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# Does Growth Require Suffering? A Systematic Review and Meta-Analysis on Genuine Posttraumatic and Postecstatic Growth

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Previous literature on growth after major life events has primarily focused on negative experiences and operationalized growth with measures which rely on the post hoc self-perception of change. Because this method is prone to many biases, two questions have become increasingly controversial: Is there genuine growth after major life events and does growth require suffering? The present meta-analysis is the first synthesis of longitudinal research on the effects of life events on at least one subdomain of psychological well-being, posttraumatic, or postecstatic growth. Studies needed to have a longitudinal design, assess changes through independent measures over time, and provide sufficient data to estimate change scores. The present meta-analysis comprises 364 effect sizes from 154 independent samples (total $N = 98{,}436$) in 122 longitudinal studies. A positive trend has been found for self-esteem, positive relationships, and mastery in prospective studies after both positive and negative events. We found no general evidence for the widespread conviction that negative life events have a stronger effect than positive ones. No genuine growth was found for meaning and spirituality. In the majority of studies with control groups, results did not significantly differ between event and control group, indicating that changes in the outcome variables cannot simply be attributed to the occurrence of the investigated life events. More controlled prospective studies are necessary to validate the genuine nature of postevent growth. Overall, the meta-analysis provides a systematic overview of the state of life event research and delineates important guidelines for future research on genuine growth.

***Public Significance Statement***
This systematic review and meta-analysis investigated whether negative life events have a stronger influence on personal growth than positive life events. The results revealed that people can show psychological gains over time independently of the valence of the life events encountered, questioning traditional models of posttraumatic growth. The paper also shows that more high-quality studies are necessary before final conclusion about the existence of genuine growth after major life events can be made.

*Keywords:* major life events, postecstatic growth, posttraumatic growth, psychological well-being

*Supplemental materials:* http://dx.doi.org/10.1037/bul0000173.supp



"What doesn't kill us makes us stronger." This famous aphorism by the philosopher Friedrich Nietzsche (1997) emphasizes the fundamental conviction that people can thrive in the face of trauma. A growing body of clinical, developmental, and personality research on benefit finding and posttraumatic growth supports the notion that negative events can lead to positive outcomes (e.g., Joseph & Linley, 2004; Park, Cohen, & Murch, 1996; Park & Helgeson, 2006; Tedeschi & Calhoun, 1996). However, as elaborated by Jayawickreme and Blackie (2014), a full understanding of whether and when adversity may lead to growth requires resolving two main issues that have characterized this field of research. First, most studies in this field have relied on cross-sectional studies in which participants are asked to retrospectively estimate to which extent they have

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changed due to the negative event, often using measures such as the Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996). As we discuss below, there are a number of limitations associated with such assessments of self-perceived change (see also Jayawickreme & Blackie, 2016, for a more detailed discussions). Second, it has been suggested that growth does not require suffering but can also occur after positive events. Roepke (2013) coined this phenomenon postecstatic growth.

The goal of the present paper is to help resolve these issues by systematically reviewing and conducting a meta-analysis to integrate longitudinal studies that investigated changes in outcomes such as social relationships, self-esteem, or meaning in life after negative and positive major events. In the remainder of this introduction, we present the theoretical framework and definitions of central terms such as growth, review empirical research on positive and negative events, and discuss the advantages of longitudinal studies assessing genuine growth compared with cross-sectional studies assessing self-perceived growth.

## Definitions and Theoretical Frameworks of Growth

The idea that positive development after adversity and traumatic experiences is possible was first introduced in two independent publications in 1996 (Park et al., 1996; Tedeschi & Calhoun, 1996). Tedeschi and Calhoun (1996) presented the concept of posttraumatic growth as well as a new scale to measure it, the Posttraumatic Growth Inventory (PTGI). This questionnaire asks participants about their perception of benefits following adverse events in five domains: relationships, openness for new possibilities, personal strengths, spirituality, and appreciation of life, using items such as "As a result of the disaster, I have a greater sense of closeness with others." The PTGI is the most frequently used instrument to measure perceived psychological benefits of trauma (Jayawickreme & Blackie, 2016). The PTGI relies on the conviction that growth can occur in psychological domains which are not directly associated with the coping process, such as openness for new possibilities or priorities in life.

Meanwhile, the concept of stress-related growth (Park et al., 1996) suggests that growth occurs in those psychological domains that are directly needed to cope with the event. Therefore, the Stress-Related Growth Scale (SRGS; Park et al., 1996) assesses perceived changes in coping skills, as well as personal and social resources, with items such as "I learned to work through problems and not just give up."

In the two decades since its introduction, a large body of research has evolved which explores the phenomenon of posttraumatic growth, and several theoretical frameworks have been developed and refined (e.g., Jayawickreme & Blackie, 2014, 2016; Joseph & Linley, 2004; Park et al., 1996; Park & Helgeson, 2006; Tedeschi & Calhoun, 1996, 2004). One of the most comprehensive of these approaches is the dynamic systems framework. According to this perspective, human development is influenced by various systems located on psychological, social, and molecular levels (Cicchetti & Toth, 2009; Masten, 2014, 2015; Overton, 2015). In addition, development is shaped by the interactions between multiple within-person factors and environmental influences as well as by the coaction of these systems. Major life events can disrupt system functioning or destabilize one or more system levels and can hereby precipitate reorganization, change, or transformation. To explain the increase in psychological functioning after traumatic life events, Park and Folkman (1997) introduced the discrepancy-based meaning making model. It includes global meaning as a general orienting system (e.g., worldviews, beliefs) and situational meaning, which refers to meaning regarding to specific situations (Park, 2013). Major life events can lead to discrepancies between the meaning of a particular experience and the global meaning system (Park, 2010). As a consequence, distress occurs, which ultimately triggers psychological processes to reduce this discrepancy (Park, 2013) and may result in psychological benefits. Thus, in a broad sense, posttraumatic growth can be defined as the potential of a dynamic system to adapt to adverse events, while hereby expanding its previous resources. On an individual level, these resources can comprise psychological variables, such as meaning in life, as well as social aspects, such as closer relationships. In the present meta-analysis, we therefore focus on a range of diverse outcomes, including all subcomponents of posttraumatic and postecstatic growth, as well as the elements of psychological well-being.

This definition highlights three critical elements of posttraumatic growth. First, posttraumatic growth can occur in one or more different areas across system levels (Joseph & Linley, 2004). Second, growth occurs not as a consequence of the event per se, but as a consequence of integrating the diversifying experience (Damian & Roberts, 2016) and the necessary reorganization, change, or transformation of the system. Finally, because personal growth can also occur as part of a normative development (cf. the maturity principle; McAdams & Olson, 2010), particularly in young adulthood (Bleidorn, 2015), posttraumatic growth describes only those changes that occur as a direct effect of the life event and that go beyond regular developmental processes (Luhmann, Orth, Specht, Kandler, & Lucas, 2014).

It is important to distinguish posttraumatic growth from recovery from stressful life events. Recovery refers to positive changes that mirror the adjustment to a stressful experience and are limited to the compensation of the initial impairment of psychological functioning. For example, a father loses his only child to leukemia. His world is shattered, and he withdraws from his partner and friends. After a time of grieving, he might slowly recover and reestablish the relationships that suffered, to regain their former quality. In contrast, posttraumatic growth refers only to those positive changes that excel the original level of psychological functioning (Jayawickreme & Blackie, 2016). For example, the grieving father might become aware that the life of every person is finite and that the relationships which he took for granted beforehand are a valuable gift. Consequently, he might not only reestablish these relationships, but make them a higher priority in his life and bring them to a new level.

## Growth After Positive Life Events

An often-discussed key mechanism underlying posttraumatic growth is the disruption of core beliefs (Cann et al., 2010). The traumatic event leaves us with a fundamental shattering of our basic convictions, which might lead to negative psychological effects and end in posttraumatic stress (Cann et al., 2010). At the same time, successful coping and reconstruction of core beliefs might lead to a new understanding of the world and, through that process, result in posttraumatic growth. For a long time, these

theoretical underpinnings have led to the perception that only a potentially traumatic experience might result in personal growth.

Meanwhile, the idea that not only life's worst but also its best experiences could lead to lasting beneficial changes has hardly received any scientific attention. Damian and Roberts (2016) pointed out that any unusual event, independently from its valence, might provide the possibility to break boundaries and thereby change cognition. They emphasized that research should therefore also investigate positive experiences as a possible catalyst for growth.

Pioneering research in the field of growth after positive life events has come from the Bar-Ilan University in Israel. The research teams used an adapted version of the PTGI to investigate personal growth through childbirth, grandmother-, and grandfatherhood (Ben-Shlomo, Taubman-Ben-Ari, Findler, Sivan, & Dolizki, 2010; Taubman-Ben-Ari, Findler, & Sharon, 2011; Taubman-Ben-Ari, Findler, & Shlomo, 2012; Taubman-Ben-Ari, Shlomo, Sivan, & Dolizki, 2009). Taubman-Ben-Ari et al. (2011) found that after these (for most people) highly positive events, participants also perceived that they had grown from the experience. Her research has been complemented by the groundbreaking work of Roepke (2013), who introduced the notion of postecstatic growth. In focus groups, she asked participants about the best things that happened to them in their lives and about the psychological changes they experienced. Participants reported to have more self-esteem, deeper relationships, more meaning in life, and enhanced spirituality, because of the event. Roepke (2013) comprised these insights into the Inventory of Growth after Positive Experiences (IGPE), which assesses self-perceived change following positive life events, with items such as "[Because of the positive experience,] there is more meaning in life."

Previous cross-sectional research has shown that perceived posttraumatic and postecstatic growth are highly interrelated (Mangelsdorf & Eid, 2015). These findings raise the question of how similar or different posttraumatic and postecstatic growth really are. Thus, one of the unanswered key questions of research on major life events is: Does growth require suffering?

## The Necessity of Longitudinal Measures of Growth

Most research which has investigated benefits of major life events operationalized growth with measures that retrospectively assessed perceived change. At the same time, an increasing number of studies, which investigated the phenomenon of growth after adversity, began to question the genuine nature of perceived posttraumatic growth (Frazier et al., 2009; Jayawickreme & Blackie, 2016; Maercker & Zoellner, 2004; McFarland & Alvaro, 2000; Park & Helgeson, 2006). Different reasons were highlighted which cast doubt on the validity of measures of self-perceived growth. Maercker and Zoellner (2004) observed in their work with former political prisoners that there are two sides to PTG: one connected to active mastery and one connected to reappraisal and self-enhancement that does not necessarily mirror genuine growth. This problem has also been referred to as a veridicality issue, arguing that at least some reports of posttraumatic growth represent cognitive distortions (Park & Helgeson, 2006). In the present meta-analysis, we consider growth as genuine when it is quantifiable as measurable pre- and postevent difference (Blackie et al., 2017; Frazier et al., 2009).

Even though the problematic entanglement of perceived and genuine growth has been known for over a decade, few studies have addressed this issue. Frazier et al. (2009) prospectively investigated the association of the subdomains of posttraumatic growth assessed with the PTGI and independent measures of the posttraumatic growth subdomains assessed over time. They found a significant association between perceived and genuine change for spirituality only. In addition, Frazier and colleagues (2009) found that people tend to overestimate personal development when directly asked. Jayawickreme and Blackie (2014) argued that to determine to which extent an individual has changed because of a past life event, multiple cognitive steps have to be made. First, to give a correct estimation of personal change, the person has to evaluate the current standing of the domain, for example, the current quality of their relationships. They then have to recall their standing on the domain before the major life event, and compare the current and the past standing to estimate the degree of change. This is especially challenging, since many studies on major life events have their first measurement time point months or even years after the event. In the last step, the person has to estimate how much of the change between these two time-points can be attributed to this specific life event, versus other experiences in that time. Taken together, the complexity of post hoc ratings of psychological change makes it unlikely that individuals are able to provide a valid estimate of the actual amount of change they have experienced.

Finally, the growing number of studies that show positive associations of self-reported growth to anxiety (Carboon, Anderson, Pollard, Szer, & Seymour, 2005), intrusive rumination (Danhauer et al., 2013; Lowe, Manove, & Rhodes, 2014), and posttraumatic stress (Lowe et al., 2014) cast doubt on the existence of beneficial changes after trauma. As early as 2006, Park and Helgeson (2006) concluded that an important endeavor for future research would be to clearly distinguish the perception of growth from genuine change. However, because most research in this field still relies on self-perceived changes, a critical question has remained unanswered until now: Is there genuine growth after major life events?

In this meta-analysis, we focused on studies that longitudinally measured the subdomains of posttraumatic and postecstatic growth as a methodological approach to assess genuine growth independent from the post hoc self-perception of change. Hence, we use the term "genuine growth" when individuals show an increase of psychological functioning after the event, which expresses itself as differences in self-reports between measurement time points.

Coyne and Tennen (2010) urged researchers in the field to step back from bad research practices and to underpin their claims with appropriate methodological approaches. To measure growth independently from the post hoc self-perception of change and to widen the scope of possible growth domains, we took into account one additional psychological construct: psychological well-being (PWB; Ryff, 1989). PWB is a well-investigated taxonomy of human thriving in the context of crises, including the six domains: self-acceptance, environmental mastery, autonomy, positive relations with others, purpose in life, and personal growth (Joseph et al., 2012). Joseph and Linley (2005) proposed that posttraumatic growth can be conceptualized as increases in psychological well-being that occur as a consequence of adjusting to threatening events. It would be likely to assume that if genuine growth does

exist apart from the subdomains of posttraumatic or postecstatic growth, it would be in the domains of PWB.

## The Present Meta-Analysis

For more than two decades, research has been conducted with the goal of understanding positive consequences of major life events. However, most of this research has had a cross-sectional design and a post hoc approach, in which the first assessment was applied after the event took place. In addition, even the few longitudinal studies mostly relied on measuring self-perceived change. Accordingly, previous meta-analyses on posttraumatic growth were exclusively based on cross-sectional research (Prati & Pietrantoni, 2009; Vishnevsky, Cann, Calhoun, Tedeschi, & Demakis, 2010) and some even actively excluded longitudinal studies (Sawyer, Ayers, & Field, 2010). With this approach, important aspects such as the timing of the on-set of growth and its degree of change over time were not investigated. Additionally, all existing meta-analyses were based on studies that operationalized growth through instruments which rely on self-perceived growth, or even excluded studies that did not use the PTGI or SRGS to assess psychological change (e.g., Vishnevsky et al., 2010). Hence, the necessity to distinguish between genuine change and cognitive distortions, as suggested by Park and Helgeson (2006), has not been addressed.

The present meta-analysis is the first large-scale systematic review of longitudinal studies on genuine posttraumatic, as well as postecstatic growth. To distinguish authentic from illusionary change, it only includes studies that investigated major life events, with the target outcomes measured repeatedly over time and which did not rely on post hoc measures of self-perceived change.

It addresses multiple open questions in the study of beneficial changes that follow major life events. First, it tries to answer the general question of whether there is genuine growth after life events. Jayawickreme and Blackie (2016) reviewed the literature on the prevalence of PTG and found that the experience of self-perceived PTG is fairly common, with 58% to 83% of participants reporting growth. It should therefore be possible to investigate growth with a between-person approach, since positive changes experienced by the majority of people should lead to increases of sample means over time.

Second, because all meta-analyses on growth focused exclusively on traumatic experiences, the question of whether beneficial psychological change can also occur after positive and ambivalent experiences remains unanswered. Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) argued that negative life events have a stronger impact on our lives than positive life events. Meanwhile, there is no comprehensive meta-analysis known to the authors that has tested this assumption across life events. Therefore, we systematically investigated whether negative, positive, and ambivalent events differ in the extent to which they lead to beneficial change.

Finally, Tedeschi and Calhoun (1996) as well as Park et al. (1996) defined fixed subdomains of posttraumatic growth (relationships, openness for new possibilities, personal strengths, spirituality, and appreciation of life) and stress-related growth (changes in coping skills, personal, and social resources). Both research groups derived these subdomains from reviewing previous literature, talking to traumatized patients, and using focus groups. Subsequent research focused primarily on these psychological outcomes and neglected the possibility of growth in other psychological areas. The present meta-analysis aims to investigate whether psychological growth is limited to the known subdomains of posttraumatic and postecstatic growth, or whether it also occurs in other psychological areas. We therefore additionally included those subdomains of postecstatic growth and psychological well-being as outcome variables, which were originally not defined as subdomains of posttraumatic growth, including self-esteem, meaning in life, self-acceptance, autonomy, and mastery.

# Method

## Literature Search Strategy

Research on major life events and their impact on human development is conducted in various fields, including psychology, sociology, and medicine. To retrieve as many studies as possible, a variety of different databases was used for the literature search, namely: PsycINFO, Pubmed, Academic Search Premier, ERIC, Medline, and SocINDEX. These databases were either searched one by one or via the EBSCO platform to allow a simultaneous search in multiple databases at a time. Titles and abstracts of articles were examined to determine whether the consequences of major life events were investigated. For those studies that investigated changes after major life events, full text versions were obtained and checked for eligibility.

We conducted an additional hand search in various forms. First, reference lists of included articles were checked. Second, during the general coding process 1752 authors were asked to provide missing data of their studies. An additional 73 authors received up to three e-mails if the missing data were necessary to include the publication. In all e-mails, we also asked for additional published or unpublished research that might fit into our work. Through these processes, 124 additional studies could be retrieved. Despite the intensive efforts to obtain unpublished research, only two unpublished studies could be included. This number is comparable with the findings of other meta-analyses that were based on longitudinal studies (e.g., Luhmann, Hofmann, Eid, & Lucas, 2012) and explainable by the fact that costly and time-consuming long-term studies are more likely to be published than cross-sectional data.

In addition, the study had to be in English or German to be included in the coding process. The literature search started in September 2013, included publications from 1990 onward, and was completed in December 2014.[1] Figure 1 shows a flowchart of the literature search and its outcomes.

[1] Even though a meta-analysis should also aim to include the most recent studies, the very time-consuming methodological approach of the present meta-analysis made this impossible. Only a few studies directly investigated posttraumatic and postecstatic growth or psychological well-being longitudinally with independent measures. Hence, we could not limit the literature search to these terms, but had to review every study that investigated one of the 12 subdomains, including self-esteem and social relationships. This led to more than 200,000 initial hits that had to be checked in the following years, in which, of course, thousands of new articles were published.

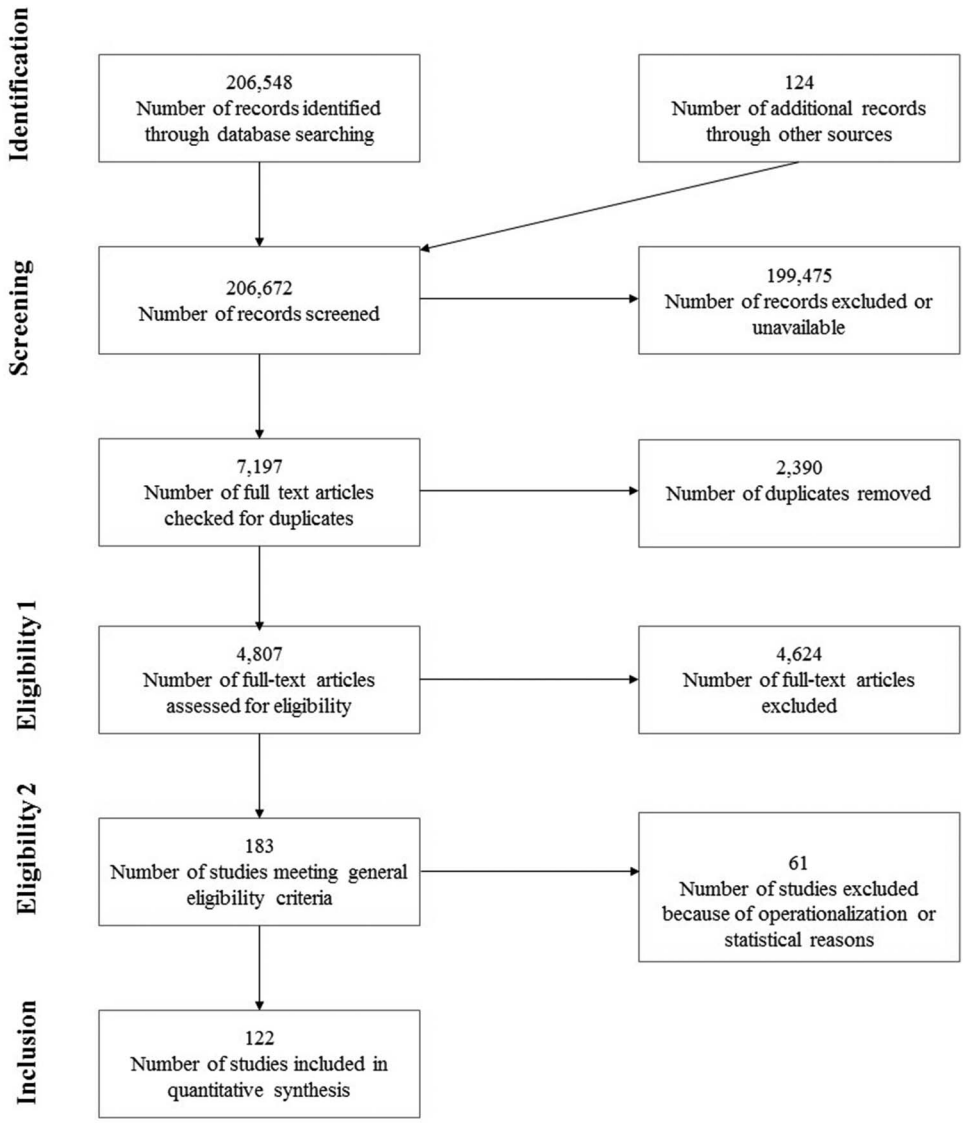


*Figure 1.* Flowchart of literature search.

## Bias Analyses

Meta-analyses can be influenced by the fact that statistically significant results are more likely to be published, which can result in an overestimation of effects sizes. In cross-sectional meta-analyses, researchers usually investigate publication biases by plotting effect sizes of included studies on their standard errors in funnel plots. Asymmetric funnel plots can be an indication of possible publication biases (Egger, Davey Smith, Schneider, & Minder, 1997). However, because the present meta-analysis is based on longitudinal studies, the effect sizes as well as the sample size depend on the timing of the measurement. Therefore, funnel plots may give a misleading indication of publication bias. In addition, deviations from funnel shapes can have multiple reasons apart from publication bias, including flawed methodology, true heterogeneity, or chance (Egger et al., 1997). We therefore estimated possible publication biases using the regression approach by Egger et al. (1997) which has been used to detect publication bias in other longitudinal meta-analyses (e.g., Luhmann et al., 2012). Specifically, we regressed effects sizes on the sample size and controlled for the time lag between event and measurement time point (see Egger et al., 1997). In the absence of publication bias, the effect sizes should not significantly vary as a function of the sample size. The results of these bias analyses are depicted in Table 1.

The relation between effect size and sample size was not significant for most outcomes. Significant regression coefficients were found for meaning, mastery (prospective), and self-esteem (prospective). Hence, the results for these three cases might be biased. It is important to point out that the directionality of the effects differed across outcomes. Relative to larger samples, smaller samples tended to provide smaller effect sizes for mastery and meaning and greater effect sizes for self-esteem.

Table 1
*Bias Analysis: Results of a Multiple Regression Controlling for Time Since Event (Time Lag)*

| Variable | Estimate | *SE* | Est./*SE* | *p* | Estimate | *SE* | Est./*SE* | *p* |
|---|---|---|---|---|---|---|---|---|
| | Meaning prospective | | | | Meaning post hoc | | | |
| Sample size | −.604 | .277 | −2.183 | .029 | −.411 | .118 | −3.481 | .001 |
| Growth | −.265 | .291 | −0.910 | .363 | −.205 | .131 | −1.563 | .118 |
| Time lag | −.111 | .125 | −0.885 | .376 | .025 | .195 | 0.130 | .897 |
| | Spirituality prospective | | | | Spirituality post hoc | | | |
| Sample size | −.424 | .234 | −1.811 | .070 | .033 | .162 | 0.202 | .840 |
| Growth | −.597 | .224 | −2.666 | .008 | −.155 | .105 | −1.483 | .138 |
| Time lag | .394 | .169 | 2.327 | .020 | −.244 | .129 | −1.895 | .058 |
| | Social relationships prospective | | | | Social relationships post hoc | | | |
| Sample size | −.046 | .036 | −1.275 | .202 | .049 | .077 | 0.644 | .520 |
| Growth | −.084 | .073 | −1.153 | .249 | −.088 | .076 | −1.154 | .248 |
| Time lag | .335 | .118 | 2.843 | .004 | .305 | .213 | 1.434 | .152 |
| | Mastery prospective | | | | Mastery post hoc | | | |
| Sample size | −.460 | .199 | −2.309 | .021 | — | — | — | — |
| Growth | −.776 | .608 | −1.276 | .202 | | | | |
| Time lag | 1.138 | .631 | 1.804 | .071 | — | — | — | — |
| | Self-esteem prospective | | | | Self-esteem post hoc | | | |
| Sample size | .159 | .076 | 2.078 | .038 | −.087 | .073 | −1.183 | .237 |
| Growth | .070 | .046 | 1.535 | .125 | −.042 | .029 | −1.454 | .146 |
| Time lag | .054 | .039 | 1.379 | .168 | −.027 | .095 | −0.279 | .780 |

*Note*. Reported are the standardized regression coefficients. Dependent variables are the effect sizes of the meta-analysis. Sample size: Sample size of the study; Growth: Dummy variable that indicates whether the term *growth* was used in the title, abstract, or keywords; Time-lag: Time lag between event and measurement time point.



Another critical bias in growth research lies in the focus on positive change process, which might make it more likely that results which indeed reveal a positive transition process will be published. Therefore, we coded publications based on whether they explicitly investigated growth following major events, as indicated by using the term "growth" in the title, abstract, or keywords. This applied to 17 of the 122 publications. We added this variable to the bias regression model to investigate whether effect sizes varied systematically as a function of the focus of the study. The regression coefficient of this variable was nonsignificant for all outcomes except for prospective studies focusing on spirituality. Relative to studies that did not focus on growth, studies focusing on growth tended to provide smaller (not, as expected, larger) effect sizes for spirituality.

## Search Terms

The literature search aimed to identify research which investigated positive consequences of major life events, which can be defined as critical experiences that mark a transition (Elder, 1977) or turning point (Tavernier & Willoughby, 2012) in one's life course. A comprehensive list of life events was combined with the terms "posttraumatic growth," "postecstatic growth," and "PWB" as well as the subdomains of these three key constructs. In the search process, the list of life events separated by <or> was combined with <and> with each outcome variable. A list of all search terms is included in the supplemental material. Table 2 provides a comprehensive overview of all life events reported in studies that were found in the search process, sorted by valence. Table 3 shows the outcome variables. Please note that the list of life events in Table 2 is more extensive than the initial search list, because the literature search revealed studies investigating a broader array of events.

The search and coding was realized by one of the authors and six student assistants. The student assistants received special training by Judith Mangelsdorf based on a comprehensive coding manual prior to the search process. This process was accompanied by meetings in which uncertainties could be discussed.

Because of the vast number of hits found with the original search terms, some alterations were applied to specify the results. The original command was specified to not show studies that only included the search terms in the form "purpose of the study," "strengths of the study," and "meaning of the results."

## Study Eligibility

Study eligibility was verified to ensure the appropriateness and relevance of studies found in the search process. Initially, all files that were positively evaluated through title and abstract screening ($n$ = 4,289) were checked for meeting the following inclusion criteria.

**Quantitative data.** Books, qualitative publications, or purely theoretical articles were excluded from the meta-analysis, because they did not provide the necessary data to calculate effect sizes.

**Longitudinal studies that provide estimates of psychological target outcomes over time.** One of the major disagreements in the research field of postevent growth evolves around the question

Table 2
*Identified Life Events Sorted by Valence and Life Domain*

| Event cluster | Positive | Ambiguous | Negative |
|---|---|---|---|
| General family-related events | 1 = Positive life event | 14 = Major life event | 21 = Negative event |
| | 2 = Falling in love | | |
| | 3 = Marriage, wedding | 15 = Child leaving home | 22 = Divorce, marital separation |
| | 4 = Childbirth, birth, delivery, labor confinement | | 23 = Dying, death, end of life |
| | | | 24 = Bereavement |
| | | | 25 = Death of a family member |
| | | | 26 = Parental bereavement by suicide |
| | | | 27a = Parental bereavement through sudden illness |
| | | | 27b = Parental bereavement through long-term illness |
| | | | 28 = War related bereavement |
| | | | 29 = Accident-related bereavement |
| | | | 30 = Parental bereavement |
| | | | 31 = Sexual sibling abuse |
| | | | 32 = Psychological sibling abuse |
| | | | 33 = Physical sibling abuse |
| | | | 34 = Partner of cancer victim |
| | | | 35 = Emotional child abuse |
| | | | 36 = Child neglect |
| | | | 37 = Failed attempt at in vitro fertilization |
| Friendship-related events | 5 = Meeting an inspiring person/ soul mate/ Idol | | 38 = Death of a friend |
| Physical events | | | 39 = Rape |
| | | | 40 = Sexual molestation, physical assault, abuse |
| | | | 41 = Accident |
| | | | 42 = Physical attack, robbery |
| | | | 43 = War, combat, battle, deployment |
| | | | 44 = Prisoner of war |
| | | | 45 = Chronic illness |
| | | | 46 = Cancer |
| | | | 46a = Breast cancer |
| | | | 46b = Cancer treatment or surgery |
| | | | 47 = Stroke |
| | | | 48 = Being spouse of a stroke victim |
| | | | 49 = Heart attack |
| | | | 50 = HIV |
| | | | 51 = Acquired brain injury |
| | | | 52 = Spinal cord injury |
| | | | 53 = Ilizarov limb surgery |
| | | | 54 = Abortion |
| | 6 = Aesthetic surgery | | |
| | | 16 = Bone marrow transplantation | |
| | | 17 = Stem cell transplantation | |
| | | 18 = Disclosure of traumatic life event | |
| | | 19 = Cancer remission | |
| Natural events | | | 55 = Natural disaster (not specified) |
| | | | 56 = Earthquake |
| | | | 57 = Flood |
| | | | 58 = Volcanic eruption |
| | | | 59 = Tsunami |
| | | | 60 = Tornado, hurricane |
| Work-related events | 7 = Graduation, graduating | 20 = Retirement | 61 = Unemployment, being laid off |
| | 8 = Employment, being hired | | |
| | 9 = Reemployment | | |
| | 10 = Goal achievement, achieving a long-term goal | | |
| Unclassified events/Other | 11 = Spiritual experience, spiritual awakening | | |
| | 12 = Living a dream, life dream | | |
| | 13 = Lottery win | | |



of whether self-reported perceived growth reflects genuine growth or is a mere coping strategy (Frazier et al., 2009; Maercker & Zoellner, 2004; McFarland & Alvaro, 2000; Park & Helgeson, 2006). To account for the potential distortion caused by retrospective evaluations, which rely on self-perceived change, only longitudinal data of independent measures were included in the meta-analysis.

**Positive outcomes.** Only studies that assessed positive outcomes of major life events were eligible. Research on traumatic or highly positive experiences which focused solely on possible negative outcomes, such as depression or posttraumatic stress, were not included. To narrow the scope of our meta-analysis, positive outcomes were restricted to PTG, postecstatic growth, and psychological wellbeing, as well as the respective subdomains of these variables. Other possible positive consequences of major life events, such as self-efficacy, were not included.

**Statistical sufficiency.** To calculate effect sizes, sufficient descriptive statistics were needed. This included means, the standard deviation of the first measurement time point, the number of participants, and the retest correlation between time points. When these data were not provided in the article, authors were contacted via e-mail and asked to send the missing information. The minimum requirements for inclusion were the number of participants and means for all time points. If authors did not answer, or were

Table 3
*Outcome Variables*

| Posttraumatic growth (PTG) | Psychological well-being (PWB) | Postecstatic growth (PEG) |
|---|---|---|
| 1 = Positive relationships | 1 = Positive relationships | 1 = Positive relationships |
| 2 = Sense of Spirituality | 3 = Purpose in life/meaning | 2 = Sense of spirituality |
| 4 = Personal strengths | 7 = Self-acceptance | 3 = Meaning in life |
| 5 = Priorities in life/New possibilities | 8 = (Environmental) mastery | 12 = Self-esteem |
| 6 = Appreciation of life | 9 = Personal growth | |
| | 10 = Autonomy | |
| | 11 = Psychological well-being (general) | |



not able to provide the necessary statistical information, the studies had to be excluded, even if they met the other criteria.

**No professional interventions.** Studies which investigated professional interventions, such as trauma therapy or other interventions that might influence the occurrence or extent to which participants experience psychological changes, were excluded from the meta-analysis. This criterion was applied to disentangle the effects that were based on specific interventions from those that were a direct consequence of the life event.

**Unduplicated data.** When the coding process was finished, we checked the remaining articles for duplicated data. Some studies that were based on longitudinal panels had to be excluded, since they used the same data. If more than one publication used the same data, the study that included more time points was prioritized. If two or more of these studies reported the same number of time points, the publication with the largest sample size was included.

Studies which met all criteria ($n$ = 122) were coded according to the coding manual. Articles that failed to meet at least one of the criteria provided above were excluded from further coding and following analyses.

## Coding

Before coding, a standardized coding manual and coding sheet were developed and tested to ensure that the coding process was sufficiently standardized. Due to the large number of records identified through initial database searching ($N$ = 206,548), Judith Mangelsdorf and six student assistants worked over the course of two years to screen all records, check for eligibility criteria, and code the remaining studies. A large range of publication characteristics were coded, including specific information about the study, the event investigated, the sample, and the outcome (see Table 3). Forty-seven randomly chosen studies were double-coded to calculate the interrater reliability between different raters. The interrater agreement of categorical variables was computed with the Kappa coefficient (Cohen, 1960). The interrater reliability of continuous variables was estimated using an intraclass correlation coefficient (ICC, agreement; Fleiss & Cohen, 1973) with total agreement of both raters (see Table 4). Most coded characteristics showed a good interrater reliability. Single items which showed a sufficient, but not good, interrater reliability and that were critical for the metaanalytical process (e.g., timing of the event) were triple checked in all publications by Judith Mangelsdorf. The item 'data source' showed the lowest interrater agreement with $\kappa$ = .60. This estimate was also found in other meta-analyses (e.g., Luhmann et al., 2012) and is usually attributed to an inconclusive distinction between self-report questionnaire and self-report interview in the study descriptions.

To examine whether negative and positive life events differ in their psychological impact, the valence of each life event was coded. We distinguished three valence categories: positive (e.g., marriage), negative (e.g., cancer diagnosis), and ambiguous (e.g., birth of a child with Down's syndrome). The coding was done by two independent raters and showed good interrater reliability ($\kappa$ = .92). A list of all life events and their complementary emotional valence is provided in Table 2. Note that, whereas there is a general perception of a certain event as desirable (positive) or undesirable (negative), the individual judgment of persons might differ.

## Computation of Effect Sizes

To estimate how effect sizes change as a function of time, we computed pairwise effect sizes which express the difference of the baseline assessment and each following time point (cf. Luhmann et al., 2012). The included studies varied in the timing of the first measurement time point. Two different study designs will be distinguished in all further analyses: prospective studies and post hoc studies.

Prospective studies first assessed the target variables before participants were confronted with the event. This study design allows investigating the direct effect of the life event on the outcome variable. However, because most major life events are unpredictable, only some studies are able to provide preevent data. Therefore, we also included longitudinal post hoc studies that first measured the target variable after the event took place. Although post hoc studies do not allow conclusions about the immediate change processes caused by the life event, they do provide insights about long-term progression.

For each sample, multiple effect sizes (number of time points – 1) were computed. As the standardized effect size, we chose the standardized mean difference: $(\bar{x}_B - \bar{x}_A)/s_A$. In contrast to the standardized mean gain it does not confound individual differences in change with mean-level change and tends to be more conservative (Morris & DeShon, 2002). To control for sampling bias, we adjusted the effect following the approach by Hedges and Olkin (1985). We abstained from adjusting effect sizes for (un)reliability (Hunter & Schmidt, 1990), since only some studies included sample-specific reliability estimates.

## Missing Data

During the coding process, 1,752 authors were asked to provide missing information about their studies, such as age, ethnicity, or

Table 4
*Interrater Agreement and Missing Data of Coded Characteristics*

| Level | Variable | Coding options | Missing% | IA |
|---|---|---|---|---|
| Publication | Year of publication | Metric | 0% | 1.00 |
| Publication | Nationality of participants | Categorical | 0% | .97 |
| Publication | Country in which the study was conducted | Categorical | 0% | .97 |
| Event | Type of event | Categorical (see Table 1) | 0% | .95 |
| Event | Timing of event | 1 = T1 before event<br>2 = T1 after event | 0% | .73 |
| Event | Valence | 1 = Positive event<br>2 = Negative events<br>3 = Ambiguous | 0% | .92 |
| Sample | Type of sample | 1 = Representative panel<br>2 = Convenient sample<br>3 = Students<br>4 = Clinical<br>5 = Children and adolescents<br>99 = Other | 1.6% | .78 |
| Sample | Number of participants with full data | Metric | 6.3% | .99 |
| Sample | Attrition | Metric (range: 0–1) | 3.2% | .99 |
| Sample | Proportion of men | Metric (range: 0–1) | 3.2% | .98 |
| Sample | Age (*M*) | Metric | 14.3% | 1.00 |
| Sample | Age (*SD*) | Metric | 46.0% | 1.00 |
| Sample | Predominant ethnicity | 1 = Caucasian<br>2 = Black<br>3 = Hispanic<br>4 = Native, Inuit<br>5 = Asian<br>6 = Mixed<br>99 = Others | 39.7% | 1.00 |
| Variable | General outcome structure | 1 = Posttraumatic growth<br>2 = Psychological wellbeing<br>3 = Only components were investigated | 1.1% | 1.00 |
| Variable | Specific outcome variable | Categorical (see Table 1) | 14.7% | .88 |
| Variable | Data source | 1 = Self-report questionnaire<br>2 = Self-report interview<br>3 = Self-report via ambulatory assessment<br>4 = Self-report day reconstruction method<br>5 = Observation<br>6 = Peer report<br>7 = Analysis of written reports<br>99 = Other data source | 4.2% | .60 |
| Variable | Scale | Categorical (more than 100 different scales) | 22.1% | .96 |
| Variable | Source of reliability estimate | 0 = Not reported<br>1 = Reference to another publication<br>2 = Calculated for sample of this study<br>3 = Calculated for sample of another study | 4.2% | .65 |
| Variable | Reliability estimate | Metric (range: 0–1) | 6.3% | .97 |
| Variable | Number of items in measure | Metric | 14.7% | 1.00 |
| Time point | Time point number | Metric | 4.2% | .98 |
| Time point | Design | 1 = Prospective<br>2 = Post hoc | 2.1% | .73 |
| Time point | Time between baseline measure and event (mean) | Metric | 31.3%[a] | 1.00 |
| Time point | Time between baseline measure and event (lower range) | Metric | 56.3%[a] | .82 |
| Time point | Time between baseline measure and event (upper range) | Metric | 70.8%[a] | .97 |
| Time point | Sample size | Metric | 2.0% | 1.00 |
| Time point | Mean independent variable | Metric | 9.3% | 1.00 |
| Time point | Standard deviation independent variable | Metric | 24.0% | 1.00 |

*Note*. IA = Interrater agreement. The reported values are intraclass correlation coefficient for metric variables and Cohen's kappa correlation coefficient for categorical variables.
[a] The time lag of events and measure was either provided as mean or range. Whereas some studies reported only mean or range, others provided multiple information.

percentage of male participants. If authors were not able to provide the data, they were coded as missing. Three statistics are mandatory to calculate effect sizes and sampling variance: means or mean differences, standard deviations, and retest correlations. Some studies did not report sufficient statistics to calculate the mean-level change or the sampling variance. First, the authors of these studies ($n = 73$) were contacted via e-mail and asked if they could provide the missing information. If authors did not respond,

reminding e-mails were sent four and eight weeks after the first request. If the corresponding author was not able to provide the data, we contacted coauthors to collect the missing information. Some authors ($n = 9$) did not reply to our requests at all. About half ($n = 38$) of the contacted authors were unable to provide or unwilling to share the missing data. For the remaining 26 studies (35.62%), we received answers containing all requested information.

If the authors were not able to provide this missing information or did not respond, we tried to substitute or estimate the missing values needed for effect size calculation. To substitute a missing standard deviation, we searched for a comparable study that (a) investigated the same life event longitudinally, (b) assessed the same outcome variable using the same measure, and (c) investigated a comparable population. A list of all included studies for which standard deviations had to be substituted through estimates obtained through other studies is included in the supplemental material. If the retest correlation was not reported in the study, provided by the corresponding author, or calculated through other given statistical information, it had to be estimated. Borenstein, Hedges, Higgins, and Rothstein (2009) suggested replacing missing retest correlations with the median correlation of the studies with full data (for a comparable meta-analytic approach, see Luhmann et al., 2012). For 48.4% of the effects, the retest correlation was substituted with $r = .67$ which is the median correlation in all complete data sets. To control for possible effects of substitution and estimation of missing values on the meta-analytic models, we conducted a series of systematically varied sensitivity analyses.[2]

## Weighting of Effect Sizes and Study Quality

Lipsey and Wilson (2001) proposed to weight effect sizes with the inverse of the sampling variance. The sampling variance was calculated by Formula 1. It includes the number of paired observations ($n$), retest correlation ($\rho$), the bias function $c(df)$, which is shown in Formula 2, and the population effect size ($\delta_{IG}$; Morris & DeShon, 2002).

$$\left[\frac{2(1-\rho)}{n}\right]\left(\frac{n-1}{n-3}\right)\left[1+\frac{n}{2(1-\rho)}\,\delta_{IG}^2\right]-\frac{\delta_{IG}^2}{[c(df)]^2} \quad (1)$$

$$c(df) = 1 - \frac{3}{4df - 1} \quad (2)$$

If sample sizes differed across time points, the smallest sample size was taken into account. Only longitudinal studies, which investigated at least one of the target outcome variables, focused on one specific event, and assessed change through independent measures were included. Because of these strict eligibility criteria, lower-quality studies were a priori excluded from the meta-analysis. Therefore, we abstained from further artificial quality ratings. The main quality difference was given by the sample size at each time point, which is already considered in the weighting through sample variance and bias function.

## Description of Meta-Analytical Methods

**Random effect model.** This meta-analysis unites studies which investigate different life events. Even if these events shared the same valence, we could not assume that all studies estimate the same true effect size (Borenstein et al., 2009). Hence, we analyzed the data with random-effects models. Specifically, we applied a random-effects structural equation model (Cheung, 2008) which allowed us to use the Mplus cluster option (Type = complex) to account for dependencies among effect sizes stemming from the same studies (see Luhmann et al., 2012 for a comparable statistical approach and the appendix for model equations).

Because of the large number of different events, it was not possible to conduct separate analyses for every single event. To account for possible variations in the effects of different kinds of life events, we included 'kind of event' as a covariate in the analytical models and distinguished between family-related, work-related, physical, natural, and other events.

**Interpretation of model parameters.** In the meta-analytic model, the effect sizes were regressed on the time since the event (unit = 1 month). Slope coefficients represent the rate of change of effect sizes over time, and the intercept reflects the predicted effect when all predictors equal zero (for a similar meta-analysis see Luhmann et al., 2012). Because it is likely that people show the strongest reaction to a major life event directly afterward and that growth is not linear, but stabilizes at a certain level, a natural log model was chosen (time = log[months + 1]) in which time was logarithmically transformed.

Coefficients of prospective studies are denoted with $b$, whereas coefficients of post hoc studies are denoted with $c$. Figure 2 depicts a prototypical course of effect sizes for a prospective study. On the left side, a logarithmic curve is depicted that exemplifies growth. After a negative initial reaction $b_0$ a positive slope $b_1$ follows. The positive change curve exceeds the previous level of the outcome variable. On the right side of Figure 2 the prototype of an recovery curve is depicted. The initial reaction to the event is negative as well, and followed by an increase of psychological functioning. However, the effect sizes do not exceed the preevent level and would therefore be interpreted as recovery and not growth.

It is important to clearly distinguish the interpretation of the parameters of prospective and post hoc studies. In post hoc studies, the intercept $c_0$ does not indicate the initial effect of the event. Thus, only the slope of post hoc studies can be interpreted and provides insights into the sustainability of effects found in prospective studies.

In addition to time since the event, other variables were included. First, we introduced two dummy variables reflecting the valence of the event ($X_2$: 0 = negative, 1 = positive, 0 = ambiguous; $X_3$: 0 = negative, 0 = positive, 1 = ambiguous; negative was the reference category). These dummy variables reflect the extent to which the intercept of positive and ambiguous events, respectively, deviates from the intercept of negative events. In addition, the interaction between time and these dummy variables was estimated to test whether the rate of change differed among events of different valence.

[2] To investigate whether the substitution of standard deviations ($SD_s$) and the estimation of retest correlations ($r_e$) had an influence on the results, we included dummy variables in the meta-analytic models. The regression coefficients for most outcomes showed that the substitution of standard deviation and the estimation of rest-correlations had no significant influence. Significant negative regression coefficients were found for meaning prospective ($SD_s$) and self-esteem prospective ($r_e$). Significant positive regression coefficients were found for social relations post-hoc ($SD_s$) mastery post hoc, and meaning prospective ($r_e$). Thus, the results of these cases might be biased because of the missing data of included studies. The detailed results can be obtained from Judith Mangelsdorf.

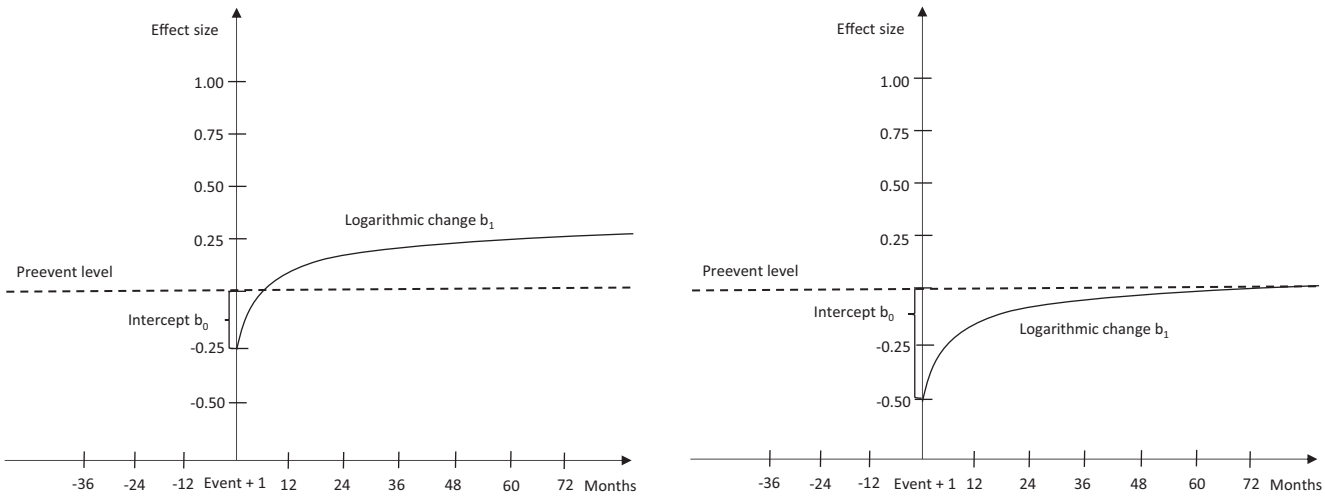


*Figure 2.* Prototypical course of effect sizes in prospective studies. The left change curve depicts personal growth the right change curve recovery.

Second, we included dummy variables that reflected the life domain of each event: family-related events ($X_6$), natural events ($X_7$), work-related events ($X_8$), and unclassified events ($X_9$). Physical events were chosen as the reference category because they were most common. Furthermore, we included the time lag between the first measurement occasion and the event as a covariate. However, because the effects of this control variable were not significant and not of central interest in this paper, we excluded the variable from the final models.

## Results

In total, 122 studies yielding 364 effect sizes with a total of $N$ = 98,436 participants were included. Table 5 shows the number of publications with specific target outcomes sorted by valence. Descriptive statistics are provided in Tables 6 and 7. Because of the large number of studies and effects across time, a comprehensive list of all studies and their descriptive details is provided in the supplemental material and not in the article.

## Descriptive Overview

In this section, we provide a cumulative overview of the characteristics of all included studies, followed by specific analyses for the different outcome variables.

**Study characteristics.** About half of the included publications ($n$ = 60, 49.2%) had a prospective design, providing pre- and postevent data. The effect sizes of these studies represent the direct effect of the event on the outcome variables and allow conclusions about posttraumatic and postecstatic growth. The remaining $n$ = 62 studies (50.8%) had a post hoc design and quantified the change processes following the event. These studies give additional information about long-term trends, but do not allow conclusions of increases or decreases that go beyond the preevent level. In total 28 studies (22.95%) had a control group design and allowed to compare the development of participants who encountered specific events with those, who did not. The results of these studies are further addressed below.

Table 5
*Number of Publications With Specific Target Outcomes Sorted by Valence*

| Outcome variable | Positive valence | Negative valence | Ambiguous valence | Total |
|---|---|---|---|---|
| 1 = Positive relationships | 13 | 21 | 4 | 38 |
| 2 = Meaning in life | 1 | 17 | 4 | 22 |
| 3 = Sense of spirituality | 0 | 21 | 3 | 24 |
| 4 = Personal strengths | 0 | 3 | 0 | 4 |
| 5 = Priorities in life | 0 | 0 | 0 | 0 |
| 6 = Appreciation of life | 0 | 0 | 0 | 0 |
| 7 = Self-acceptance | 1 | 1 | 0 | 2 |
| 8 = Environmental mastery | 3 | 4 | 2 | 9 |
| 9 = Personal growth | 0 | 1 | 0 | 1 |
| 10 = Autonomy | 1 | 1 | 2 | 5 |
| 11 = Self-esteem | 17 | 32 | 12 | 61 |
| 12 = Psychological well-being | 1 | 1 | 1 | 3 |

*Note*. The summed number of studies in Table 5 exceeds the total number of included publications in the meta-analysis because some publications reported data on more than one target outcome.

Table 6
*Descriptive Statistics of Included Studies for the Outcomes Positive Relationships, Meaning, Spirituality, Strengths, Priorities in Life, and Self-Acceptance*

| | Positive relationships | | | Meaning | | | Spirituality | | | Strengths | | | Priorities in life | | | Self-acceptance | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Measure | P | N | A | P | N | A | P | N | A | P | N | A | P | N | A | P | N | A |
| *N* of studies | 13 | 21 | 4 | 1 | 17 | 4 | — | 21 | 3 | — | 3 | — | — | — | — | 1 | 1 | — |
| *N* of samples | 26 | 25 | 5 | 2 | 18 | 4 | — | 25 | 3 | — | 3 | — | — | — | — | 2 | 1 | — |
| *N* of effects | 35 | 36 | 8 | 6 | 31 | 4 | — | 61 | 3 | — | 5 | — | — | — | — | 2 | 1 | — |
| Publication year (Md) | 2010 | 2006 | 2004 | 2012 | 2012 | 2010 | — | 2011 | 2012 | — | 2011 | — | — | — | — | 2011 | 2009 | — |
| Studies conducted in the U.S. (%) | 38.5 | 57.1 | 50.0 | .0 | 82.4 | 50.0 | — | 81.0 | 100.0 | — | 100.0 | — | — | — | — | .0 | 100.0 | — |
| Medical studies (%) | .00 | 77.3 | 75.0 | .0 | 76.5 | 75.0 | — | 85.7 | 100.0 | — | 33.3 | — | — | — | — | .0 | 100.0 | — |
| *N* of time points (mean) | 2.46 | 2.43 | 2.75 | 4 | 2.53 | 2.0 | — | 3.19 | 2.00 | — | 2.67 | — | — | — | — | 2.0 | 3.0 | — |
| Prospective studies (%) | 84.6 | 28.6 | 100.0 | 1 | 23.5 | 100.0 | — | 28.6 | 66.7 | — | 33.3 | — | — | — | — | .0 | 100.0 | — |
| Timing of T1 (mean in months) | −11.52 | −17.34 | −6.02 | −.3 | −19.75 | −1.76 | — | −14.09 | −9.02 | — | −1.00 | — | — | — | — | — | −48.00 | — |
| Post hoc studies (%) | 15.4 | 71.4 | .0 | .0 | 76.5 | .0 | — | 71.4 | 33.3 | — | 66.7 | — | — | — | — | 100.0 | .0 | — |
| Timing of T1 (mean in months) | 1.50 | 29.96 | — | — | 27.67 | — | — | 17.63 | .03 | — | 4.00 | — | — | — | — | 2.00 | — | — |
| *N* of participants at T1 | 68,954 | 8,754 | 274 | 384 | 4,502 | 870 | — | 4,430 | 2,035 | — | 372 | — | — | — | — | 198 | 207 | — |
| 1 - Attrition rate | 86.75 | 83.85 | 76.87 | 88.35 | 91.43 | 100.0 | — | 83.8 | 87.72 | — | 64.41 | — | — | — | — | 100.00 | 100.0 | — |
| Men (%) | 42.8 | 35.2 | 66.7 | 35.9 | 30.3 | 48.4 | — | 27.05 | 34.4 | — | 50.0 | — | — | — | — | .0 | 37.4 | — |
| Age (mean) | 36.32 | 53.11 | 46.5 | 27.48 | 46.53 | 48.16 | — | 50.52 | 57.39 | — | 56.45 | — | — | — | — | — | 63.00 | — |
| Age range | 19.01–59.10 | 6.50–75.10 | 26.00–67.00 | 17.94–56.00 | 6.50–75.10 | 17.00–74.15 | — | 16.58–72.10 | 52.10–61.13 | — | 51.90–61.00 | — | — | — | — | — | — | — |
| *N* of items in scale (mean) | 7.75 | 23.71 | 5.75 | 9.00 | 8.57 | 25.00 | — | 11.13 | 12.00 | — | 3.00 | — | — | — | — | 126 | — | — |
| Reliability estimate based on current sample (%) | 72.7 | 54.5 | .25 | 100.0 | 70.6 | 50.0 | — | 47.6 | 33.3 | — | 100.0 | — | — | — | — | 100.0 | 100.0 | — |
| Reliability estimate T1 | .81 | .81 | .86 | .79 | .81 | .87 | — | .79 | .86 | — | .62 | — | — | — | — | .88 | .54 | — |
| *N* of family-related events | 7 | 2 | 1 | — | 3 | — | — | 2 | 1 | — | 2 | — | — | — | — | — | — | — |
| *N* of physical events | 2 | 15 | 2 | — | 12 | 3 | — | 18 | 2 | — | 1 | — | — | — | — | — | 1 | — |
| *N* of natural events | — | 2 | — | — | 1 | — | — | 1 | — | — | — | — | — | — | — | — | — | — |
| *N* of work-related events | 4 | — | 1 | 1 | — | 1 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| *N* of unspecified events | — | 2 | — | — | 1 | — | — | — | — | — | — | — | — | — | — | — | — | — |

*Note*. P = positive event; N = negative event; A = ambiguous event. Some studies provided data of different samples or measured more than one outcome variable. That is why the total number of samples and participants is lower than the cumulative number across all outcome variables. Number of participants included in the meta-analysis $N = 98{,}436$.

Table 7
*Descriptive Statistics of Included Studies for the Outcomes Mastery, Growth, Autonomy, Self-Esteem, and Psychological Wellbeing*

| | Mastery | | | Growth | | | Autonomy | | | Self-esteem | | | Psychological well-being | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Measure | P | N | A | P | N | A | P | N | A | P | N | A | P | N | A |
| *N* of studies | 3 | 4 | 2 | — | 1 | — | 1 | 1 | — | 17 | 32 | 12 | 1 | 1 | 1 |
| *N* of samples | 7 | 5 | 3 | — | 1 | — | 2 | 1 | — | 24 | 39 | 12 | 1 | 1 | 1 |
| *N* of effects | 8 | 13 | 3 | — | 1 | — | 6 | 1 | — | 47 | 68 | 21 | 1 | 2 | 1 |
| Publication year (Md) | 1997 | 2006 | 2008 | — | 2009 | — | 2012 | 2012 | — | 2000 | 2004 | 2005 | 2011 | 2004 | 2013 |
| Studies conducted in the U.S. (%) | 66.6 | 75.0 | 100.0 | — | 100 | — | .0 | .0 | — | 52.9 | 50.0 | 25.0 | 100.0 | .0 | .0 |
| Medical studies (%) | .0 | 50.0 | .0 | — | .0 | — | .0 | 100.0 | — | .0 | 59.4 | 46.2 | .0 | 100.0 | .0 |
| *N* of time points (mean) | 2.33 | 3.5 | 2.0 | — | 2.0 | — | 4.00 | 2 | — | 2.47 | 2.78 | 2.67 | 2.00 | 3 | 2.00 |
| Prospective studies (%) | 100.0 | 75.0 | 100.0 | — | 100.0 | — | 100.0 | .0 | — | 70.6 | 18.8 | 91.7 | 100.0 | .0 | 100.0 |
| Timing of T1 (mean in months) | −7.01 | −20.01 | −20.05 | — | −48.00 | — | −.03 | — | — | −9.66 | −12.43 | −1.43 | −72.0 | — | — |
| | | | | | | | | | | | | | | | 6.00 |
| Post hoc studies (%) | .0 | 25.0 | .0 | — | .0 | — | .0 | 100.0 | — | 29.4 | 81.2 | 8.3 | .0 | 100.0 | .0 |
| Timing of T1 (mean in months) | — | .85 | — | — | — | — | — | .03 | — | .41 | 25.16 | 42.7 | — | .30 | — |
| *N* of participants at T1 | 797 | 380 | 192 | — | 207 | — | 384 | 194 | — | 6,465 | 7,242 | 1,974 | 1,728 | 66 | 90 |
| 1 - Attrition rate | 100.0 | 100.0 | 87.5 | — | 100.0 | — | 88.4 | 64.0 | — | 95.1 | 87.9 | 87.4 | 100.0 | 100.0 | 100.0 |
| Men (%) | 25.77 | 44.35 | 14.7 | — | 37.4 | — | 35.88 | 66.0 | — | 30.52 | 45.84 | 34.03 | 53.6 | 30.0 | 73.3 |
| Age (mean) | 40.31 | 51.68 | 74.15 | — | 63.0 | — | 27.48 | — | — | 25.79 | 50.34 | 35.13 | 53.70 | 57.0 | 57.90 |
| Age range | — | 14.40–71.60 | 46.20–74.15 | — | — | — | — | — | — | 17.94–30.00 | 8.43–75.10 | 17.00–62.00 | — | — | — |
| *N* of items in scale (mean) | 7.33 | 9.33 | 8.5 | — | 18 | — | 9.00 | 3.0 | — | 10.00 | 14.35 | 10.08 | 20.00 | 4.0 | 24.00 |
| Reliability estimate based on current sample (%) | 100.0 | 80.0 | 50.0 | — | .100 | — | 100.0 | — | — | 46.7 | 53.1 | 69.2 | 100.0 | .0 | 100.0 |
| Reliability estimate T1 | .83 | .71 | .71 | — | .54 | — | .79 | — | — | .81 | .81 | .81 | .88 | — | .90 |
| *N* of family-related events | 6 | — | 1 | — | — | — | — | — | — | 5 | 7 | 4 | — | 1 | — |
| *N* of physical events | 2 | 4 | 2 | — | 1 | — | — | 1 | — | — | 22 | 5 | — | — | — |
| *N* of natural events | — | 1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *N* of work-related events | 3 | — | 1 | — | — | — | 1 | — | — | 11 | 2 | 3 | 1 | — | 1 |
| *N* of unspecified events | 0 | 1 | — | — | — | — | — | — | — | 1 | 1 | — | — | — | — |

*Note.* P = positive event; N = negative event; A = ambiguous event. Some studies provided data of different samples or measured more than one outcome variable. That is why the total number of samples and participants is lower than the cumulative number across all outcome variables. Total number of participants of all included studies $N = 98{,}436$.

The majority of the publications came from the United States ($n$ = 66; 54.1%). Hence, results should be interpreted while considering that the majority of the effect sizes relied on Western, mostly American samples. Half of the included articles were medical studies investigating life changes after severe accidents, childbirth, or life-threatening illnesses in a clinical setting. On average, each study yielded 2.27 ($SD$ = 1.74) effects, comprised 1.26 ($SD$ = .56) samples, and had $M$ = 2.68 ($SD$ = 1.32) measurement time points. The first measurement time point of prospective studies was about 11 months ($M$ = 10.88, $SD$ = 17.66) before the event took place. In post hoc studies the first measurement was on average one and a half years ($M$ = 19.14, $SD$ = 28.65) after the event. 25.5% of all effect sizes ($n$ = 93) referred to positive life events, 63.7% ($n$ = 232) were based on negative life events, and 10.7% ($n$ = 39) on ambiguous life events. Therefore, the findings for posttraumatic growth are somewhat more comprehensive than those for postecstatic growth. Most studies ($n$ = 60) focused on the effects of physical life events such as accidents or severe illnesses. Family-related events ($n$ = 32), such as marriage, work-related ($n$ = 23), and natural events ($n$ = 4) were less often investigated. Three studies were included that did not belong to any of the categories mentioned above. In addition, the subdomains of posttraumatic and postecstatic growth have not been studied equally. Sufficient data for meta-analytic computations were available for five outcome variables, namely positive relationships, meaning in life, spirituality, mastery, and self-esteem. Descriptive analyses are provided for the remaining subdomains.

**Sample characteristics.** The meta-analysis included nine publications which were based on panels that aimed to provide data from representative samples. The effect sizes from these studies comprised the data of 70,218 persons (71.3% of all participants included in the meta-analysis). A relatively small percentage of the publications was based on convenient samples, which otherwise represent the majority of psychological studies. The average attrition rate was relatively low, with 12.22%. This circumstance has to be accounted for by the fact that many studies only reported data of participants who took part at all time points. Meanwhile, in most cases, the dropout was not systematic when reported. It is important to mention that in publications which investigated the psychological consequences of cancer or other life-threatening illnesses, dropout most frequently occurred because of severe worsening of the illness or death. In total, 10.7% ($n$ = 13) of the publications were based on ad hoc adult samples, and 6.6% ($n$ = 8) presented student samples. Meanwhile, many of the studies that investigated life events with negative emotional valence, stem from clinical samples ($n$ = 59, 48.4%). The mean age of the participants was 44.85 ($SD$ = 18.62; range: 6.50–75.10) years. Because of the large number of studies investigating motherhood and breast cancer, women are somewhat overrepresented (63.98%). In addition, the predominant ethnicity in the studies which provided data on the race of participants was white (47.5%). Despite the large number of samples ($n$ = 154) and participants, men (36.02%) were somewhat underrepresented in the included studies.

**Graphical overview.** Figure 3 shows the effect sizes and the change curves sorted by outcome. Some key constructs, such as relationships and self-esteem, have been studied in prospective as well as post hoc designs and provide data for life events with different emotional valences. However, no or few longitudinal studies were available for other constructs such as priorities in life, personal strengths, self-acceptance, personal growth, autonomy, and PWB.

In addition, the constructs differ in the time frames in which they have been studied. Autonomy, personal strengths, and environmental mastery have predominantly been investigated in the first months after the event, whereas self-esteem, spirituality, relationships, and meaning in life have been studied for periods up to 10 years.

## Social Relationships

With a total of 38 longitudinal studies and 56 samples, yielding 79 effect sizes and the data of $n$ = 77,982 participants, social relationships was one of the most intensively studied outcome variables. As some of the publications focused on female-specific experiences, such as breast cancer, men were somewhat underrepresented in the results (40.32%). Half (51.3%) of the longitudinal studies on social relationships were based on clinical samples, of people suffering from severe illnesses. Prospective ($n$ = 21, 55.3%; positive: $n$ = 11, negative: $n$ = 6, ambiguous: $n$ = 4) and post hoc ($n$ = 17, 44.7%; positive: $n$ = 2, negative: $n$ = 15) studies were fairly equally distributed. The first measurement time point was about one year before the event ($M$ = 12.14, $SD$ = 18.41, $Md$ = 2.43) for prospective studies and more than two years after the event ($M$ = 26.61, $SD$ = 66.01, $Md$ = 26.61) for post hoc publications. The average number of time points did not differ between prospective ($M$ = 2.48, $SD$ = .87) and post hoc studies ($M$ = 2.47, $SD$ = 0.72).

**Prospective studies.** Figure 4 (left) depicts the effect sizes of all prospective studies investigating social relationships longitudinally. The intercept for negative physical events was negative and significant ($b_0$ = −.48, 95% CI [−.84, −.11]). The initial reaction to positive ($b_2$ = −.08, 95% CI [−.39, .24]) and ambiguous life events ($b_3$ = .42, 95% CI [−.21, 1.04] was a decline of relationship quality, which was not significantly different from the initial effect of negative experiences.

Most effect sizes of positive life events below zero are based on studies which assessed the influence of childbirth on marital relationships. After the initial negative reaction, a significant positive trend emerged, which led to long-term positive effects, significantly increasing over time for all events ($b_1$ = .21, 95% CI [.07, .35]). As can be seen in Figure 4, this change continues for positive, negative, and ambiguous events beyond the preevent level of social relationships, indicating growth. The interaction of time and valence of events was not significant and therefore not included in the model.

Negative physical events were the reference category used to investigate if distinguishable kinds of life events differ in their impact on social relations. In studies with natural events, such as hurricanes, a more positive initial effect on social relationships than physical experiences ($b_7$ = .38, 95% CI [.11, .65]) was found. There was no significant difference between physical events, such as illnesses, and family- ($b_6$ = −.19, 95% CI [−.53, .14]) or work-related events ($b_8$ = .01, 95% CI [−.30, .33]).

**Post hoc studies.** The post hoc effect sizes showed a negative intercept ($c_0$ = −.60, 95% CI [−1.23, .03]), and a positive, but not

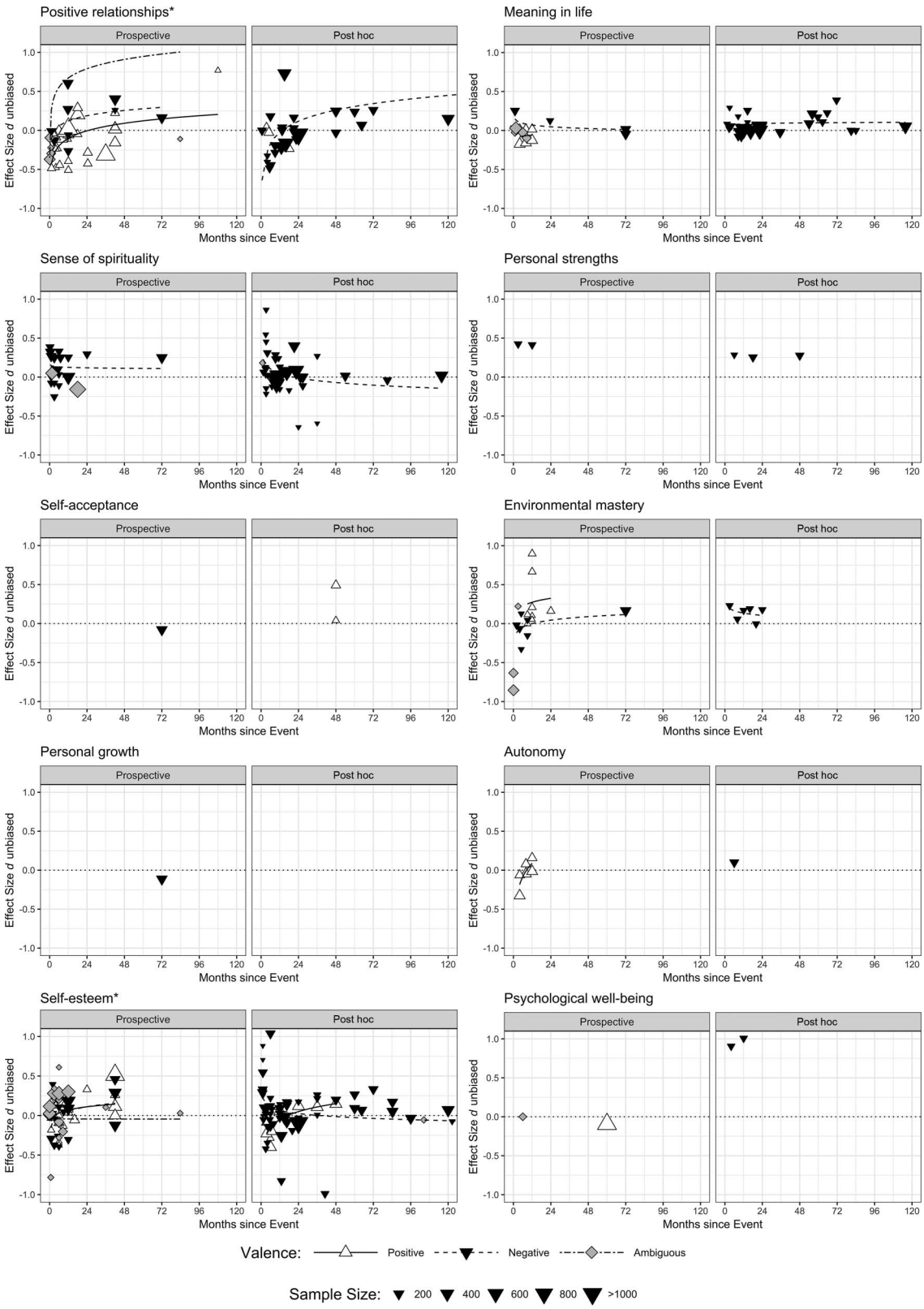


*Figure 3.* Overview of effect sizes and predicted logarithmic change. * Figures marked with asterisk are zoomed for reasons of visibility. A full version of these figures is depicted further below. Figures with five or less data points are depicted in the supplemental material.

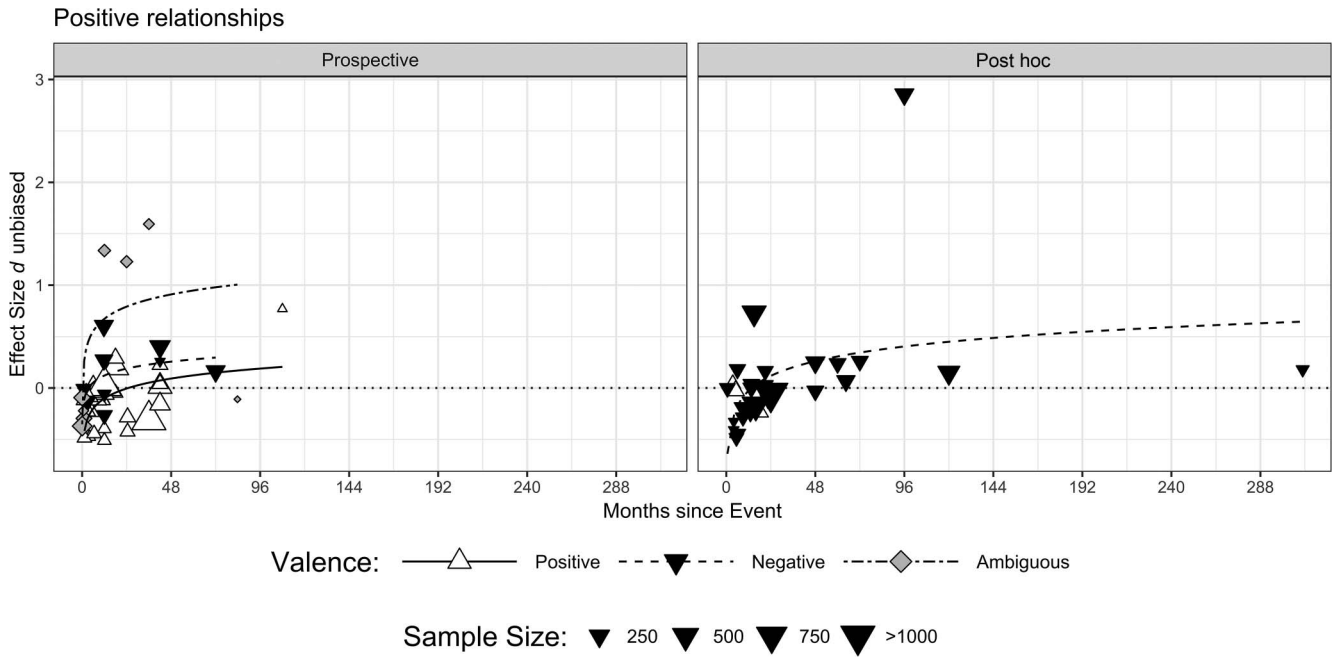


*Figure 4.* Effect sizes of positive relationships with logarithmic curve.

significant, slope for negative physical experiences ($c_1$ = .23, 95% CI [−.07, .52]). There was a significant difference in the intercept of effect sizes after positive and negative events. In studies with positive life events a significantly stronger increase in relationship quality between the first two measurement time points ($c_2$ = 3.03, 95% CI [.47, 5.59]) was found. In addition, there was a significant interaction effect between valence and time for positive events, indicating that with time, a stronger increase in relationship quality ($c_4$ = −.08, 95% CI [−.14, −0.02]) was found in studies with negative events. However, because of the small number of positive life events, these findings need to be interpreted carefully. There was no significant difference in the effects of physical and family-related ($c_6$ = .11, 95% CI [−.64, .42]), natural ($c_7$ = −.16, 95% CI [−.38, .06]), or work-related ($c_8$ = −1.00, 95% CI [−2.18, .16]) events.

**Summary.** Participants who experienced major life events initially reacted with a significant decline in relationship quality, irrespective of the event's valence. This effect seems to be strongest for positive events. After this impairment, a significant positive trend emerged that went beyond the preevent level of social relationships after traumatic, positive, and ambiguous experiences. The results suggested that the experience of major life events is related to deeper relationships after an initial phase of impairment. The post hoc effects suggest that this positive trend continues over time for negative events.

## Meaning

In total, 22 studies with 24 samples and 41 effect sizes could be found which addressed changes in meaning or purpose in life after major life events. Notably, only one publication (4.55%), providing six effect sizes, was found that assessed meaning longitudinally and focused on a positive event, which was employment. Corresponding to the publications on social relations, male participants were also underrepresented here (33.85%), because some studies only reported data from female participants. The majority of the studies that investigated meaning longitudinally were medical studies (59.1%) and had a post hoc design (59.1%; prospective studies: positive = 1, negative = 4, ambiguous = 4; post hoc studies: negative: $n$ = 13). Most of these publications (77.3%) reported results of clinical studies which investigated changes in meaning in life after severe illnesses, including cancer, heart attack, stroke, and HIV. The average number of time points was slightly higher for post hoc studies ($M$ = 2.69, $SD$ = 1.03) than for prospective studies ($M$ = 2.22, $SD$ = 0.67). In prospective publications, the first measurement was assessed about one and a half years ($M$ = 12.95 months, $SD$ = 23.60, $Md$ = 1.00) before the event, whereas the time lag in post hoc studies was more than two years ($M$ = 28.13 months, $SD$ = 34.33).

**Prospective studies.** Figure 5 (left) depicts the effect sizes of prospective longitudinal studies on meaning after life events with positive, ambiguous, and negative valence. Because of the small number of effect sizes ($n$ = 6) that were based on positive events and the small time lag of these effect sizes, the trend line of positive events has to be interpreted carefully. The initial reaction on meaning was positive and not significant ($b_0$ = .11, 95% Cl [−.11, .3]) in studies focusing on negative physical events. In studies with positive ($b_2$ = −.03, 95% Cl [−.32, .26]) and ambiguous events ($b_3$ = −.01, 95% Cl [−.25, .24]), a comparable initial effect on meaning is reported. The interaction effect of valence and time was not significant and therefore not included in the model.

After this primary effect, the slope for positive, negative, and ambiguous events was not significantly different from zero ($b_1$ = −.11, 95% Cl [−.28, .07]). There was no significant

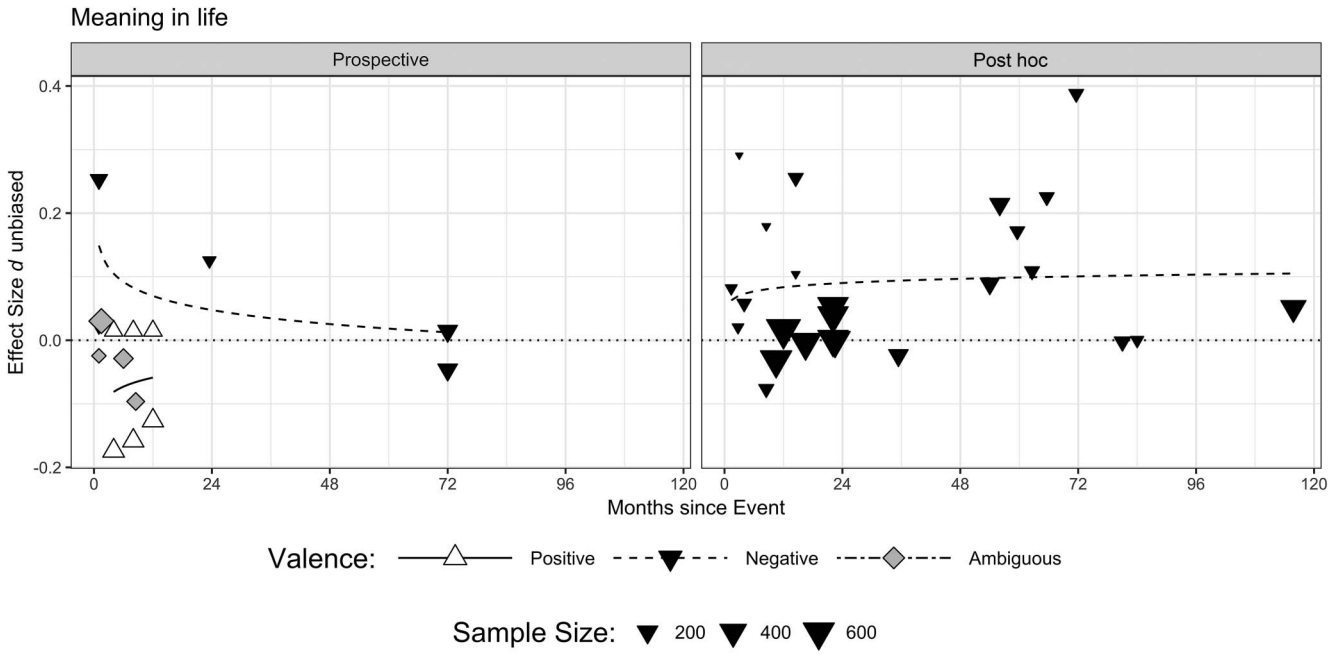


*Figure 5.* Effect sizes of meaning in life and predicted logarithmic change.

difference between physical and family- ($b_6$ = .33, 95% CI [−.36, 1.02]) or work-related events ($b_8$ = .07, 95% CI [−.06, .20]).

**Post hoc studies.** Figure 5 (right), in which the post hoc studies are plotted, shows the effect sizes of negative life events. Studies which investigated meaning after positive or ambiguous events with a post hoc design could not be identified. Again, we found a negative intercept ($c_0$ = −.09, 95% CI [−.30, .13]) and a positive, but not significant, slope for negative physical events comparable with the results of the prospective studies ($c_1$ = .04, 95% CI [−.01, .09]). Nearly all reported post hoc effect sizes are positive and the trend line suggests a further increase of these effects over time, indicating that growth might occur. All post hoc effect sizes relied on negative physical events.

**Summary.** Taken together, the results of prospective and post hoc studies indicate that there is no significant increase in meaning in life for the majority of people in studies investigating traumatic experiences. Because very few studies have addressed meaning after positive events, this conclusion cannot be generalized across events with different valences.

## Spirituality

In total, 24 publications were found which investigated longitudinal changes in spirituality as a consequence of struggling with major life events. None of these studies, which together included 28 samples and reported 64 effect sizes, focused on positive life events. Instead, the vast majority of these publications (87.5%) were based on medical studies, investigating the consequences of severe illnesses and accidents. A quarter of the publications investigated predominantly female-specific life events, such as breast cancer (20%) and widowhood (4.1%). Therefore, the number of male participants was smaller than expected (28.0%). Because most of these studies recruited participants after their initial diagnosis, there were fewer prospective (33.3%; negative: $n$ = 6, ambiguous: $n$ = 2) than post hoc studies (66.7%; negative: $n$ = 15, ambiguous: 1 = 4). The first measurement occasion of the prospective studies was about one year before the event ($M$ = 12.82 months, $SD$ = 16.90, $Md$ = 5.5 month). Meanwhile, post hoc studies had their first assessment, on average, 17 months after the event occurred ($M$ = 16.53, $SD$ = 30.90, $Md$ = 1.00). It is important to note that the timing of post hoc studies had a large range, reaching from immediate assessment after diagnosis to 10 years after the event had happened.

**Prospective studies.** Figure 6 (left) shows the effect sizes of all included prospective studies investigating spirituality. In contrast to the initial effects on social relationships, there is an immediate but not significant increase ($b_0$ = .13, 95% CI [−.10, .35]) in spirituality in studies with negative physical events. The trend over time that follows this initial effect of spirituality was close to zero and not significant ($b_1$ = .003, 95% CI [−.05, .06]). Most of the effect sizes are positive, indicating at least temporary beneficial changes in spirituality. In studies investigating ambiguous events a significantly more negative initial effect was found than in studies with negative ones ($b_3$ = −.22, 95% CI [−.45, −.01]).

Since there were no studies that investigated changes in spirituality after positive events, we could not include further predictors in the model to investigate differences attributable to event valence. There was no significant difference between the effects of physical and family-related ($b_5$ = .07, 95% CI [−.10, .24] or natural events ($b_7$ = −.14, 95% CI [−.29, .02]).

**Post hoc studies.** Figure 6 (right) depicts the post hoc development of spirituality. Comparable to the prospective results, most effect sizes that were assessed in the first two years after the event took place were positive, indicating an initial positive trend. The intercept of post hoc studies was positive, but not

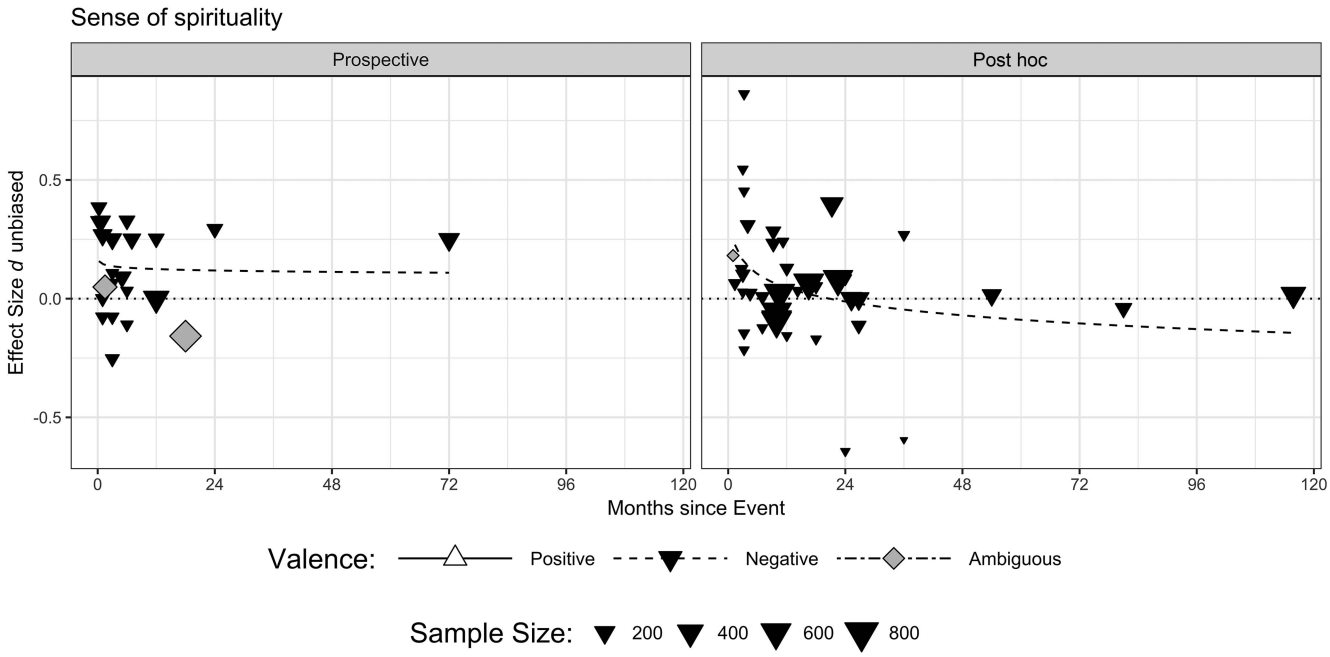


*Figure 6.* Effect sizes of spirituality and predicted logarithmic change.

significant ($c_0 = .17$, 95% CI [−.01, .35]). However, over time an insignificant decrease of these effects emerges ($c_1 = -.04$, 95% CI [−.09, .01]). Physical and family-related events ($b_5 = -.10$, 95% CI [−.41, .22]) did not show significant differences in their effects.

**Summary.** In studies with negative life events. the increase of spirituality, especially in the first two years after the event, was not significant. The findings of the post hoc studies, which investigated longer periods, suggest that with time, this effect diminishes and is not sustained, as would be expected for posttraumatic growth.

## Strengths

One of the outcome variables for which we found little empirical evidence was the perception of personal strengths. Only three longitudinal studies could be identified which investigated change in personal strengths after major life events over time (Costanzo, Ryff, & Singer, 2009; Kim, Kjervik, Belyea, & Choi, 2011; Pratt, Walker, & Wood, 1992). The publications addressing this topic included three samples and reported five effect sizes in total. All of them investigated life events with negative emotional valence. One third of the studies reported data from clinical populations. The three studies focused on two kinds of life events: bereavement or widowhood (66.6%; Kim et al., 2011; Pratt et al., 1992) and cancer (33.3%; Costanzo et al., 2009). Because all of these events are more likely to occur at an older age, participants of these samples were somewhat older than in the other samples ($M = 56.45$, $SD = 6.43$). Men (50.0%) and women (50.0%) were equally distributed in the samples. The majority of the publications had a post hoc design (66.7%), assessing their participants for the first time four months ($M = 4.00$, $SD = 2.82$) after the event. Only one study had the first measurement time point one month before the event occurred (Costanzo et al., 2009). Because of the very small number of effects, the results should be interpreted carefully and are not depicted separately. However, all found effect sizes of the prospective ($d_1 = .41$; $d_2 = 42$) and post hoc studies ($d_3 = .25$; $d_4 = .28$; $d_5 = .28$) were positive and stable over time, suggesting major life events might have a lasting beneficial effect on personal strengths.

## Self-Acceptance

Another psychological outcome variable which has rarely been studied is self-acceptance. Only two publications could be found that investigated self-acceptance longitudinally after major life events (Ceyhan & Ceyhan, 2011; Costanzo et al., 2009). The prospective study (Costanzo et al., 2009) investigated the impact of cancer on self-acceptance, in a clinical setting, with the first measurement time point 2 years after diagnosis. The post hoc study (Ceyhan & Ceyhan, 2011) focused on students transitioning to college and was conducted in the US. The first assessment took place 4 years before the event. Again, men were underrepresented in the sample (18.7%). With a total of three samples and three reported effect sizes these data can only provide preliminary insights into changes in self-acceptance after coping with challenging events. Whereas the prospective effect size ($d_1 = -.08$) indicates an impairment of self-acceptance, the post hoc studies show positive effects ($d_2 = .49$; $d_3 = 04$). For the interpretation of these results, it is important to note that next to the small sample size no prospective studies investigated further negative events and no post hoc studies investigated positive experiences. For a meta-analytic interpretation that goes beyond the findings of the original studies, the data are not sufficient.

## Mastery

In total, nine publications were found which investigated the impact of major life events on environmental mastery in a longitudinal design. Taken together, these studies comprised data from 15 samples yielding 24 effects sizes. Again, most publications focused on the consequences of negative (44.4%) or ambiguous (22.2%) life events. The majority of these studies (88.9%; positive: $n = 3$, negative: $n = 3$, ambiguous: $n = 2$) had a prospective design with the first measurement occasion about 15 months before the event took place ($M = 15.15$ months, $SD = 15.46$, $Md = 12.00$). Participants were on average about 51 years old ($M = 51.64$, $SD = 57.70$) and mostly female (68.43%). It is important to note that only one study, providing six effect sizes, investigated mastery in a post hoc design. Because this publication focused on widowhood, the exclusively female participants were much older ($M = 71.6$ years) at the first measurement time point, compared with the participants of the prospective studies. The women were assessed for the first time immediately after losing their partner ($M = .85$ months).

**Prospective studies.** Figure 7 (left) shows the results of the prospective studies investigating mastery after challenging experiences. In studies on negative physical events, the initial effect on mastery was negative and significant ($b_0 = -.25$, 95% CI [−.48, −.02]). The initial effect did not differ significantly between ambiguous and negative life events ($b_3 = .03$, 95% CI [−.39, .45]). Meanwhile, in studies with positive events a significantly larger direct increase of mastery was found ($b_2 = .19$, 95% CI [.02, .37]). Over time mastery increased significantly with a slope of $b_1 = .25$ (95% CI [.09, .41]) for all types of events. The initial effects did not significantly differ between negative physical events and family-related ($b_6 = .22$, 95% CI [−.08, .51]) or work-related events ($b_8 = -.12$, 95% CI [−.27, .03]).

**Post hoc studies.** Figure 7 (right) depicts the post hoc effect sizes of environmental mastery. All effect sizes were positive. The post hoc model had a positive, but not significant intercept ($c_0 = .20$, 95% CI [−.18, 2.23]) and a not significant negative slope ($c_1 = -.06$), 95% CI [−1.93, 1.81]), indicating that the beneficial initial effects found in the prospective studies did not change significantly over time.

**Summary.** In studies with major life events increases of environmental mastery have been found. This increase seems to be continuous, leading to lasting higher levels of mastery, especially in studies with positive events. The comprised findings of all studies addressing mastery suggest that posttraumatic as well as postecstatic growth in this area does occur and is sustained over time.

## Growth

The outcome of personal growth, as defined by Ryff (1989; continued development and expansion as a person), has only been investigated in a single longitudinal study. The panel study that operationalized growth in the sense of an independent psychological asset had a prospective design and investigated psychological adjustment to cancer. Of the 605 participants who suffered from cancer, 207 received their diagnosis between the two waves of the panel, which lay 10 years apart. The average age was 63 years, which reflects the higher likelihood of being diagnosed with cancer at an older age. As for the other outcome variables, men were underrepresented (37.4%). This study found a decrease of growth as a psychological asset after cancer diagnosis ($d_1 = -.11$).

## Autonomy

Like self-acceptance and growth, autonomy has rarely been studied as an outcome in longitudinal studies on major life events.

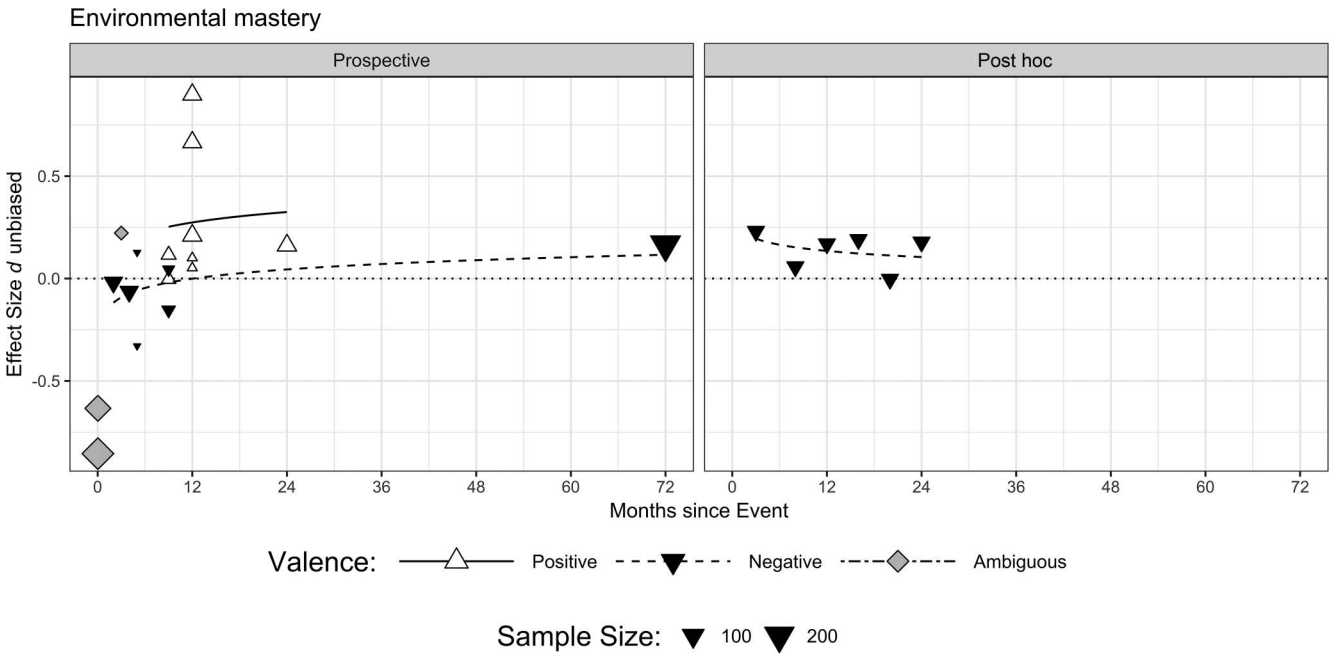


*Figure 7.* Effect sizes of environmental mastery and predicted linear change.

Only two publications (Aitken, Chaboyer, Kendall, & Burmeister, 2012; Haase, Heckhausen, & Silbereisen, 2012) with three samples and seven effect sizes could be found, including a total of 443 participants. Men and women were about equally represented with 50.94% ($SD$ = 21.30) of male participants. Only one of the two studies provided detailed information about the age of participants. On average, participants were younger than in the other publications ($M$ = 27.48). The prospective study investigated the psychological consequences of employment (Haase et al., 2012). The post hoc study had a medical background and investigated health changes after traumatic injury (Aitken et al., 2012). Both studies had their first measurement time point directly before ($M$ = −.03) or immediately after ($M$ = .03) the event. Figure 8 depicts the results of the prospective (left) and the post hoc study (right). Again, the results must be interpreted carefully due to the limited number of life events, samples, and effect sizes.

Figure 8 suggests that in studies investigating positive events an immediate negative reaction occurs followed by an upward trend that goes beyond the former level of autonomy. In addition, negative events also show a positive effect after the event. Since these effects are small and close to zero, the positive direction might be a recovery effect. It is interesting to note that the results of two different groups are depicted in Figure 8 (left). Above the curve are the results for the group of students that transitioned into work life and had favorable employment opportunities, and hereby actually a positive experience. Below the curve are the results for the group with unfavorable employment opportunities, for which the transition from university to work had more negative aspects.

## Self-Esteem

With 61 longitudinal publications and 136 effect sizes, which together comprised the data of 75 samples, self-esteem was the most intensively studied outcome variable. In total, the studies included the data of $n$ = 15,681 participants. Again, women were somewhat overrepresented with only 39.8% of men in the samples. On average, participants were around 41 years old ($M$ = 40.99, $SD$ = 20.47). A large number of the included publications (41.0%) had a medical background. Most of these studies investigated the psychological consequences of severe illnesses, such as cancer. About half of the studies that focused on self-esteem had a prospective (47.5%; positive = 12, negative = 6, ambiguous = 11) and the other half a post hoc design (positive: $n$ = 5, negative: $n$ = 26, ambiguous: $n$ = 1). The time lag between the first measurement occasion and the event was about 8 months ($M$ = 6.73, $SD$ = 13.13, $Md$ = 2.00) for prospective studies. For post hoc studies, the time lag was on average 23 months ($M$ = 23.02, $SD$ = 54.57). The number of time points was comparable between post hoc ($M$ = 2.88, $SD$ = 1.74) and prospective studies ($M$ = 2.45, $SD$ = 0.78).

**Prospective studies.** Figure 9 (left) depicts the effect sizes of all prospective studies that investigated the impact of major life events on self-esteem. The intercept of negative physical events was negative and not significant ($b_0$ = −.23, 95% CI [−.51, .06]). The initial effects of positive ($b_2$ = −.01, 95% CI [−.17, .16]) and ambiguous experiences ($b_3$ = .17, 95% CI [−.12, .46]) were comparable to those of negative events. This initial reaction is followed by a significant positive upward trend ($b_1$ = .08, 95% CI [.01, .14]) after negative physical experiences, which lasts over time. The interaction effect between positive and negative experiences was not significant and therefore not included in the model. The initial reaction to physical life events was not significantly different from the effect of family-related ($b_6$ = .13, 95% CI [−.21, .16]), or work-related events ($b_8$ = .10, 95% CI [.47, .35]).

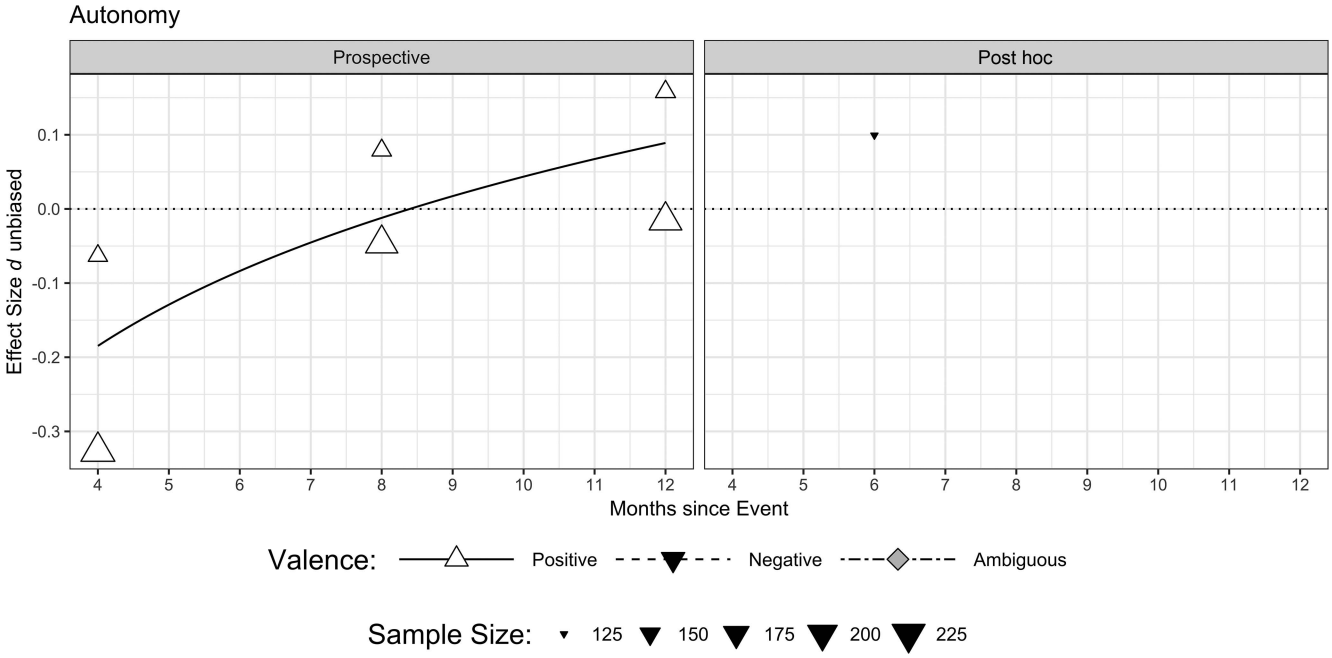


*Figure 8.* Effect sizes of autonomy and predicted logarithmic change.

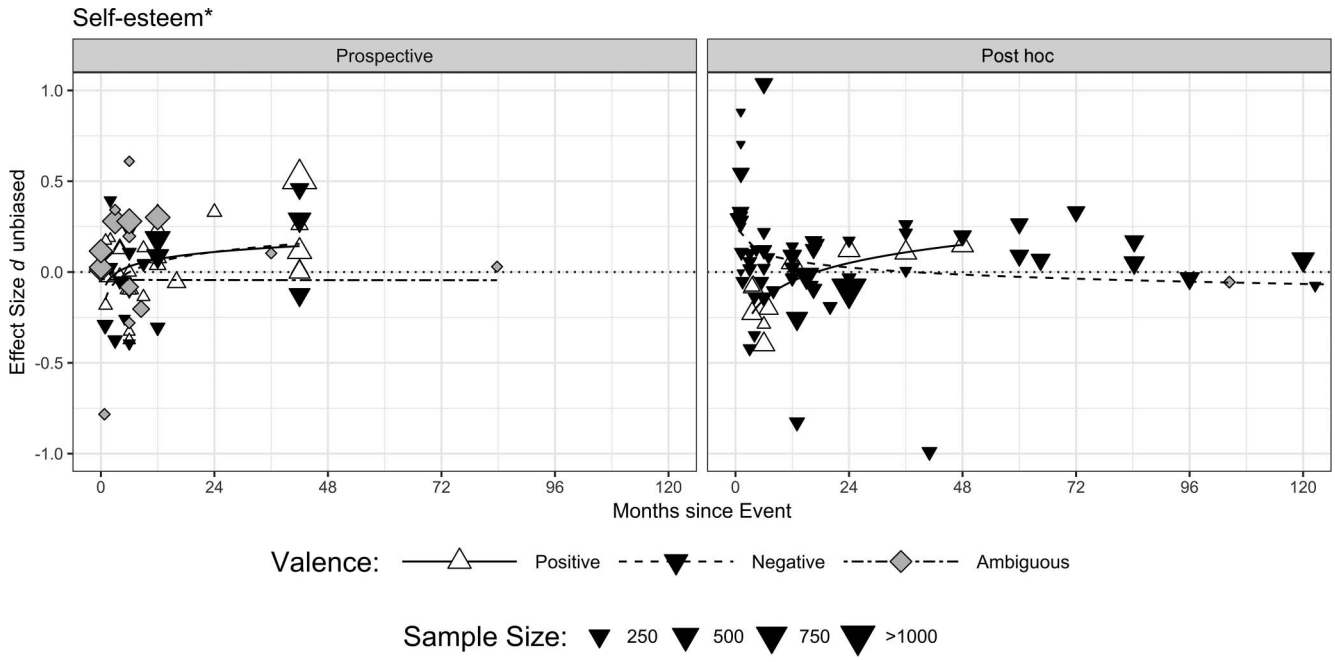


*Figure 9.* Effect sizes of self-esteem and predicted logarithmic change. For reasons of visibility two data points have been truncated. A version with all data points is provided in the supplemental material.

**Post hoc studies.** In Figure 9 (right) the post hoc results for self-esteem are depicted. The post hoc studies had a positive but not significant intercept ($c_0$ = .09, 95% CI [−.07, .24]), a not significant slope of zero ($c_1$ = .00, 95% CI [−.001, .001]), and a significant interaction effect of zero ($c_4$ = .00, 95% CI [.00, .001]) between positive and negative experiences.

**Summary.** Self-esteem is the most extensively studied psychological domain. Most of the found effect sizes were positive. Prospective studies indicate an increase of self-esteem with time. This effect is strongest in the first 4 years after the event. It is important to notice that the results also indicate an increase in self-esteem after negative and ambiguous events, even though self-esteem is not a subdomain of PTG.

## Psychological Wellbeing

Very few publications could be found that investigated changes in psychological wellbeing as a whole after major life events. Taken together, we found three studies (Forsberg-Wärleby, Möller, & Blomstrand, 2004; Kubicek, Korunka, Raymo, & Hoonakker, 2011; Yeung, 2013) with one sample each, and four effect sizes that met the eligibility criteria. These studies, though small in number, comprised the data of 1,884 participants, were about equally distributed between men (52.3%) and women, represented data from three continents, and included medical (33.3%) as well as psychological (66.6%) studies. The mean age was $M$ = 56.20 years ($SD$ = 2.21). The two prospective studies had their first measurement occasion about three years before the event ($M$ = 39.00, $SD$ = 46.67), whereas the post hoc publication measured their participants within a week after the event.

The effect sizes of two prospective studies show no ($d_1$ = .00) or only very small changes ($d_2$ = −.09) in PWB. Meanwhile, the post hoc results show large positive effects ($d_3$ = .90; $d_4$ = 1.01) after the traumatic event (Forsberg-Wärleby et al., 2004). Here, it is important to notice that the prospective studies refer to positive or ambiguous events, while the single post hoc study investigated an event with negative valence. Hence, the results of prospective and post hoc studies on PWB are not directly comparable, even though the post hoc studies suggest positive changes after negative experiences.

## Control Group Results

In the studies presented, it is assumed that observed changes are attributable to the investigated life event. However, changes might also occur as a result of other influences such as normative maturation, simultaneous nonmeasured changes in life circumstances, such as other major events, or other threats of internal validity (see, e.g., Shadish, Cook, & Campbell, 2002). Of the 122 included studies, 25 studies (20.5%) comprising 53 independent event groups had a control group (see supplemental material). For these studies, we recorded (a) descriptive statistics such as means and standard deviations that would allow us to compute appropriate effect sizes, and (b) information on statistical significance tests related to differences between the event group and the control group (e.g., test of a Group × Time interaction in a repeated-measures ANOVA). For eight event groups, the available data were insufficient to compute effect sizes and no information on relevant statistical tests was provided. For the remaining 45 event groups, effect sizes could be computed for 37 groups (total number of effect sizes: 45) and significance tests were available for 30 group comparisons. For 19 group comparisons, both effect sizes and significance tests were available.

Effect sizes were computed as the bias-corrected difference between the standardized mean change in the event group and the standardized mean change in the control group, with both group-specific effect sizes standardized on the pooled pretest *SD* (Becker, 1988; Morris, 2008). A positive effect size therefore reflects that the standardized mean change in the event group was more positive (or less negative) than the standardized mean change in the control group. Conversely, a negative effect size reflects that the standardized mean change in the event group was more negative (or less positive) than the standardized mean change in the control group. It was not possible to analyze these effect sizes meta-analytically because the retest correlation required to compute the sampling variance was reported for only one publication. However, a descriptive inspection of the effect sizes can nevertheless provide some preliminary insights into the magnitude of the difference between event and control groups. For positive events, nine effect sizes were available that ranged between −0.29 and 0.22 with an unweighted mean of −0.08. For negative events, 34 effect sizes were available that ranged between −0.48 and 0.52 with an unweighted mean of −0.03. Only two effect sizes were available for ambiguous events (−0.01 and 0.03). Hence, for both positive and negative events, studies where the event group changed more strongly than the control group as well as studies where the control group changed more strongly than the event group could be found. On average, however, event groups and control groups do not differ substantially with respect to their mean-level change.

In interpreting these descriptive findings, it is important to bear in mind that these effect sizes are heterogeneous in terms of the construct they reflect as well as the timing with respect to the event. We do not have enough data to test whether either of these characteristics explain variance among these effect sizes. However, since most effect sizes refer to either social relationships or self-esteem, we inspected these effect sizes more closely. Figure 10 displays the effect sizes for these constructs as a function of time since the event, separately for positive, negative, and ambiguous events. For self-esteem, effect sizes for negative events were distributed unsystematically shortly after the event but tended to be negative for studies with longer time lags, suggesting that for these studies, event groups tended to show weaker increases (or stronger decreases) in self-esteem than control groups. For social relationships, all effect sizes for positive events were negative whereas effect sizes for negative events were mostly positive, indicating that event groups tended to show weaker increases (or stronger decreases) in social relationships after positive events and greater increases (or weaker decreases) after negative events.

Overall, it should be noted that all effect sizes tended to be weak, a pattern also reflected in the significant tests: 23 tests were nonsignificant and seven tests were significant.

## Growth in Children and Adolescents

One of the controversial questions in growth research is the possibility of accelerated psychological development in children. Therefore, we included a more detailed overview of those included studies that relied on the data of children or adolescents. Table 8 depicts the results of studies that focused on youth samples.

Among the 122 studies included in the meta-analysis, 13 (10.66%) investigated changes in psychological functioning of children and adolescents. Most (76.92%) of the four prospective and nine post hoc studies focused on changes in self-esteem. Because self-esteem increases in young age until young adulthood (Huang, 2010), the results of studies without a control group need to be interpreted carefully in these samples. Four of the studies (30.77%) that focused on youth samples actually found a decline of self-esteem instead of the developmentally expected increase (Borgen, Amundson, & Tench, 1996; Creed, Muller, & Patton, 2003; Martinez, Martin, Liem, & Colmar, 2012; Meân Patterson, 1997). Doherty and Needle (1991) found in their study an increase of self-esteem after parental divorce for girls, but not for boys. Notably, all of these studies had a time frame of 6 months after the event or less and did not monitor long-term changes beyond this period. The remaining eight studies (61.54%) found an increase of

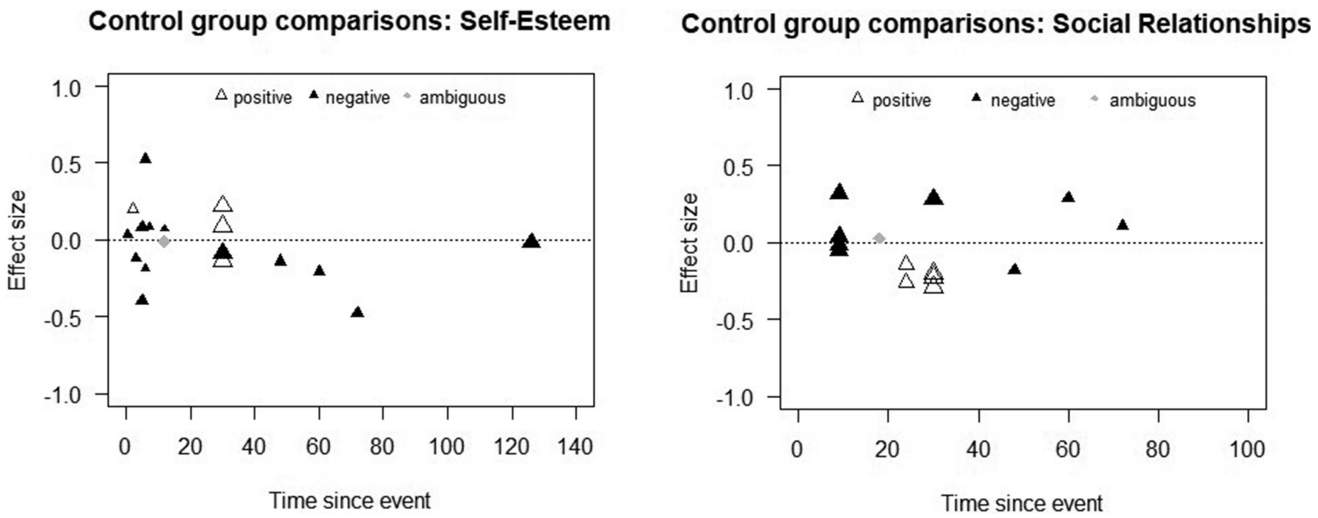


*Figure 10.* Effect sizes reflecting differences in the standardized mean change between event groups and control groups for self-esteem and social relationships.

Table 8
*Overview of Included Youth Studies*

| Publication | Design | Event | Outcome | Group | Age at T1 | $T_{T2}$ | $N_{T2}$ | $g_{T2}$ | $T_{T3}$ | $N_{T3}$ | $g_{T3}$ | $T_{T4}$ | $N_{T4}$ | $g_{T4}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borgen, Amundson, and Tench (1996) | PR | Graduation from school | Self-esteem | — | | 6 | 172 | −.10 | 16 | 172 | −.06 | — | — | — |
| Creed, Muller, and Patton (2003) | PR | Graduation from school | Self-esteem | University | 17.42 (.44) | 6 | 29 | −.34 | — | — | — | — | — | — |
| | | | | university + job | | 6 | 51 | −.06 | — | — | — | — | — | — |
| | | | | Employment | | 6 | 36 | −.38 | — | — | — | — | — | — |
| | | | | Unemployment (control) | | 6 | 30 | −.40 | — | — | — | — | — | — |
| Doherty and Needle (1991) | PR | Divorce of parents | Self-esteem | Boys | 11–13 | 5 | 24 | −.26 | — | — | — | — | — | — |
| | | | | Boys (control) | | | | .12 | — | — | — | — | — | — |
| | | | | Girls | 11–13 | 5 | 24 | .26 | — | — | — | — | — | — |
| | | | | Girls (control) | | | | .10 | — | — | — | — | — | — |
| | | | Mastery | Boys | 11–13 | 5 | 24 | −.34 | — | — | — | — | — | — |
| | | | | Boys (control) | | | | .07 | — | — | — | — | — | — |
| | | | | Girls | 11–13 | 5 | 24 | .13 | — | — | — | — | — | — |
| | | | | Girls (control) | | | | .13 | — | — | — | — | — | — |
| Dooley and Prause (1995) | PR | Transition from school to job | Self-esteem | Employed unsatisfied | ~ 16.9 (1.2) | 42 | 157 | .46 | — | — | — | — | — | — |
| | | | | Employed satisfied | ~ 16.9 (1.2) | 42 | 2033 | .51 | — | — | — | — | — | — |
| | | | | Unemployed (control) | ~ 16.9 (1.2) | 42 | 253 | .29 | — | — | — | — | — | — |
| Feiring, Coates, and Taska (2001) | PO | Sexual child Abuse | Self-esteem | White | 11.3 (2.2) | 36 | 48 | .22 | — | — | — | — | — | — |
| | | | Self-esteem | Black | | 36 | 57 | .26 | — | — | — | — | — | — |
| | | | Self-esteem | Hispanic | | 6 | 25 | .01 | — | — | — | — | — | — |
| Gomes and Speizer (2010) | PO | Teen-pregnancy | Self-esteem | — | 17.5(1.41) | 8 | 202 | 1.97 | — | — | — | — | — | — |
| Healy, Malley, and Stewart (1990) | PO | Parental separation | Self-esteem | — | 8.61 (1.99) | 16.5 | 121 | .17 | — | — | — | — | — | — |
| Jaffee, Caspi, Moffitt, Polo-Tomás, and Taylor (2007) | PO | Child maltreatment | Social relationships | Nonresilient | 5 | 48 | 214 | .25 | — | — | — | — | — | — |
| | | | | Resilient | 5 | 48 | 72 | .23 | — | — | — | — | | — |
| | | | | Nonmaltreated (control) | 5 | 48 | 1895 | .19 | — | — | — | — | | — |
| Kim and Cicchetti (2006) | PO | Maltreatment | Social relationships | Maltreated | 8.46 (1.11) | 48 | 142 | −.03 | 60 | 142 | .24 | 72 | 142 | .26 |
| | | | | Nonmaltreated (control) | 8.46 (1.11) | 48 | 109 | .16 | 60 | 109 | −.05 | 72 | 109 | .16 |
| Lyon et al. (2011) | PO | HIV | Meaning | Non-Intervention group | 16.65 (2.11) | 3 | 18 | .30 | — | — | — | — | — | — |
| Martinez, Martin, Liem, and Colmar (2012) | PO | Finishing school | Self-esteem | — | 17 (.96) | 6 | 213 | −.08 | — | — | — | — | — | — |
| Meân Patterson (1997) | PO | Unemployment | Self-esteem | — | 16–17 | 6 | 32 | −.08 | — | — | — | — | — | — |
| | | Employment | Self-esteem | — | 16–17 | 6 | 48 | −.10 | — | — | — | — | — | — |
| Størksen, Røysamb, Moum, and Tambs (2005) | PO | Parental divorce | Self-esteem | Girls (divorce) | 14.4 (.89) | 84.29 | 233 | .05 | — | — | — | — | — | — |
| | | | | Boys (divorce) | 14.4 (.89) | 84.29 | 180 | .17 | — | — | — | — | — | — |
| | | | | Girls (control) | 14.5 (.89) | 84.29 | 938 | .43 | — | — | — | — | — | — |
| | | | | Boys (control) | 14.5 (.89) | 84.29 | 820 | .27 | — | — | — | — | — | — |

*Note.* PR = prospective study; PO = post hoc study; $T_{T2}$ = time since event at T2 in months; $N_{T2}$ = sample size at T2, $g_{T2}$ = standardized mean change between T1 and T2; $T_{T3}$ = time since event at T3 in months; $N_{T3}$ = sample size at T3, $g_{T3}$ = standardized mean change between T1 and T3; $T_{T3}$ = time since event at T4 in months; $N_{T4}$ = sample size at T4, $g_{T4}$ = standardized mean change between T1 and T4.

psychological functioning and hereby the possibility of postevent growth.

Because of the developmentally typical increase of self-esteem in childhood and adolescents (Huang, 2010) and the necessity to distinguish maturation from growth, studies that had a control group are of particular interest in this age group. There are four studies that included control groups, who had not encountered the same event in the time of the study. Two of the included youth studies (Doherty & Needle, 1991; Størksen, Røysamb, Moum, & Tambs, 2005) investigated the long-term consequences of parental separation on children's self-esteem. They found that children whose parents were still together had a significantly steeper increase in self-esteem than those who experienced parental divorce in one study (Størksen et al., 2005) but not in the other (Doherty & Needle, 1991).

The remaining two studies investigated the influence of child maltreatment on social relationships (Jaffee, Caspi, Moffitt, Polo-Tomás, & Taylor, 2007; Kim & Cicchetti, 2006). The results of both studies showed that children who experienced maltreatment, in the long run, showed a stronger increase in relationships (social behavior) than their nonmaltreated controls. The results of these two studies support the growth hypothesis.

One of the most informative included youth study has been conducted by Kim and Cicchetti (2006). The study did not only compare an event with a control group, but had also four measurement time points up till 6 years after the event. Interestingly, at time point 2, four years after the event, children who experienced maltreatment still showed a significant decrease in social behavior scores and were worse off than their nonmaltreated control group. However, five and six years later, these children experienced growth and showed a stronger increase in social relationships than the control group did. This study, again, emphasized the importance of timing when studying postevent growth.

## Discussion

The present meta-analysis was the largest and most comprehensive study on personal growth since the beginning of research in this field. With 122 studies, including 364 effect sizes and a total of 98,436 participants, it investigated beneficial changes following major life events with the goal of exploring genuine posttraumatic and postecstatic growth. Through a longitudinal approach that excluded studies which solely relied on the retrospective self-perception of change, it addressed some of the most salient und controversial topics in research on growth after major life events. Because of the strict eligibility criteria, included studies were of relatively high quality. All publications operationalized growth with independent measures over time. About half of the studies provided pre-event data and the majority had more than two measurement time points.

### State of the art of Life Event Research

Of the 206,548 original hits that were found during the initial literature search, 4,807 were coded and checked for eligibility. However, only 122 (2.5%) of the coded studies met the eligibility criteria. Most of the excluded studies either had a cross-sectional design, were exclusively qualitative, or relied solely on the self-perception of change. This circumstance is closely related to some of the most critical methodological problems of life event research: In a rigorous scientific design, prospective longitudinal data are needed to quantify genuine change and avoid selection effects and distortions due to retrospective assessments of growth (Jayawickreme & Blackie, 2016). In addition, potentially traumatic life events are relatively rare and often unforeseen. Hence, a large number of participants should be recruited at baseline and followed over years to investigate genuine change and causal relations. This is an enormously costly and time-consuming research design, which is often only given in representative panels. Consequently, most researchers abstain from this possibility and rely on more convenient samples and cross-sectional designs, which may distort the results.

Moreover, one of the most critical findings was the dearth of literature addressing certain events or target outcome variables, which will be systematically addressed below. First, there is a strong negativity bias in life event research. Second, some subcomponents of PTG, such as priorities in life, have not been investigated in a single included study. Finally, some of the most impactful negative life events, for example, sexual molestation (Mangelsdorf & Eid, 2015), have not been addressed in longitudinal growth research at all.

**Negativity bias in research.** Only 25.5% of all effect sizes stem from studies that focused on positive events. These numbers point out a critical problem in life event research. In the last few decades, scientists have focused much more on the effects of negative, rather than positive, life experiences. Hence, one of the most obvious problems in the large number of studies we reviewed for the present meta-analysis was the negativity bias in research. This bias is especially critical because it reverses the natural occurrence of negative and positive life events. Research on the likelihood of positive and negative events has shown that on average positive events happen much more often than negative ones. Gable (2000) found a ratio of 3.2 positive events for every negative experience we encounter. At the same time, only a small number of studies systematically investigated the long-term consequences of positive life experiences. Future research should put more emphasis on the investigation of positive events to develop a comprehensive understanding of personality development across the life span.

**Target variables.** Even within the pool of longitudinal studies, some target variables have been studied much more extensively than others. Most of the longitudinal research on major life events focused on two outcomes: social relationships and self-esteem. Although both constructs are important psychological assets, the study of other outcomes has been severely neglected. Some subcomponents of PTG, such as priorities in life, have not been studied at all with other measures, except for the PTGI. Other subcomponents, for example personal strengths and self-acceptance, have only been addressed in a few longitudinal studies. Thus, there is hardly any reliable scientific evidence for growth in these areas.

**Under- and overrepresented life events.** Mangelsdorf and Eid (2015) conducted a study in which they asked participants to rate the impact of a large scale of positive and negative life events. In the U.S. sample, four of the top 10 most impactful events were related to sexual molestation. At the same time, not a single longitudinal study in the meta-analysis investigated the consequences of these life events in the target domains. This is espe-

cially critical, because sexual abuse is not only one of the most impactful experiences, but also fairly common. A global meta-analysis on the prevalence of sexual child abuse alone has shown that more than 10% of all children experience sexual molestation (Stoltenborgh, van IJzendoorn, Euser, & Bakermans-Kranenburg, 2011). Meanwhile, researchers seem to abstain from studying these events and hereby inform clinical practitioners. It could be argued that asking participants about possible silver linings of abuse could be retraumatizing. However, following participants over time and measuring growth outcomes independently from the event would not have this effect.

Although events that are related to the experience of sexual abuse are underrepresented, the majority of research on PTG is based on clinical samples. Approximately half of all included publications in the meta-analysis were medical studies. Jayawickreme and Blackie (2014) have pointed out before that most researchers in the field who have the possibility to draw from clinical samples do so, because it is a convenient way of studying trauma. However, it is likely that the focus of PTG research on severe illnesses biases the scientific results. Presumably, growth is not only influenced by the valence of the event, but also by other event characteristics. Hefferon, Grealy, and Mutrie (2009) found in their comprehensive systematic review on PTG after life-threatening illness that people reported growth in another psychological domain. Survivors of cancer and other severe illnesses perceived that they had gained a new awareness of the body as a consequence of the struggle with their illness. Although this finding is consistent for physical life events, it would be unlikely to expect that bereaved individuals would have the same experience. Thus, future research should take a large variety of life events into account and be sensitive to event-specific outcomes.

## Evidence for the Existence of Genuine Posttraumatic and Postecstatic Growth

Sufficient data for meta-analytic computations were available for five target variables, namely self-esteem, mastery, social relationships, meaning and spirituality. The meta-analysis revealed mixed results and can be summarized as follows:

1. For social relationships, growth was found in prospective and post hoc studies. In post hoc studies, growth was stronger for negative events than for positive events. This is in line with studies with control groups that also point to stronger growth after negative events and even a decrease in positive relationships for positive events. Hence, to improve social relationships suffering might be more important than positive events. However, a broader array of positive events should be studied to confirm this conclusion.

2. For self-esteem and environmental mastery, growth was found in prospective studies. Most interestingly, with respect to environmental mastery, growth was stronger after positive than negative events. The studies with control groups showed a tendency that self-esteem increases after positive but decreases after negative events.

3. No growth was found for meaning in life and spirituality, neither in prospective nor in post hoc studies. This is an interesting result because both variables can be considered central for understanding growth and the studies covered a long time span up to 10 years after the event. However, there are only few prospective studies on meaning in life and much more studies are needed to test whether there is growth on the average level for meaning in life and spirituality.

The number of studies for the remaining subcomponents was too small to draw conclusions about lasting changes in these areas. Although the effect sizes of studies investigating personal strengths point in the direction that beneficial changes might occur, the few studies that focused on other outcomes are not conclusive. Filling the scientific gaps in these domains should be a primary endeavor for future research.

## Increase in Psychological Functioning: Normative Maturation or Event-Driven Growth?

Blackie et al. (2017) pointed out that genuine growth must be quantifiable as pre- and postevent change. Simultaneously, changes in the time of the event can be due to several reasons. For example, they can either be related to the event on which the study focused or to other events in the time of the study. Furthermore, they can be caused by the cumulative effects of daily experiences, or biological maturation (for a more complete discussion of threats of internal validity see Shadish et al., 2002). Most of the studies presented were based on a pre–post design without a control group. In these studies, it is not possible to distinguish between event-related changes and changes due to other influences. Although research on the stability of specific outcome variables (e.g., Huang, 2010) does not suggest that change would occur without these influences, studies without nonevent control groups do not allow this conclusion. However, only 20.5% of the included studies integrated a control group. In the majority of these studies, no significant difference between the event and control groups were found and the effects sizes fluctuated around zero. Therefore, the studies with control groups challenge the conclusions that the found increase in psychological functioning can solely be attributed to the investigated events. Simultaneously, it is important to note that only seven studies included matched control groups (none of them comprehensively controlling for other life events), whereas the majority of studies are based on nonequivalent control groups causing other threats to internal validity (Shadish et al., 2002). This might explain why, in many studies, growth has also been found in the control group and not just in the event group (see Figure 11). One important result of the present study is that much more elaborated research designs with modern matching procedures are needed to analyze the effects of life events.

Because the question of alternative explanations for increases found in the included studies is critically important, we will discuss maturation and daily experiences as two possible alternative explanations in detail.

**Maturation.** Whitbourne and Waterman (1979) coined the term psychosocial maturation to refer to the age-related increase in psychosocial functioning that is prominent especially in the personality literature. This development might be the result of "species-wide intrinsic maturational processes" (p. 27, Costa & McCrae, 2006) and biological, genetically determined influences

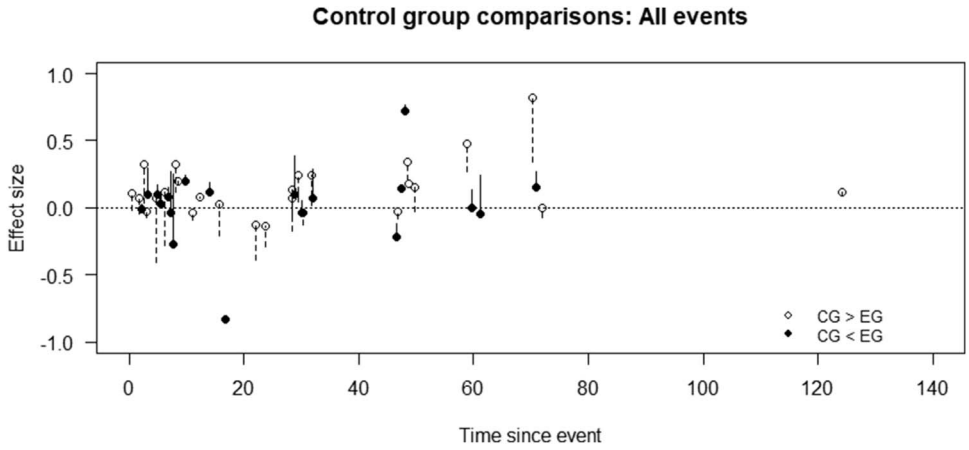


*Figure 11.* Effect sizes found in studies with control groups. The dots reflect the standardized mean change in the control groups. The lines above or below these dots indicate the difference between the effect size in the control group and the effect size in the event group. For group comparisons where the effect size in the event group was above (more positive or less negative) the effect size of the control group, these lines appear above of the dots (black dots and solid lines). For group comparisons where the effect size in the event group was below (less positive or more negative) the effect size of the control group, these lines appear below the dots (white dots and dashed lines). The length of each line reflects the difference in the effect sizes between the two groups.

for which environmental factors play only a minor role (Bleidorn, 2015; McCrae & Costa, 2008). The question whether the found effects might originate from biological maturation can best be answered by drawing on evidence from personality research. Jayawickreme and Blackie (2014, 2016) define posttraumatic growth as positive personality changes that stem from the adaptational processes following traumatic life events. Thus, growth can be understood in the framework of personality change. Personality research focused for decades on the question whether genetic or environmental factors have the stronger influence on personality change and can therefore provide reliable evidence to answer this question.

In contrast to the dynamic systems approach, in which development is seen as the result of the interaction of various system levels such as genes, social, and environmental factors (Cicchetti & Toth, 2009; Masten, 2014, 2015; Overton, 2015), the intrinsic maturation approach emphasizes the importance of biological factors. Following this argumentation, the increase of psychological functioning found in the present meta-analysis might reflect age-related, genetically determined maturation processes instead of event-related growth. However, Roberts, Walton, and Viechtbauer (2006) pointed out in a large-scale longitudinal meta-analysis of change processes in personality across the life span that there is only scarce evidence to support this position especially in adult development. There are three recent reviews and meta-analyses that comprised the results of longitudinal research on personality development which focused on behavioral genetic research (Bleidorn, Kandler, & Caspi, 2014; Briley & Tucker-Drob, 2014; Kandler, 2012). All three come to the conclusion that environmental factors have a substantial influence on personality change and stability across the life span. Furthermore, in a systematic review and meta-analysis of mean-level change in personality across the life span, Roberts et al. (2006) emphasized that especially in adulthood environmental influences play the most critical role in personality changes. Only about 30% or less of personality changes in adulthood can be attributed to genetic effects (McGue, Bacon, & Lykken, 1993; Roberts et al., 2006). Different authors conclude that although both environmental and genetic factors influence changes in personality across the life span, genetic influences are only critical in young age (Bleidorn, 2015; Bleidorn et al., 2014; Briley & Tucker-Drob, 2014; Kandler, 2012). In contrast, "environmental influences appear to represent a lifelong source of interindividual differences in personality development" (Kandler, 2012, p. 290). Finally, Huang (2010) concluded in a comprehensive longitudinal meta-analysis on self-esteem development that self-esteem does not change naturally beyond the age of 30. Thus, changes in self-esteem later in life cannot be attributed to psychological maturation.

**Daily experiences.** Another possible source of psychological change across time is daily experiences. Research that can actually disentangle the relative importance of daily experiences and major life events for developmental processes on growth must meet various criteria: it must have a longitudinal design to analyze effects over time and a matched control group to prevent effects attributable to other sociodemographic differences, and most importantly it must control for a large variety of life events over and above the key event investigated in the study. Especially the last criterion is often neglected because event and control groups are usually selected for the event in question (e.g., cancer patients versus benign diagnosis) and not for other major events in the time of the study. Ultimately, studies with this design (e.g., Carr, 2004; Costanzo et al., 2009; Gall, Guirguis-Younger, Charbonneau, & Florack, 2009; Keizer, Dykstra, & Poortman, 2010) compare the consequences of a specific event, such as cancer diagnosis, to a control group for which it remains unclear whether and what kind of life events this control group might experience. Multiple possible unspecified events, including transitions in relationships, work, family life and so forth, might happen in control groups, but also additionally in the life event group. Therefore, event and control group might appear more alike than they actually are.

Studies with control groups must carefully check for events that might happen in the time of the study in addition to the event on which the study focuses in all groups.

In sum, the mostly nonsignificant differences between event and control groups indicate that changes in the outcome variables can occur for many reasons and cannot be attributed to the occurrence of positive or negative life events alone, but can also be caused by other events experienced in the time of the study, normative maturation, or by other unmeasured factors. Results obtained from single-group studies can therefore offer only limited evidence on growth. To overcome this limitation, matched control groups have to become the standard in this area of research.

## Is Bad Really Stronger Than Good?

Baumeister et al. (2001) stated in their famous article "Bad Is Stronger than Good" that bad events have greater power than good ones. They wrote: "events that are negatively valenced (e.g., losing money, being abandoned by friends, and receiving criticism) will have a greater impact on the individual than positively valenced events of the same type" (Baumeister et al., 2001, p. 323). This general assumption has already been challenged in other studies which investigated the perceived impact of life events and found that the experience of negative experiences as more impactful is a cultural artifact (Mangelsdorf & Eid, 2015). In this meta-analysis, we investigated two questions systematically. First, is the initial effect of negative experiences stronger than the effect of positive experiences? Second, do people grow more after negative than positive events?

Sufficient data to compare life events with different valences were available for four outcome variables: social relationships, mastery, self-esteem, and meaning in life. Although there are many more psychological variables that might be influenced by major life events, the included target variables bring together social, cognitive, and emotional aspects. Thus, they can provide a good picture of the psychological changes related to major life events.

Meta-analytic computation showed a stronger impact of negative events on social relationships, while positive events had a stronger impact on environmental mastery. The effects for self-esteem and meaning in life did not differ significantly for positive and negative events.

When considering all included longitudinal studies that provide data on life events with different valences, it cannot be concluded that the initial impact, or the following development, is generally stronger for negative life events. Although more systematic research is necessary to scrutinize whether the found effects are caused by major life events, one would expect stronger effect sizes in studies with negative events than positive events if suffering is necessary for growth. Given that the studies on negative and positive events do not differ in basic features of their research designs, the results of the meta-analysis presented do not support the assumption that bad is stronger than good.

## Posttraumatic and Postecstatic Growth in Children and Adolescents: A Developmental Perspective

Highly challenging life events are not only part of an adult's life. Many children experience events, such as parental divorce (Schaan & Vögele, 2016), sexual child abuse (Stoltenborgh et al., 2011), serious accidents (Goniewicz, Goniewicz, Pawłowski, Fiedor, & Lasota, 2017), or even war (Halevi, Djalovski, Vengrober, & Feldman, 2016). In addition, different researchers suggested that younger people might take away bigger learnings and experience more posttraumatic growth than adults (Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003; Tedeschi & Calhoun, 2004). Finally, the results of this meta-analysis suggest that genuine growth is not only a temporary phenomenon, but that the gain of psychological resource is long-lasting. Consequently, it should be of high importance for researchers to investigate childhood events not only from a psychopathological point of view, but also from a perspective of growth across the life span.

However, despite of the extensive literature search process, we only found 13 studies that investigated possible positive consequences of major life events in youth samples. The majority of these studies focused on a single outcome, which was self-esteem and only three studies investigated children who were on average younger than 11 years old. This finding aligns with the search results of a previous systematic review on PTG in children conducted by Meyerson, Grant, Carter, and Kilmer (2011). The authors found only 25 studies investigating PTG in young age, despite including cross-sectional studies that relied on self-perceived change. Tedeschi and Calhoun (2004) pointed out that because of the complex cognitive processes underlying posttraumatic growth, the construct might rather apply to adults and to adolescents than to young children. At the same time, because genuine PTG has rarely been investigated in young age groups, there are hardly any empirical data on the occurrence or psychological phenomenology of posttraumatic growth at that period of life.

In this meta-analysis, all youth studies that followed the participants for more than six months showed an increase of psychological functioning. Among these studies three had a control group design and two found a steeper increase of psychological functioning for the event than the control group (Jaffee et al., 2007; Kim & Cicchetti, 2006). These results are also supported by a more recent comprehensive longitudinal study, which found evidence for growth following major life events. High school students who participated in a student exchange program showed a lower rank-order stability and a significantly steeper mean-level increase in self-esteem than their classmates who stayed at home (Huttemann, Nestler, Wagner, Egloff, & Back, 2015). These findings can be interpreted as a (first) indication of genuine growth in children and teenagers.

However, because of the very limited number of available studies in this age group, studying posttraumatic growth in children might be one of the most important endeavors for future growth research. The available studies revealed three critical insights for future research with this age group. First, childhood is the natural period of psychological maturation. In addition, measures that rely on the self-perception of change, ask children to disentangle their regular maturation processes form event-related change, which is even for an adult a very complex task. Therefore, prospective longitudinal studies with control groups are necessary to disentangle growth from regular development. Second, posttraumatic growth in childhood might express itself differently than later in life, for example in accelerated normative developmental processes. Therefore, growth might be investigated with other methodological approaches and a broader and different set of

outcome variables than the established subdomains of posttraumatic growth. Finally, timing, especially in regard to the necessary time intervals of the investigation to detect PTG, plays a critical role. It was a compelling finding that nearly all studies which followed participants for fewer than 6 months showed a decrease of psychological functioning, whereas studies with longer investigation periods showed significant increases.

## Limitations of Studies in Life Event Research

**Missing nonevent control groups.** The main limitation of this meta-analysis is the lack of matched control groups that did not experience any major event in the time of the study. Those studies that had a control group design did not control for any events except for the one in question. As discussed in detail above, this methodological approach introduced two problems: First, studies without any control group might confound event-related with normative, age-related changes in the event group (Luhmann et al., 2014) and other threats of internal validity. Second, studies that simply compared an event group to a group of participants, who did not encounter the event in question, might confound normative and event-related changes in the control group and hereby underestimate the role of major life events. Since randomized experiments are not possible in this area of research, modern matching approaches such as propensity score matching have to be used to control for potential confounders (e.g., Guo & Fraser, 2014; Rosenbaum & Rubin, 1983).

**Limited high-quality research in the field.** Different researchers have pointed out that although there is a growing number of studies investigating posttraumatic growth, most of these studies use inappropriate research designs and methods (Coyne & Tennen, 2010; Frazier et al., 2009; Jayawickreme & Blackie, 2014). Because of the strict eligibility criteria of this meta-analysis, many studies on posttraumatic growth had to be excluded. Therefore, there are some subcomponents of postecstatic and posttraumatic growth for which very few or no studies were available for meta-analytic computations.

**Missing parallelization of events.** One of the research questions was the comparison of life events with different valences. Of course, events can be distinguished in more characteristics than just valence. Hence, to minimize the influence of other characteristics it would be necessary to parallelize life events, that is, to match events that are opposite in valence but otherwise comparable (e.g., divorce with marriage, employment with unemployment). However, because many life events are not reversible and because of the large number of outcomes and limited number of studies available, we withdrew from parallelization. Instead, we controlled for the influence of different kinds of life events by categorizing events and including the event category as an additional predictor.

**Single life events.** Even though life events rarely happen in isolation, all included studies did only investigate one distinct event. It was therefore not possible to address questions such as the cumulative effects of multiple (positive and negative) events and their relative importance, the role of subsequent and simultaneous events, or the question whether growth becomes less or more likely with an increasing number of events in a certain time period. Dynamic systems theories would suggest that various factors and resources on different levels across time influence whether growth occurs after one specific distinct event. Future growth research should therefore broaden its focus and take into account that growth does not only stem from the struggle with one specific event, but from the interaction between the present experience and other simultaneous or past events and adaptational processes.

**Self-report data.** To ensure a reliable estimate of genuine growth, this meta-analysis was based on longitudinal studies which investigated different outcome variables over time. The majority of the included studies used self-report measures such as questionnaires or interviews. Some authors argue that genuine growth should best be operationalized in multimethod approaches which map prospective self-reports to behavioral anchors, peer reports, or observational data, since genuine change should also express itself in altered behavior (Blackie et al., 2017; Frazier, Coyne, & Tennen, 2014). However, despite the efforts to include such studies in the meta-analysis, we could hardly find any research using multimethod approaches. Future research should therefore strive to operationalize growth also with other measures but self-reports.

## Guidelines for Future Research

**Time frame.** Growth is a long-lasting process. As is evident from the meta-analytic results for self-esteem, social relationships, and mastery, the most common initial reaction to a major life event is an immediate decrease, or no significant change. However, after the initial decline, an increase of psychological functioning emerges. This finding fits very well into the conceptual foundation of PTG, which emphasizes that the positive change is not the result of the event per se, but of the struggle with the highly challenging experience (Tedeschi & Calhoun, 2004). Hence, growth occurs time-lagged to the event. On average, the current standing excels the original level between one and two years after the event. These findings highlight a very critical aspect of the study of growth: the time lag between measurement time points and event. From the meta-analytic results, we would not expect to find genuine growth within the first year after the event. Perceived positive changes in that period might rather mirror the recovery process from the initial decline than genuine posttraumatic growth. However, many cross-sectional and longitudinal studies only assess posttraumatic growth within the first year after the potentially traumatic event (e.g., Carboon et al., 2005; Rimé, Páez, Basabe, & Martínez, 2010; Xu & Liao, 2011; Yu et al., 2010). Thus, a recommendation for future cross-sectional, as well as longitudinal, research would be to include a minimum of one measurement time point that lies at least one and a half year after the event.

**Broadening the conceptualization of growth.** The concepts of posttraumatic (Tedeschi & Calhoun, 1996) and postecstatic growth (Roepke, 2013) suggest that the positive changes occur in specific areas. Although this approach provides a valuable simplification of a complex psychological construct, it might also be misleading, and a case of data censoring. The results of the meta-analysis suggest that PTG does not only occur in the five areas specified by Tedeschi and Calhoun (1996), but also in other psychological domains, such as self-esteem and mastery. Because neither concept is included in the PTGI, they received little scientific attention in the context of PTG research. That PTG is not limited to the five components identified by Tedeschi and Calhoun (1996) has already been shown in other studies (e.g., Hefferon et al., 2009). Taken together, the findings of this meta-analysis and

previous work that used qualitative approaches, suggest incorporating other possible target outcomes in future growth research.

**Perceived and genuine growth.** This meta-analysis has demonstrated that actual posttraumatic and postecstatic growth as pre- and post-event difference do exist. However, previous studies found that genuine and perceived growth are not, or only slightly, related (e.g., Frazier et al., 2009; Ransom, 2005). In addition, perceived PTG is associated with mental illnesses such as anxiety (Carboon et al., 2005) or PTSD (Lowe et al., 2014). These findings raise many critical questions which should be addressed in future research, for example, whether genuine or perceived growth is more important for mental health. The positive associations of perceived growth and critical mental outcomes might suggest that it is genuine, and not perceived, growth that enables people to thrive after bad and good experiences.

**Research designs.** As discussed above more sophisticated research designs are needed. In particular, longitudinal studies with matched control groups and multimethod assessment of the constructs under consideration are required.

**Investigating the benefits of positive life events.** The negativity bias in life event research distorts the general understanding of personal growth. For many years, the possibility that positive life events could also be a catalyst of beneficial personality changes has not been considered. Meanwhile, highly positive events happen much more often than potentially traumatic experiences (Gable, 2000), and contribute to personal growth as much as negative experiences do. Hence, it is likely that our personality is also shaped by life's best experiences. In consideration of these findings, future research should put more effort into the systematic investigation of the psychological consequences of positive experiences.

## Conclusions

Does growth require suffering? This meta-analysis has shown that people tend to experience psychological gains over time independently from the valence of encountered life events. These findings question our understanding of posttraumatic growth and challenge traditional models explaining its emergence. It was also evident that prospective longitudinal studies with appropriate comparison groups are severely lacking in the literature. Thus, robust evidence for claiming that negative life events promote psychological growth is missing and should be the most critical endeavor for future research in the field.

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## Appendix

## Model Equations

Following Cheung (2008) we used a structural equation modeling approach for meta-analysis, for which the random-effects model is defined as:

$$y^* = X_0^* \cdot u + e^*. \quad (3)$$

The vector $\mathbf{y}^*$ contains the effect sizes, and is weighted by the inverse sampling error of the effect sizes. $\mathbf{X}_0^*$ is a transformed identity matrix, whereas $\mathbf{u}$ is a vector of study specific random effects. Finally, $\mathbf{e}^*$ is the standard error vector of effect sizes weighted with the inverse of the standard errors. An extended version of the model includes the covariates such as valence of event and is expressed as follows:

$$y^* = X_0^* \cdot u + b_1 \cdot X_1^* + e^*. \quad (4)$$

The vector $\mathbf{X}_1^*$ contains the values of the moderator variables, which are also weighted by the inverse standard error of the effect size. The regression coefficient of the moderator variable is denoted with $\mathbf{b}_1$. In this model the value $b_0$ of the random intercept variable $\mathbf{u}$ is the expected effect size of the reference category (negative physical events) for $\mathbf{X}_1^* = 0$. We extended the model to include multiple covariates.

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