positive events	sense	< 1	< 1	1/228	.00
	affective	17.96 <sup>a</sup>	18.39***	1/227	.07
	residual LT	1.90	< 1	1/226	.00
	story	5.28	4.67 <sup>b</sup>	1/225	.02
	regulate	3.06	2.24	1/224	.01

*Note.* <sup>a</sup>Significance level cannot be evaluated but would reach  $p < .01$  in univariate context. Since the interaction of number of negative and positive events did not significant, results are not reported.

\*\*  $p < .01$ , \*\*\*  $p < .001$ .<sup>b</sup>  $p < .05$  (not significant because of apportionment of alpha to .01). df of the univariate analyses = 5/224.

*Table 6. Pooled Within-Group Correlations Among DVs.*

	sense	affective	residual LT	story	regulate
sense	.665				
affective	-.117	.509			
residual LT	.027	.334	6.806		
story	.210	-.017	-.067	.619	
regulate	.382	-.212	-.053	.210	.538

*Note.* Diagonal elements are pooled standard deviations; sense = remembering events to create meaning; affective = affective valence of future time perspective; residual LT = residual life time; story = remembering events to tell stories; regulate = remembering events to regulate emotions.

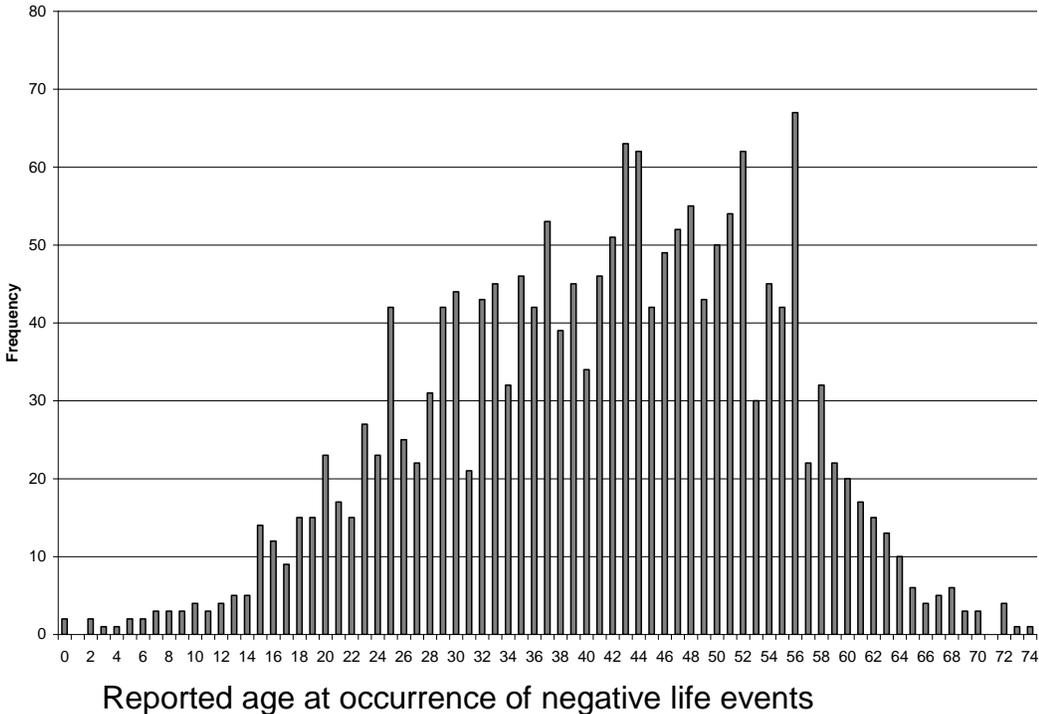
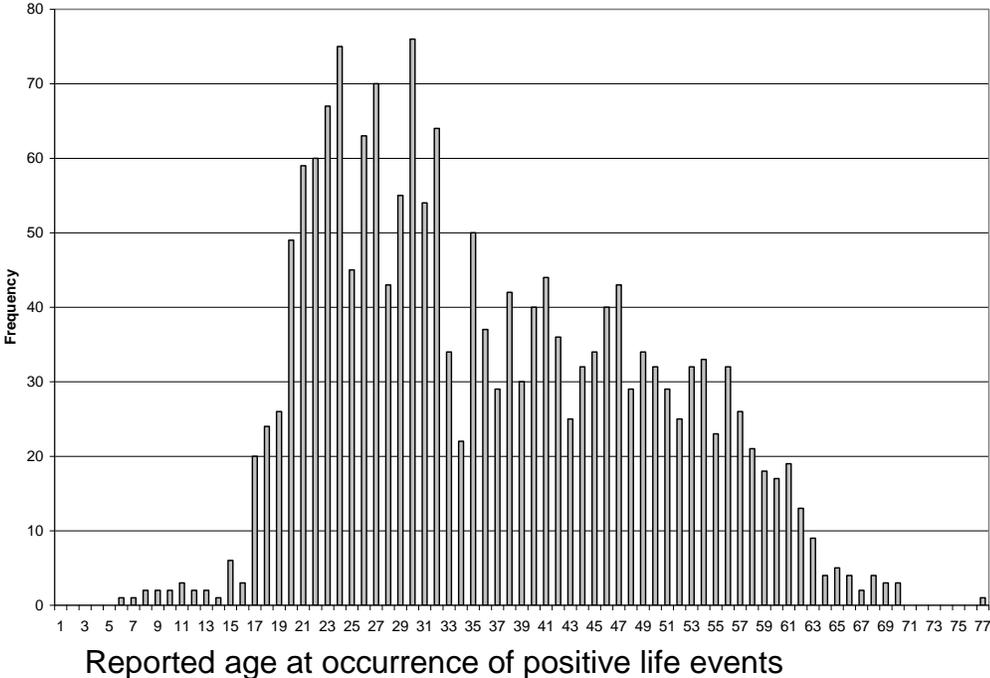


Figure 1. Distribution of positive and negative life events over the life span.