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Review

Psychological and clinical correlates of the Centrality of Event Scale: A systematic review☆

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HIGHLIGHTS

- Event centrality refers to having a stressful event central to one's identity.
- The Centrality of Event Scale (CES) is a robust measure of event centrality.
- The CES correlates highly with posttraumatic stress disorder symptoms.
- The CES correlates highly with grief, shame, and qualities of the stressful memory.
- The CES correlates moderately with symptoms of dissociation, depression and anxiety.

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ABSTRACT

The Centrality of Event Scale (CES) was introduced to examine the extent to which a traumatic or stressful event is perceived as central to an individual's identity and life story, and how this relates to Posttraumatic Stress Disorder (PTSD) symptoms. In addition, the CES has been examined in relation to a range of other conditions and dispositions. We present a systematic review of the correlates of the CES. Results from 92 publications resulted in 25 measurement categories in the six theoretical domains of trauma, negative affect and distress, autobiographical memory, personality, positive affect, and gender. The mean weighted correlations of the 25 measurement categories ranged from −.17 to .55, with standard errors from .01 to .02, allowing us to distinguish empirically among effects. Consistent with the theoretical motivation for the CES and predictions predating the review, the CES correlated positively with a range of measures, correlating most highly with measures related to trauma, PTSD, grief, and autobiographical memory. The findings show that the CES probes aspects of autobiographical memory of broad relevance to clinical disorders, and with specific implications for theories of PTSD.

1. Introduction

Autobiographical memory is normally biased towards positive events, supporting a positive view of oneself and the past. For example, people generally remember more positive than negative events from their lives (Walker, Skowronski, & Thompsen, 2003), the affective intensity of positive events fades more slowly than it does for negative events (e.g., Ritchie, Skowronski, Cadogan, & Sedikides, 2014; Walker et al., 2003), and people feel temporally closer to positive events and more removed from negative events (e.g., Ross & Wilson, 2002). Culturally shared expectations of transitional events in an individual life course likewise tend to focus on events judged to be emotionally positive (e.g., Berntsen & Rubin, 2004; Rubin & Berntsen, 2003) and such events are known to play a key role in structuring individual life stories (e.g., Habermas & Bluck, 2000; Pillemer, 1998, 2003; Shum, 1998).

However, for some individuals and under some circumstances, a negative event that is traumatic, highly stressful, unexpected, or shocking, such as a loss of a loved one, a dangerous accident, or a shameful situation, may take on a similar pivotal role. Research based

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on the Centrality of Event Scale (CES; Berntsen & Rubin, 2006a) has shown that having a negative event central to identity and life story is associated with symptoms of Posttraumatic Stress Disorder (PTSD) and adverse psychological health (e.g., Berntsen & Rubin, 2006a, 2007; Rubin, Boals, & Hoyle, 2014).

The CES was first introduced to measure the centrality of a traumatic or stressful event in a person's identity and life story and how this related to PTSD symptoms (Berntsen & Rubin, 2006a). However, since its introduction, the CES has been used to examine the centrality of a wide range of events, including memories for events not directly associated with trauma or PTSD, such as memories of shameful events (e.g., Matos & Pinto-Gouveia, 2010, 2014), happy memories (e.g., Janssen, Hearne, & Takarangi, 2015; Zaragoza Scherman, Salgado, Shao, & Berntsen, 2015), self-discrepant memories (Mutlutürk & Tekcan, 2016) and memories of public events (Koppel, Brown, Stone, Coman, & Hirst, 2013). Likewise, the scale has been employed in a wide range of study populations, such as veterans (e.g., Brown, Antonius, Kramer, Root, & Hirst, 2010; Staugaard, Johannessen, Thomsen, Bertelsen, & Berntsen, 2015), older adults (e.g., Boals, Hayslip, Knowles, & Banks, 2012; O'Connor, Piet, & Hougaard, 2014), patients with schizophrenia (Allé et al., 2016; Berna et al., 2017) and patients with multiple sclerosis (Voltzenlogel et al., 2016).

The large and diverse body of research on the CES has created a need for a systematic review to map the pattern of correlations between our key measure (the CES) and multiple other variables. The initial theoretical motivation for the CES (Berntsen & Rubin, 2006a, 2007) emphasized the enhanced accessibility of the traumatic or stressful memory relative to other memories due to the emotionally arousing and schema deviant nature of the traumatic event. However, the accessibility of any specific stressful memory is likely to be shaped, not only by factors related to the remembered event itself, but also by more general dispositions of the individual. For example, the centrality of a negative event would likely be intensified by a general tendency for self-focused attention (e.g., Ingram, 1990), Neuroticism (Costa & McCrae, 1990) and a general tendency for engaging in maladaptive repetitive thought (Watkins, 2008).

Consistent with this view, it has been found that the CES correlates not only with measures of PTSD symptoms in relation to a specific traumatic event, but also with measures of negative affect and affective disorders unrelated to trauma, such as symptoms of depression and anxiety (e.g., Allbaugh, O'Dougherty Wright & Folger, 2016; Berntsen & Rubin, 2007). However, the strengths, and the differences between these associations, as well as their theoretical implications, are not clear. One aim of this systematic review is to clarify such patterns of correlations in order to attain a deeper understanding of event centrality as a theoretical construct and its implications for clinical disorders.

In the following, we review the theoretical background of the CES, as well as some key findings, in order to motivate the hypotheses and research questions to be examined in the systematic review that follows. We focus on the CES as answered for a traumatic or stressful event, consistent with the original conception of the scale and the largest body of literature.

1.1. The theoretical background for the CES and empirical findings

The CES taps the extent to which a traumatic memory forms a reference point for everyday inferences, a turning point in the life story, and a central component of personal identity by asking questions such as “This event has become a reference point for the way I understand myself and the world”, “This event permanently changed my life” and “I feel that this event has become part of my identity” (Berntsen & Rubin, 2006a).

The theoretical motivation for the CES was based on autobiographical memory research showing that highly accessible and vivid personal memories provide meaning and structure to an individual's life story and help to anchor their conceptualization of themselves (Berntsen & Rubin, 2006a). In most cases, this role is played by memories of positive and normative life events, such as marriage, childbirth, graduation, or major achievements. The CES was developed to specifically address the potential maladaptive effects of a traumatic event taking such central role. Berntsen and Rubin (2006a) hypothesized that this would correlate with symptoms of PTSD. Integrating the conception of availability heuristics (Tversky & Kahneman, 1973) with autobiographical memory theory, Berntsen and Rubin (2006a) proposed that a highly accessible memory of a negative event might become a reference point for everyday inferences, which likely would generate unnecessary worries about future events, intrusive memories and attempts at avoidance, consistent with symptoms of PTSD. Also, a highly accessible negative event might narrow the person's sense of identity and negatively color his or her interpretation of other personal events, which might lead to internal, stable, and global attributions (Abramson et al., 1978) known to be associated with both depression (Peterson & Seligman, 1984) and PTSD symptoms (Greening, Stoppelbein, & Docter, 2002; Berntsen & Rubin, 2006a).

Consistent with these expectations, numerous studies involving a variety of trauma populations have shown the CES to be a robust correlate of symptoms of PTSD (e.g., Robinaugh & McNally, 2011; Roland, Currier, Rojas-Flores, & Herrera, 2014; Wessel et al., 2014). This positive relationship between the CES and PTSD symptoms persists when controlling for such factors as severity of the traumatic event, depression, anxiety, dissociation, personality traits, repressive coping, and self-consciousness (e.g., Berntsen & Rubin, 2007; Boelen, 2012a; Fitzgerald, Berntsen, & Broadbridge, 2016; Lancaster, Kloep, Rodriguez, & Weston, 2013; Pinto-Gouveia, Castilho, Matos, & Xavier, 2013; Rubin, Boals, & Berntsen, 2008; Smeets, Giesbrecht, Raymaekers, Shaw, & Merckelbach, 2010). Recent studies have highlighted the role played by event centrality in the trajectory of PTSD symptoms over time (e.g., Blix, Birkeland, Solberg, Hansen, & Heir, 2016; Boals & Murrell, 2016), suggesting that event centrality may play a prominent role in both the development and maintenance of symptoms of PTSD.

The CES has also shown associations with other psychological constructs and disorders, not necessarily related to trauma. Specifically, research has found a positive relationship between centrality of negative events and symptoms of anxiety (e.g., Cunha, Matos, Faria, & Zagalo, 2012; Newby & Moulds, 2011), paranoia (e.g., Matos, Pinto-Gouveia, & Gilbert, 2013; Pinto-Gouveia et al., 2013), dissociation (e.g., Brown et al., 2010; Robinaugh & McNally, 2011) and depression (e.g., Allbaugh et al., 2016; Webb & Jobson, 2011). Event centrality is also related to depressive symptoms over time after negative events, such as a romantic break-up (Boals, 2014) and after the loss of a loved one (Boelen, 2012a).

The consistent positive correlations between the CES and various measures of negative affect and adverse psychological health are not consistently paralleled by negative correlations between the CES and measures associated with positive affect and good mental health (e.g., Bohn, 2010; Johnson & Boals, 2015 vesus Currier et al., 2013; Schuettler & Boals, 2011).

Research has shown that the CES score for a given stressful event is positively related to many other measures of the memory for the same event, possibly indexing overall accessibility (Berntsen & Rubin, 2008). Several studies have found a positive relationship between the CES and features of memories, such as vividness (e.g., Berntsen & Rubin, 2006b; Newby & Moulds, 2011), emotional intensity (e.g., Boals, 2010; Ogle, Rubin, & Siegler, 2015) and the feeling of reliving the event (e.g., Fitzgerald et al., 2016; Newby & Moulds, 2011). The CES is also positively correlated with the perceived -self, social, and directive functions of the autobiographical memory (Rasmussen & Berntsen, 2009, 2010, 2013).

However, in line with the idea that the centrality of a specific, negative event is shaped, not only by factors related to this event *per se*, but also by more general dispositions of the individual, research has

shown associations between CES scores and specific personality traits. Notably, robust positive correlations have been found between Neuroticism and the CES, which is consistent with the role of Neuroticism in many psychopathologies (e.g., Boelen, 2009; Ogle et al., 2015). Some studies also have found positive correlations between the CES and the personality trait Openness (e.g., Berntsen, Rubin, & Siegler, 2011; Ogle, Rubin, & Siegler, 2014), consistent with a general tendency for characteristics of autobiographical memory to be correlated with Openness (e.g., Rasmussen & Berntsen, 2010; Rubin & Siegler, 2004). Findings are mixed regarding the relation between the CES and the personality traits of Agreeableness, Conscientiousness, and Extraversion (e.g., Fitzgerald et al., 2016; Ogle et al., 2014).

1.2. Research questions and hypotheses

Previous research on the CES has generated insights, but it also left several unanswered questions to be addressed in a systematic review. The questions fall into two categories. Some can be formulated as direct hypotheses on the basis of theoretical claims stated in articles published before this systematic review was initiated. Others are theoretically motivated, more open-ended research questions to be pursued and clarified through an exploratory approach.

1.2.1. Hypotheses

Based on the theoretical conceptions underlying the CES (Berntsen & Rubin, 2006a, 2007, 2014; Berntsen et al., 2011) and previous work, five main hypotheses can be generated. Although the literature reviewed in the introduction supported and helped to motivate these hypotheses, it provided no systematic, quantitative measure of it, which is a goal of the current paper.

First, we expect the CES as answered for a negative event to correlate positively and consistently with a range of measures of negative affectivity and maladaptive thought. Second, we expect the CES to have larger positive correlations for measures of PTSD and trauma-related cognition than for measures for which the CES was not initially developed. Third, the trauma criteria derived from DSM-IV criteria (American Psychiatric Association, 1994) distinguish between the A1 addressing whether the negative event involved life danger and injury and the A2 asking about specific negative emotions at the time of the trauma. We expected that the exact nature of the trauma and retrospective reports of emotions during the trauma would show weaker correlations with the CES than reports of current symptoms. We also expected that the A2, indexing the subjective emotional reaction at the time of the trauma, would correlate more strongly with the CES compared with the A1 probing more objective aspects of the severity of the traumatic event, such as whether the event involved life danger and personal injury. Fourth, because the CES is intended to index memory accessibility, we expect the CES to be consistently and highly correlated with other measures of memory for the target event, such as the emotional intensity and vividness associated with remembering the event. Fifth, following previous work, we expect only weak or non-significant findings regarding correlations between the CES and measures of positive affect and adaptive behavioral responses, such as life satisfaction and personality traits associated with positive affectivity. The systematic review provides quantitative, reliable, estimates evaluating these hypotheses.

1.2.2. Other research questions to be explored

A number of other questions is target of exploration. First, it is unclear whether correlations between the CES and measures of PTSD symptoms are equally strong for all subscales of PTSD, or especially strong for measures related to memory, that is, re-experiencing symptoms, given that the CES can be viewed as a memory measure (Berntsen & Rubin, 2006a). Second, although it has been established that the CES correlates with a range of measures of emotional distress, it remains unclear whether the effect sizes of these relationships are at the same level as the correlations with measures of PTSD symptoms and whether they differ among themselves. For example, it might be that the correlations with the CES are especially strong for measures tapping the combined effects of factors related to event memory and general individual dispositions for negative affect, rather than just one of the dimensions. Third, we have no hypotheses regarding correlations with gender, but given the tendency for women to have more detailed emotional memories and show higher levels of PTSD (e.g., Rubin, Berntsen, & Bohni, 2008), the CES may be generally higher for women than for men. No other socio-demographic variables had data that were sufficient to satisfy the inclusion requirements listed in the Method section. Although many studies listed the means of their participants on such socio-demographic variables, few provided correlations with their CES scores. In addition, age, which was the socio-demographic variable most commonly reported, often had a range that was too narrow to measure its correlation with other variables.

2. Method

We analyze 25 measurement categories defined by the available data (see inclusion criteria).

2.1. Literature search

Berntsen and Rubin (2006a) introduced the CES, provided the 7 and 20-item versions, and made the CES freely available for research, thus it should be cited by all papers using the scale. Google Scholar searches were performed to find all published and unpublished records citing this article in English until June 1, 2015. A supplemental literature search was performed in Scopus and Web of Science on November 18, 2016 for records published before June 1, 2015. On July 5, 2018, a final supplemental literature search was performed in Google Scholar, Scopus and Web of Science for records published after June 1, 2015 (see Fig. 1).

2.2. Inclusion and exclusion criteria

There were six inclusion criteria. First, records had to be in English. Second, the record had to use the CES, not just mention it in a theoretical discussion or review. We included the standard published 7 and 20-item versions (Berntsen & Rubin, 2006a) and versions of the CES with three or more items (e.g., Berntsen & Rubin, 2006b; Rubin, Berntsen, & Hutson, 2009). Third, we excluded theses and unpublished records. A total of twenty-two theses that otherwise satisfied the requirements were excluded. Four of these reported data that were already included in published articles, five had correlations that did not contribute to any of our measurement categories. The remaining thirteen theses reported correlations with PTSD, posttraumatic growth (PTG), Neuroticism, anxiety, depression, shame, social support and satisfaction with life, respectively; all with coefficients in the range of published work. Our decision not to include results from non-peer-reviewed studies was based on several considerations. Unpublished studies have less rigorous quality control. Empirical studies that tested adding results from dissertations found that they did not affect the conclusions of meta-analyses (Vickers & Smith, 2000). Furthermore, the thirteen studies that would have been included all had correlations in the range of the included peer-reviewed studies.

Fourth, because there were so few studies with small *n*s and because most studies had *n*s > 200, only studies with > 30 participants were included. We did so in order to avoid including data from grossly underpowered studies that may overestimate effect sizes (Kraemer, Gardner, Brooks, & Yesavage, 1998). As pointed out by Kraemer et al. (1998), removing underpowered studies reduces biases due to the file-drawer-problem and thus increases the robustness of the outcome of the analyses. There is no accepted analytic way to decide on how many participants should be in a study for it to be included. As there were

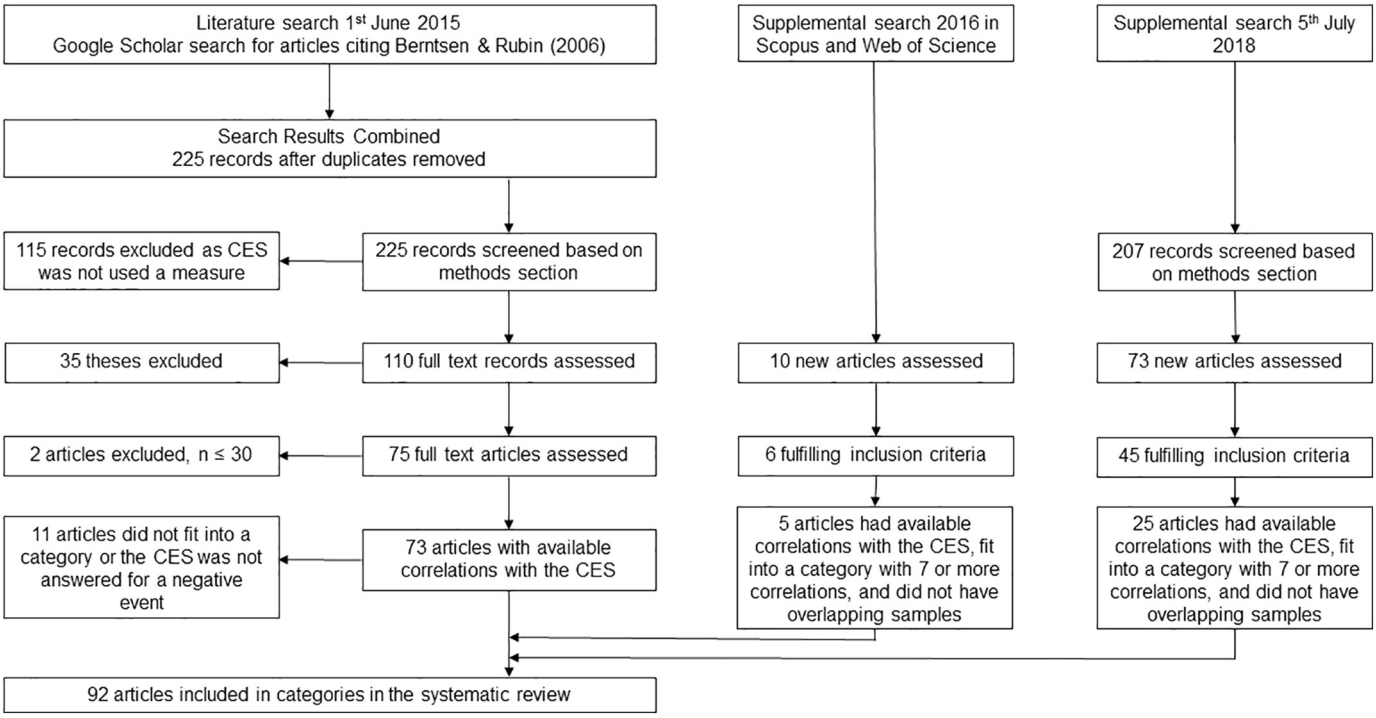

Fig. 1. Flowchart displaying inclusion and exclusion of articles.

only six studies that did not have > 30 participants and no studies between 30 and 40 participants, we chose 30 as our cutoff. Fifth, in order to be theoretically relevant to the present analyses, the CES had to be answered for an emotionally negative event, which included traumatic experiences, stressful events, self-nominated negative life events, or events associated with shame or loss. However, we do compare the CES as answered for a negative event to the CES as answered for a positive event in the measurement category of CES-positive. Sixth, the article had to provide a measure of association for a measurement category that had seven or more measures of association within our database of studies using the CES. See Fig. 1 for details about the inclusion and exclusion of articles. The full references to all records excluded for each of the last three criteria are listed in the Supplemental material A.

2.3. Information not in articles

Articles often included variables for which no correlation or other measure of association with the CES was reported. Before the inclusion and exclusion criteria were applied, additional information was requested from 47 records by sending e-mails to the corresponding authors. We received additional information from 36. To foreshadow, the size of these correlations did not differ from the ones published, suggesting the absence of a publication bias.

For records retrieved in the search on July 5, 2018, additional information was not requested. The full references to all articles from the search on July 5, 2018, that could have been included if additional information had been requested are listed in the Supplemental material A.

2.4. Selection of measurement categories

We looked for categories of measures that had at least seven entries. Seven entries were chosen as the cut-off to ensure sufficiently large sample sizes for each measurement category. An article could contribute more than one entry in a measurement category, if it included different focus memories from the same experiment (e.g., sad and fearful; Matos, Pinto-Gouveia, & Duarte, 2012), different subsamples (e.g., Berntsen & Rubin, 2007; Kuenemund, Zwick, Rief, & Exner, 2016), multiple time points at which the CES was measured (e.g., Staugaard et al., 2015; Boelen, 2012a) or had different studies within the same article (e.g., Berntsen & Rubin, 2007; Rubin et al., 2009). The measurement categories were mostly standardized measures of disorders (e.g., PTSD and depression) or traits (e.g., Neuroticism), or other properties of the event or memory (e.g., vividness). All 25 measurement categories are shown in Table 1 grouped into conceptual domains.

2.5. Multiple results from a single sample that appear in more than one article

Articles using the same sample were included if they reported correlations from different time points or between different measurement categories and the CES in the different articles (e.g., Blix, Solberg, & Heir, 2014; Blix, Birkeland, Hansen, & Heir, 2015; Lancaster, Rodriguez, & Weston, 2011; Lancaster et al., 2013). If correlations between the CES and a variable from the same sample appear in two articles, only data from one article was included (e.g., Chukwuorji, Ifeagwazi, & Eze, 2017a, 2017b; Eckholdt, Watson, & O'Connor, 2018; O'Connor et al., 2014; Reiland, 2017; Reiland & Clark, 2017). For studies on data from the longitudinal University of North Carolina Alumni Heart Study (Berntsen et al., 2011; Ogle, Rubin, Berntsen, & Siegler, 2013; Ogle, Rubin, & Siegler, 2014, 2015, 2016a, 2016b; Ogle, Siegler, Beckham, & Rubin, 2016) correlations between the CES and a measurement category are only included once per wave, always from the article with the largest sample size.

2.6. Multiple results from a single article

Results from the same article that did not include data that overlapped with other results were reported individually. In particular, this included relations of the same CES data with different measurement categories (e.g., the same CES data correlated with PTSD, depression, and gender), results for individual experiments in the same article, different non-overlapping groups of participants in the same experiment, different times of data collection in the same longitudinal

experiment, and different memories for which the CES was obtained (e.g., memories cued to the emotion fear versus the emotion of shame). Where more than one measure of a category was present in a study for the same focus memory, their correlations were averaged.

2.7. Subscales and full scales

Subscales of tests were reported in addition to the full scale only if there were seven or more entries for the subscales.

2.8. Coding of measurement categories

For details on the coding of the measurement categories that form the basis of our analyses, see Supplemental material B.

2.9. Analytic techniques

We conducted 25 separate analyses of measurement categories for which there are seven or more correlations. This provided us with the empirical findings to evaluate our theoretically-based hypotheses.

2.10. Computation and testing of effect sizes

We expected variability in effect sizes within each category to be attributable to sampling error, therefore we used a fixed effect model (Borenstein, Hedges, Higgins, & Rothstein, 2010). Effect sizes were expressed as *r*s and weighted by their standard error prior to computing means. Comparisons of independent mean effect sizes were done using standard meta-analytic procedures (Cooper, Hedges, & Valentine, 2009). In particular, effect sizes from individual studies were converted to *Z* and weighted by their sample size ($N - 3$). An overall effect size for each measurement category was calculated as $\Sigma\ Z(N-3)/\Sigma\ (N-3)$, and converted to *r*, from which the standard error and confidence intervals were calculated. The comparison of effect sizes between the CES and two measurement categories were performed using Steiger's (1980) method for comparing dependent correlation coefficients as implemented by Hoerger (2013). When comparing coefficients to which some samples contributed only one effect size (as in Table 1), the smaller of the two sample sizes was used to construct the test statistic.

3. Results

3.1. Publication bias

We expected minimal publication biases because, in most cases, the included studies are not testing statistical hypotheses about relationships of the CES and other variables that, if non-significant, would affect whether the study would be publishable. Rather, they are typically presenting correlations among many measures that vary across participants. In addition, because most of the studies are concerned with individual differences in state and/or trait variables, they generally are designed to have large enough sample sizes to detect fairly small correlations.

We address the issue of publication bias in three ways. First, we examined all the correlations reported in our tables, plotting a histogram of their observed *p* levels in Fig. 2. To do this, we used an approximately logarithmic scale of commonly used *p* levels in which each *p* is approximately half the one before it. We started at $p < 1.0, < .50, < .25, < .10, < .05, < .025, < .01, < .005$ and ended at $p < .00001$. As illustrated in Fig. 2, there is no evidence of a publication bias that results in *p* values being more frequent at the $p < .05$ boundary. There are 441 correlations in all of the analyses; 271 (62%) have $p < .00001$. The remaining 170 correlations are fairly uniformly distributed on the approximately logarithmic scale distribution from $p < 1.0$ to $p < .0001$. In the 4 bins adjacent to $p < .05$ that do not meet that threshold, there are 74 correlations; in the 4 adjacent bins

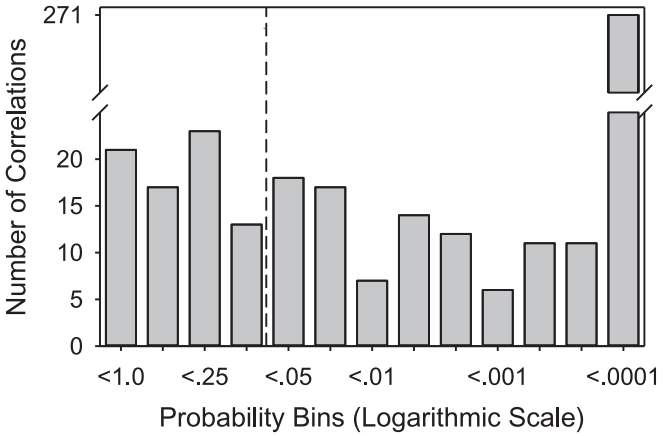

Fig. 2. Histogram displaying the p-value of all correlations in the systematic review along an approximately logarithmic scale. The y-axis represents the number of correlations.

that meet that threshold there are 56. Thus, there is no indication of a build-up to the just significant side of the $p < .05$ boundary. Second, many studies have included the CES together with a range of other instruments, where the specific associations between the CES and these instruments were not central to the theoretical concern of the study and thus not reported in the published study. Such studies provided additional data for our systematic review and help to control for publication bias. The correlations in the published articles were similar to those received as additional information and thus not previously reported (see Table 2). Third, we present a histogram of the distribution of correlations for each of our 25 conceptual categories. We initially tried funnel plots, but because there was no effect of sample size, histograms provided easier to understand figures. As with funnel plots, we looked for symmetry in the distribution of effect sizes, which might suggest that studies were missing from what should be a symmetric distribution around the mean (Sterne & Harbord, 2004). As none was evident, we saw no indication of a publication bias within individual measurement categories (Duval & Tweedie, 2000).

3.2. Overview

Table 1 provides an overview of our findings of the 25 measurement categories. Several observations should be stressed. First, the mean correlations of each measurement category are based on a large number of individual subjects, ranging from about 1,500 to 35,000 participants. Second, the mean correlations varied widely from approximately .5 for several of the measures related to PTSD to some that were close to 0 and a few negative correlations, including Agreeableness, Social Support, and Satisfaction with Life. Third, the standard errors in the mean correlations ranged from approximately .01 to .02. Given the large range in correlations and their small standard errors, it is possible not only to report the mean correlations with confidence, but also to compare the degree to which each of the 25 measurement categories correlates with the CES. Because the mean correlations of the categories within the conceptual groupings are generally similar, we use the conceptual grouping to summarize our results.

The correlations and confidence intervals shown in Table 1 provide a general sense of the overlap among the mean correlations of different measurement categories. The correlations and number of participants presented in Table 1 allow specific tests to be conducted under the assumption that the participants for each measurement category are from different samples. Given that the samples often partially overlap and that we will make multiple comparisons, the specific tests need to be taken with some caution. This is the *shifting unit of analysis* problem which is hard to handle here because correlation among the measures

Table 1
Mean weighted effect sizes for individual measurement categories.

Measurement categories	Total *N*	*r*	95% CI		*SE*
			LL	*UL*	
PTSD					
Full scale	37,626	.511	.503	.520	0.004
A1	10,767	.129	.110	.148	0.010
A2	10,737	.264	.246	.282	0.009
Re-experiencing	4,421	.497	.472	.523	0.013
Avoidance	4,421	.408	.381	.435	0.014
Arousal	4,096	.456	.428	.483	0.014
Trauma Related					
PTG	11,578	.549	.534	.564	0.008
Trauma cognitions	2,082	.438	.399	.477	0.020
Negative affect and distress					
Depression	21,953	.281	.268	.293	0.007
Anxiety	6,201	.271	.247	.295	0.012
Dissociation	2,211	.246	.205	.286	0.021
Shame	3,858	.383	.354	.412	0.015
Grief	1,260	.539	.492	.585	0.024
Autobiographical memory					
Memory vividness	2,161	.398	.360	.437	0.020
Emotional intensity	2,176	.384	.346	.423	0.020
Physical reaction	2,082	.305	.264	.346	0.021
Personality					
Neuroticism	18,987	.203	.189	.217	0.007
Extraversion	5,923	−.065	−.091	−.040	0.013
Openness	5,923	.079	.054	.104	0.013
Agreeableness	5,923	−.021	−.046	.005	0.013
Conscientiousness	5,923	−.061	−.087	−.036	0.013
Positive affect and adaptive responses					
Social support	7,374	−.083	−.106	−.061	0.012
Satisfaction with life	3,509	−.175	−.207	−.142	0.017
CES positive	4,156	.215	.185	.244	0.015
Gender[a]	6,714	.113	.089	.137	0.012

Note. CI = confidence intervals; *LL* = lower limit; *UL* = upper limit; PTSD = Post-traumatic Stress Disorder; PTG = Post-traumatic Growth; CES = Centrality of Event Scale.
[a] For all correlations it applies that: male = 0, female = 1.

being compared are not usually available. Fortunately, the distortions caused by this problem are minimal (Cooper, 1998, 2010). Overall, the analyses to be presented in Table 3 and the low *p*-values of the tests we report leave little doubt that our inferences are correct.

As a detailed examination to ensure that the distributions of the correlations from the individual studies are not problematic, we present histograms of their distributions. We use bins of $r = .2$ to allow easy visual comparison across measurement categories, except for PTSD, measures of negative affect and distress, and personality. For these measurement categories, there are enough studies to support the use bins of $r = .1$.

3.3. Individual measurement categories grouped by theoretical domains

Tables displaying the correlations from individual studies included in each measurement category are available in Appendix A.

3.3.1. PTSD symptoms including subscales (Fig. 3)

The weighted mean correlation between the full-scale measures of PTSD and the CES is .51 (range: .19–.83), and the distribution of correlations shows a relatively normal distribution with a clear peak between .50 and .60. The commonly used subscales for PTSD have weighted mean correlations with the CES of .50 (range: .31–.67) for re-experiencing, .41 (range: .19–.56) for avoidance, and .46 (range: .24–.59) for arousal.

The weighted mean correlations between the A1 and A2 criterion for PTSD in the DSM-IV/DSM-IV-TR (American Psychiatric Association, 1994, 2000) and the CES are .13 (range: −.04–.33) and .26 (range: .18–.51), respectively. The distribution of correlations with the A1 criterion has a peak between .00 and .20, whereas the correlations for the A2 criterion show a distribution with a peak from .20 to .40.

Table 2
Average correlations reported in articles and correlations received as additional information.

Measurement category	Reported in article		Additional information	
	Total *N*	*r*	Total *N*	*r*
PTSD	32,008	.51	5,735	.42
A1	6,736	.14	4,031	.12
A2	6,736	.30	4,001	.28
Re-experiencing	4,245	.45	176	.60
Avoidance	4,245	.38	176	.42
Arousal	3,981	.44	115	.57
PTG	8,212	.44	3,366	.44
Trauma cognitions	1,483	.42	599	.41
Depression	15,450	.33	6,503	.29
Anxiety	3,772	.32	2,429	.28
Dissociation	2,096	.27	115	.40
Grief	804	.55	456	.53
Memory vividness	1,538	.41	623	.17
Emotional intensity	1,671	.35	505	.43
Physical reaction	1,577	.32	505	.29
Neuroticism	11,201	.24	7,786	.24
Extraversion	2,926	−.15	2,997	−.08
Openness	2,926	.04	2,997	.07
Agreeableness	2,926	−.04	2,997	−.04
Conscientiousness	2,926	−.13	2,997	−.09
Social support	3,983	−.08	3,391	−.11
Satisfaction with life	2,267	−.18	1,242	−.28
CES positive	2,695	.14	1,461	.30
Gender[a]	4,673	.02	2,041	.05

Note. PTSD = Post-traumatic Stress Disorder; PTG = Post-traumatic Growth; CES = Centrality of Event Scale.
[a] For all correlations it applies that: male = 0, female = 1.

Table 3
Comparisons of mean effect sizes restricted to studies that include both measurement categories as a method of removing the effects of having studies with different methods and participants.

Category 1	Category 2	*k*	Total *N*	*r* for Category 1	*r* for Category 2	Z_h	*p*
PTSD	Depression	52	19,308	.507	.284	46.20	.00001
	Neuroticism	23	14,667	.517	.197	40.73	.00001
	PTG	14	9,060	.513	.568	5.53	.00001
	Shame	11	3,261	.571	.366	13.88	.00001
	Dissociation	10	2,211	.457	.246	10.26	.00001
A1	A2	12	10,622	.130	.262	12.67	.00001
Depression	Neuroticism	15	9,924	.251	.200	5.84	.00001
	Shame	14	3,416	.331	.394	3.95	.00008
	Dissociation	9	1,998	.341	.257	4.01	.00006
	Anxiety	15	5,873	.297	.269	3.33	.00088

Note. *k* = number of studies; PTSD = Post-traumatic Stress Disorder; PTG = Post-traumatic Growth; CES = Centrality of Event Scale.

3.3.2. Trauma-related measures (Fig. 3)

The weighted mean correlation between PTG and the CES is .55 (range: .01–.67), and the distribution of correlations shows a relatively normal distribution with a peak between .40 and .60. The weighted mean correlation between the measures of trauma cognitions and the CES is .44 (range: .31–.61), and the distribution has most correlations between .40 and .60.

3.3.3. Negative affect and distress (Fig. 4)

Depression has a weighted mean correlation with the CES of .28 (range: .10–.78), and the distribution of correlations peaks at .20 to .40.

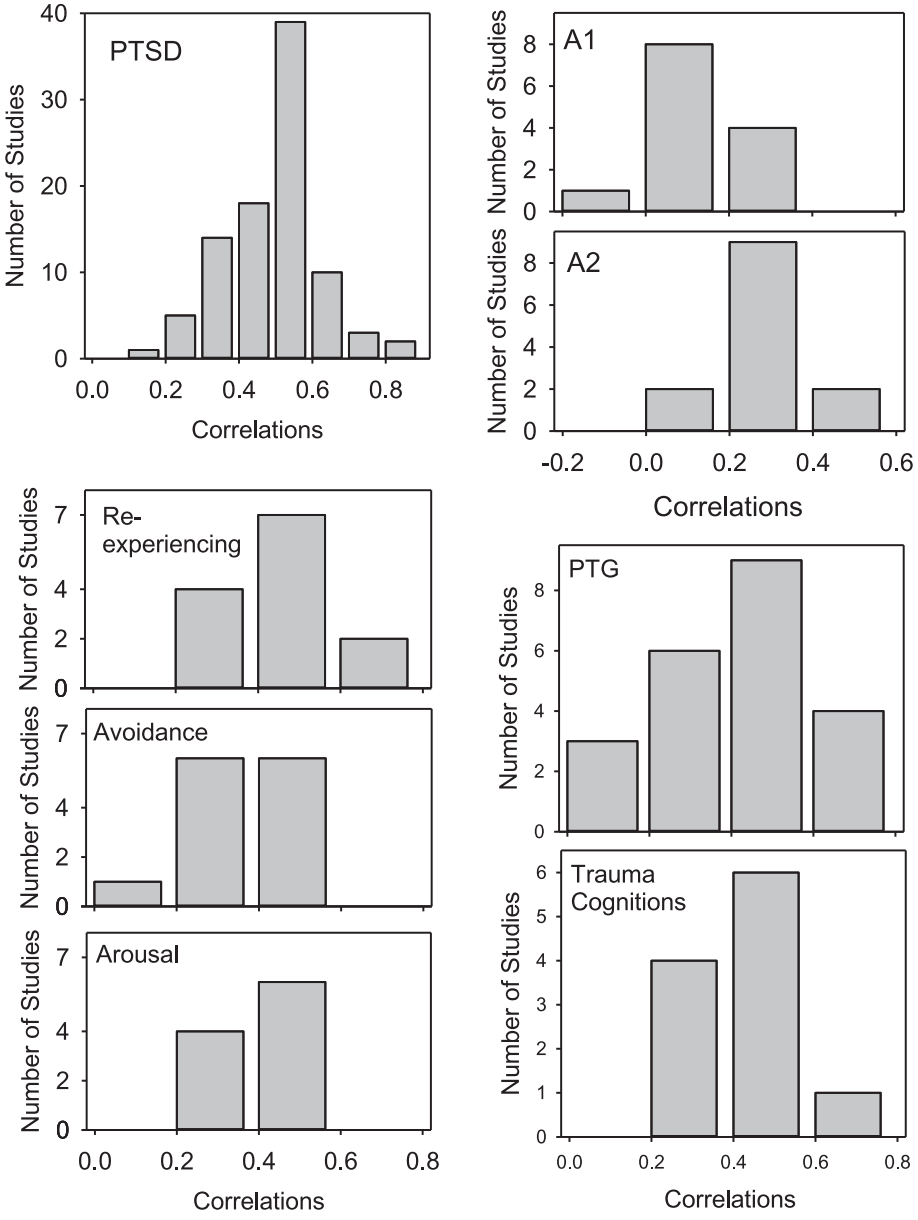

Fig. 3. The top left panel has histograms of correlations between the CES and full scale measures of PTSD. The three bottom left panels have histograms of correlations between the CES and three subscales of PTSD, all using the same class intervals, or bins, to facilitate comparisons. The two top right panels have histograms for the A1 and A2 criteria of the DSM-IV using the same bins. The two bottom right panels have histograms for measures of posttraumatic growth (PTG) and trauma cognitions.

For anxiety, the weighted mean correlation with the CES is .27 (range: .17–.48), and the correlations between the two are fairly normally distributed and peak at .20 to .40. The weighted mean correlation for the measurement category of shame is .38 (range: .22–.85), and the correlations between shame and the CES has a peak between .30 and .40. The weighted mean correlation between the CES and dissociation is .25 (range: .09–.51), and the distribution of correlations forms a relatively uniform distribution with no clear peak. Grief has a weighted mean correlation with the CES of .54 (range: .44–.70), and the distribution of correlations forms a relatively uniform distribution clustering between .40 and .60.

3.3.4. Personality (Fig. 4)

Neuroticism has a weighted mean correlation with the CES of .20 (range: .06–.42), and the distribution of correlations clusters between .10 and .30; Agreeableness is −.02 (range: −.19–.11); Conscientiousness is −.06 (range: −.26 to −.01); Extraversion is −.07 (range: −.27–.05); and Openness is .08 (range: −.08–.22). The distributions of correlations for Conscientiousness and Extraversion show peaks between −.10 and .00, and Openness shows a peak between .00 and .20, whereas the correlations with Agreeableness cluster between −.20 and .10.

3.3.5. Autobiographical memory (Fig. 5)

The vividness of memories has a weighted mean correlation with the CES of .40 (range: .02–.51), and the distribution of the correlations between the two shows a peak from .20 to .40. For the emotional intensity of the memory, the weighted mean correlation with the CES is .38 (range: .20–.54). The distribution of correlations forms a uniform distribution with no clear peak but a clustering between .20 and .40. The physical reaction experienced when remembering the event has a weighted mean correlation with the CES of .31 (range: .19–.43), and the

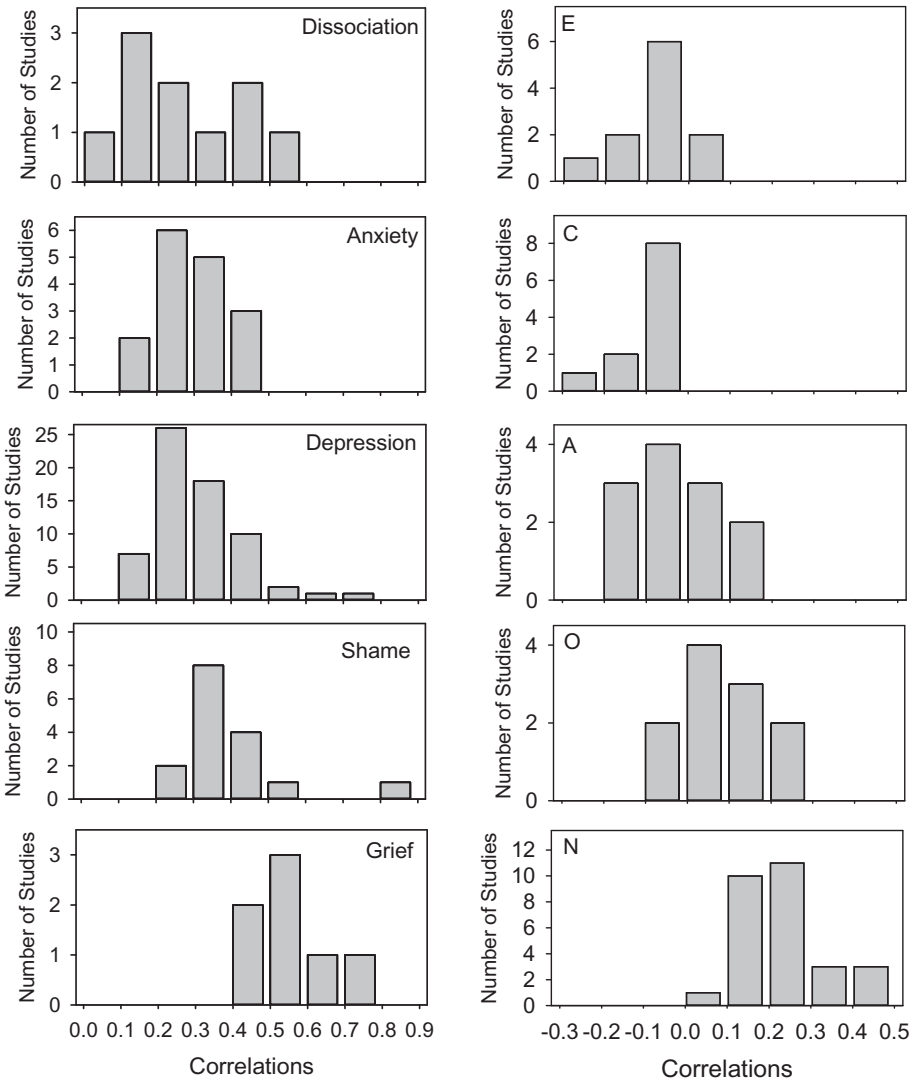

Fig. 4. The left panels have histograms of the correlations of the CES and measures of depression, anxiety, dissociation, shame and grief all using the same bins. The right panels have histograms of correlations of the CES and the personality traits of Extraversion (E), Conscientiousness (C), Agreeableness (A), Openness (O) and Neuroticism (N) all using the same bins. The order of the histograms is organized according to the mean correlation with the CES from smallest to largest.

distribution of correlations shows a peak from .20 to .40.

3.3.6. Positive affect and adaptive responses (Fig. 5)

For social support, the weighted mean correlation with the CES is −.08 (range: −.29–.05), and the distribution of correlations peaks between −.20 and .00. For life satisfaction it is −.18 (range: −.53–.12), and the distribution of correlations shows a relatively uniform distribution, with 2 ± 1 correlations per bin.

For the CES and the same questions answered for positive past events (CES positive; such as memories associated with pride and happiness; e.g., Janssen et al., 2015; Rasmussen & Berntsen, 2013) it is .22 (range: .08–.49). The distribution of correlations shows a relatively uniform distribution, with 3 ± 1 correlations per bin.

3.3.7. Gender (Fig. 5)

For gender (male = 0, female = 1) the weighted mean correlation with the CES is .11 (range: −.12–.19). The eleven correlations that make up the measurement category form a relatively uniform distribution, indicating that women have slightly higher CES scores.

3.4. Comparisons among effect sizes in the measurement categories

In the following section, we describe two types of comparisons. The first comparisons are based on correlations in Table 1. The second comparisons are restricted to studies that include both measurement categories in order to remove potential heterogeneity attributable to a subset of the effect sizes being based on different methods and participants and are based on correlations in Table3.

For the first type of comparison, standard measures of PTSD symptom severity and their three subscales in the DSM-IV (American Psychiatric Association, 1994) all correlated approximately .4 to .5 with overlapping 95% confidence intervals. The two dichotomous A1 and A2 scales were lower, with confidence intervals that did not overlap with the measures of symptom severity or with each other. Unlike symptom severity, these scales were intended to measure properties of the negative event at the time it occurred. In terms of specific tests, the A1 is lower than the A2 ($z = 10.74$, $p < 00001$), which is lower than avoidance ($z = 9.89$, $p < 00001$); avoidance being the lowest symptom cluster (Table 1). The symptom cluster of re-experience correlated more strongly with the CES than the symptom cluster of avoidance ($z = 8.74$, $p < .0001$) and the symptom cluster of arousal ($z = 2.42$, $p = .015$).

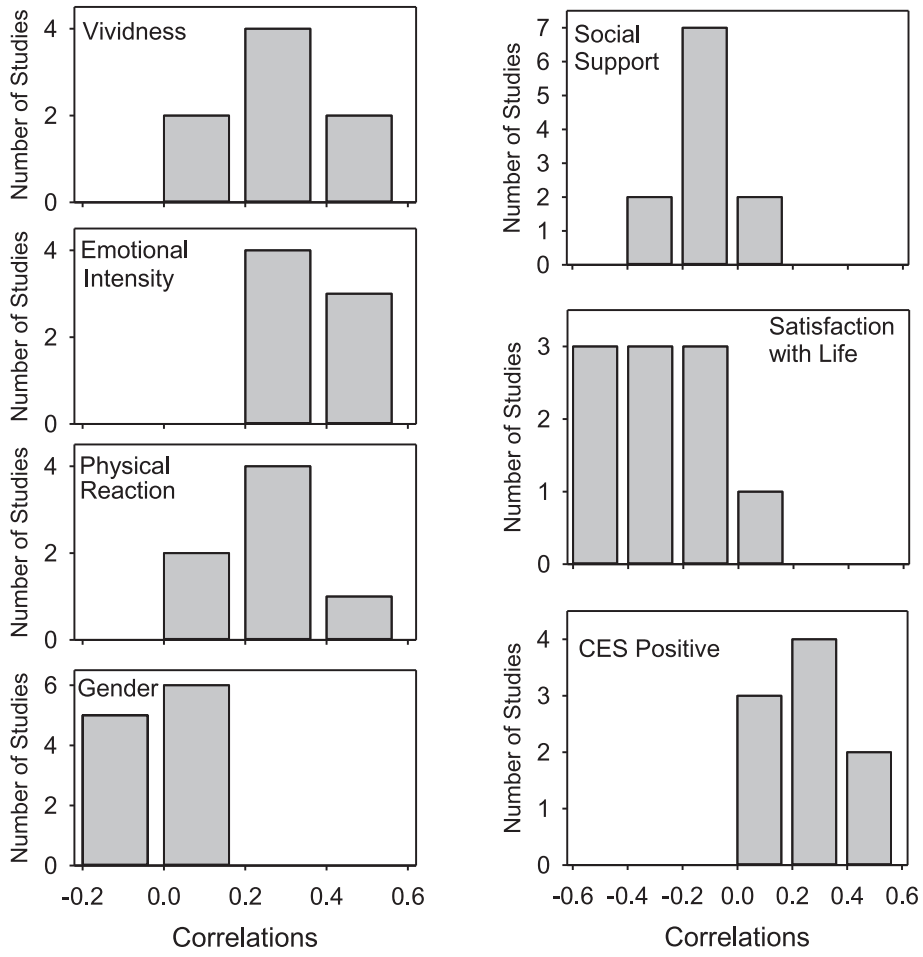

Fig. 5. The three top left panels have histograms of correlations between the CES and measures of memory vividness, the emotional intensity and the physical reaction to the event, all using the same bins. The bottom left panel has a histogram of the correlations between the CES and the gender (male = 0, female = 1) of the participants. The right panels have histograms of correlations between the CES and measures of social support, satisfaction with life and the CES for positive events, all using the same bins.

We have two measurement categories related to trauma. PTG has the highest correlation with the CES, higher than the full-scale PTSD measure ($z = 4.29$, $p < .0001$). Trauma cognitions correlates moderately with the CES.

The correlation between the CES and grief was higher than all of the four other measures of negative affect and stress (zs ranged from 5.75 to 15.09, $ps < .00001$), but did not differ from the correlations of the CES with the full-scale PTSD measure ($z = 1.63$, $p = .103$) or PTG ($z = 0.39$, $p = .699$). Shame has a correlation of .383 with the CES, which is higher than depression, anxiety and dissociation, which have correlations between .246 and .281 and all have overlapping confidence intervals (zs ranged from 6.72 to 7.48, $ps < .00001$). These high correlations may reflect that ratings of grief and shame (like the CES) are based on the memory of a past negative event (loss or shameful event, respectively). The correlation of depression with the CES was higher than the correlation of the CES with Neuroticism ($z = 18.99$, $p < .00001$). However, the correlation of depression with the CES did not differ from the correlations of anxiety with the CES ($z = 1.20$, $p = .230$) or dissociation with the CES ($z = 1.72$, $p = .085$).

For the measurement categories of autobiographical memory, memory vividness and the emotional intensity of the memory have similar correlations with the CES of .398 and .384 ($z = 0.62$, $p = .532$), respectively. The physical reaction to the memory has a correlation of .305 with the CES, which is lower than the two other measures of autobiographical memory ($zs > 3.73$, $ps < .0002$). The correlations between the CES and memory vividness and emotional intensity are higher than all measures, except PTSD symptoms, PTG, shame, grief, and trauma cognitions (e.g., the difference between emotional intensity and depression, anxiety, and dissociation all have $zs > 4.95$ and $ps < .0001$).

For the second type of comparison, Table 3 includes ten comparisons for the full-scale PTSD, A1, and depression measurement categories, with each comparison including at least nine studies.[1] These comparisons are different from the previous analyses in which the values compared were not necessarily from the same studies. Thus, in the previous analyses, any difference between effect sizes observed can be caused by differences in the samples and procedures of the studies. In contrast, the analyses in Table 3 included only studies that include both of the two measures being compared. Most comparisons are significant at the $p < .0001$ level. By a Bonferroni correction, all comparisons are significant at the $p < .05$ level.

With few exceptions, these comparisons replicate the findings reported in the previous analyses. Comparing the correlation between the CES and the full-scale measures of PTSD with the correlation between the CES and depression, neuroticism, PTG, shame, and dissociation indicated that the CES had a higher correlation with PTSD than other measures of negative emotions, but correlated most strongly with PTG. The correlations between the CES and the A1 and A2 criterion of PTSD

[1] In order to ensure a sufficient sample size for each comparison there had to be at least seven studies providing data for each comparison for it to be included in Table 3.

indicated that the A2 criterion had a higher correlation with the CES than the A1 criterion. The CES also correlated more strongly with depression than with Neuroticism. These comparisons directly replicate comparisons based on the correlations in Table 1. In contrast to the previous comparisons based on correlations in Table 1, the correlation between the CES and depression was higher than the correlation between the CES and dissociation and anxiety, respectively. For each measurement category included in Table 3, the results from the comparisons cannot be explained by difference in the individual studies included, or by the inclusion of studies that both did and did not overlap in the measurement categories.

4. Discussion

We have presented a systematic review of the correlations between the CES and a total of 25 measurement categories. Consistent with our predictions, we found that the CES correlated robustly with a range of measures of negative affect and distress, but also that the strength of these correlations varied systematically and consistent with predictions. The CES had larger correlations with measures of trauma-related distress (e.g., PTSD) and measures of conditions with a direct reference to an autobiographical memory (e.g., shame and grief) than with measures without such reference (e.g., Neuroticism). The importance of autobiographical memory was also underscored by stable positive correlations between the CES and subjective characteristics (i.e., vividness, emotional intensity, and physical reaction) related to the target memory for which the scale was answered.

It is of note that the B (re-experiencing), C (avoidance), and D (arousal) symptoms of PTSD all correlated highly with the CES, showing that all of these symptom categories, and not just one aspect of PTSD, were closely related to the centrality of negative events. However, at the same time, inspections of the strength of these associations suggested that the correlation between CES and the subscale for re-experiencing symptoms was stronger than for the other two subscales, again underscoring the CES as a memory-related measure and in line with theories of PTSD as a memory-based disorder (Rubin, Berntsen, and Bohni, 2008; Dalgleish, 2004). It is also in line with this view that the A2 criterion of PTSD (indexing the overall emotional reaction to the event) correlated more highly with the CES than did the A1 criterion of PTSD (Rubin, Berntsen, and Bohni, 2008; Rubin, Boals, and Berntsen, 2008).

Measures of PTSD and PTG both correlated strongly with the CES, supporting the notion that PTSD and PTG represent separate (but correlated) dimensions, such that the same negative event may be followed by an experience of both growth and distress within the same individual (e.g., Groleau, Calhoun, Cann, & Tedeschi, 2013; Tedeschi & Calhoun, 2004). This is also consistent with both being tied to the memory for the trauma, where PTSD symptoms may be associated with repetitive thoughts about the negative aspects and consequences of this event whereas PTG may be associated with repetitive thoughts focusing on more constructive aspects of the event (Watkins, 2008).

The fact that PTG was more strongly correlated with the CES than were PTSD measures might reflect an especially close relationship between autobiographical reasoning and the experience of personal growth after a traumatic event, consistent with the view that the integration of the negative event in an individual's life story may be one of the processes involved in PTG (Groleau et al., 2013; Staugaard et al., 2015; Tedeschi & Calhoun, 2004).

Similarly, the high correlation between grief and the CES may reflect that the memory of the loss and its perceived centrality to the self may play a key role in the development and maintenance of prolonged grief reactions (e.g,Boelen, 2009, 2012a). Grief is a reaction to the loss of a loved one, that is, to a particular event in an individual's life (e.g., Prigerson et al., 2009). Like the CES, grief is closely related to the self. Grief impacts the perception of the self (Gluhoski, 1995), and symptoms of prolonged grief disorder have been found to be associated with reduced self-clarity (Boelen, 2012a, 2017). In addition, the loss of a loved one has instant and major impact on the individual's life, and can shatter positive assumptions about the self and the world (Gluhoski, 1995) and may be experienced as a traumatic event. Symptoms of prolonged grief are also highly correlated with symptoms of PTSD (e.g., Boelen, 2017; Eckholdt et al., 2018), and among individuals recently experiencing bereavement, symptoms of PTSD are commonly reported (Prigerson et al., 2009).

Shame correlated more strongly with the CES than depression, anxiety and dissociation. This again is consistent with the importance of autobiographical memory in that shame is typically experienced and measured in relation to a particular (shameful) event. In addition, shame is a self-conscious emotion like pride and embarrassment, and shame is important for self-identity (e.g., Matos & Pinto-Gouveia, 2010, 2014). Thus, another potential reason for the strong association between the CES and shame is their mutual relation with self and identity. In addition, shame memories can be perceived as traumatic memories (e.g., Matos & Pinto-Gouveia, 2010), and measures of shame and symptoms of PTSD correlate (e.g., Matos & Pinto-Gouveia, 2010; Stotz, Elbert, Müller, & Schauer, 2015).

The stronger association between the CES and grief, and the CES and shame compared to other non-trauma related measures of negative affect and maladaptive thought might therefore be explained by their mutual ties to identity and PTSD symptoms as well as their mutual focus on an autobiographical memory (i.e., a memory of a shameful or loss event).

However, we also found positive correlations between the CES and measures of negative affect with no direct reference to a particular autobiographical event. This is consistent with our assumption that more general dispositions (such as a tendency to engage in self-focused attention or to experience low mood) may enhance centrality of a negative event, for example by boosting the associated emotion or supporting maladaptive repetitive thought in relation to the event (e.g., Watkins, 2008). However, as expected, the strength of these correlations was generally weaker than correlations between the CES and constructs with more direct references to a stressful autobiographical event.

More specifically, we found that the CES correlated moderately with measures of depression, anxiety, Neuroticism, and dissociation. More detailed analyses showed that the CES correlated significantly more strongly with measures of depression than with measures of anxiety, neuroticism, or dissociation when the effects of different samples and methods were removed, which may reflect that a highly negative event being central may enhance rumination and support negative attributional style characteristics, associated with depression (Berntsen & Rubin, 2006a; Peterson & Seligman, 1984). In addition, episodes of depression often are preceded by negative life events (Hammen, 2005).

With regard to personality measures, Neuroticism showed consistent, but relatively weak, positive correlations with the CES. This finding agrees with the general association between the CES and negative affectivity. Neuroticism is strongly associated with negative affectivity (e.g., Costa & McCrae, 1990; Rubin et al., 2014), and high levels of Neuroticism may lead to increased perception of psychological distress and may impact the way stressors are perceived (Costa & McCrae, 1990). The finding that the correlation between the CES and Neuroticism was relatively low shows that these measures nonetheless probe different dimensions. This is consistent with Rubin, Boals, and Hoyle (2014) who presented evidence classifying the CES as a measure of narrative identity and Neuroticism as a measure of negative affectivity. Although these two dimensions were correlated, each dimension had independent contributions to traumatic stress reactions.

The CES did not correlate with the personality traits of Agreeableness and Extraversion, which are generally associated with positive affect (McCrae & John, 1992). Thus, these traits do not seem to act as a buffer against perceiving a negative event as central to identity and life story. Conscientiousness also did not show a systematic

association with the CES, whereas Openness showed very weak, but positive, correlations with the CES, consistent with some previous work reporting correlations between autobiographical memory measures and Openness (e.g., Rasmussen & Berntsen, 2010; Rubin, Boals, and Berntsen, 2008; Rubin & Siegler, 2004).

Consistent with our expectations, we generally obtained mixed results regarding correlations between the CES and measures of positive affect and adaptive behavioral responses. It has been suggested that social support could play a role in integrating negative events into the life story, when the event is rehearsed with sympathetic others (Staugaard et al., 2015; Tedeschi & Calhoun, 2004). The present analysis found no evidence for a correlation between measures of social support and the CES. The CES correlated negatively with satisfaction with life. Finally, the CES correlated moderately and positively with the CES as answered for a positive event, consistent with the assumption of more stable dispositional factors contributing to perceiving events as being central.

The lack of consistent negative correlations between the CES and measures of positive emotions suggests that the absence of having a negative event central to identity and life story is not associated with positive affect. Instead it might be conceived of as a baseline or default state in healthy individuals, consistent with cultural norms and a bias in favor of positive events in autobiographical memory (e.g., Berntsen et al., 2011). A highly negative event being central would form a deviation from such default state, which would be associated with emotional distress and, in severe cases, affective disorders. This view would be consistent with the extensive literature on positive self-enhancement in normal cognition (e.g., Alicke & Sedikides, 2009).

4.1. Broader implications and future directions

The present findings have a number of implications and open interesting avenues for future research. In the following, we discuss the findings in relation to *cognitive theories of PTSD*, *structures of the self-concept* and *mechanisms underlying event centrality*.

4.1.1. Cognitive theories of PTSD

The robust correlations between the CES and symptoms of PTSD extend our understanding of the role of memory in relation to PTSD and trauma cognition and challenge common theoretical views. In cognitive theories of PTSD (e.g., Dalgleish, 2004), it has often been argued that incomplete processing and faulty encoding of the traumatic event lead to difficulties with intentionally remembering the traumatic event, and more so in individuals suffering from higher levels of PTSD symptoms (see Berntsen & Rubin, 2014, for a review). In this view, a faulty processing of the traumatic event at encoding due to peritraumatic dissociation causes the trauma to be poorly integrated into the autobiographical knowledgebase (Conway & Pleydell-Pearce, 2000; Ehlers & Clark, 2000) because of "little elaboration of the contextual and meaning elements of the event" and "an inability to establish a self-referential perspective" (Halligan, Michael, Clark, & Ehlers, 2003, p. 420). This lack of integration is expected to be positively related to level of PTSD symptoms (Berntsen & Rubin, 2014). Because the CES measures the extent to which a traumatic event is perceived as central to the person's life story and identity, and because of the high correlations between the CES and PTSD symptoms shown here, the present findings challenge this position. Rather than being poorly integrated and hard to access, the traumatic memory appears to be highly accessible and this elevated accessibility is robustly related to PTSD symptoms.

However, it might be argued that the CES only taps into the integration of a traumatic memory at higher levels of construal, that is, an integration that focuses on abstract aspects of the traumatic event and their relation to other parts of the individual's life (e.g., Trope & Lieberman, 2003, for a review, see Watkins, 2008), whereas more concrete aspects of the event, such as specific emotional reactions and sensory images remain disintegrated and poorly understood, and may form the content of intrusive memories (Brewin, 2014).

Although we acknowledge the relevance of operating with different levels of construal, we consider this interpretation less likely in the light of the fact that the CES correlated positively with the emotional intensity, physical reaction and sensory vividness of the specific target memory. This finding suggests that the CES is strongly related to the overall accessibility of the target memory, including the emotional and sensory components of the remembered event.

The present findings do not clarify the direction of causality for the reported correlates. For example, the positive correlations between the CES and measures of PTSD may reflect that having a negative event central to identity boosts symptoms of PTSD, such as intrusive memories and avoidance of reminders of the trauma, or it may be the other way around, that these symptoms lead to perceiving the stressful memory as central to identity. A few prospective studies suggest that event centrality precedes the development and maintenance of PTSD symptoms (Boals & Murrell, 2016; Boals & Ruggero, 2016; Blix et al., 2016), but more research is needed to clarify the directions of causality.

4.1.2. Structures of the self-concept

The stable correlations between the CES and measures of negative affectivity and maladaptive thought broadly suggest that the CES may probe a structural aspect of the self-concept with wider implications for adjustment and well-being. According to Campbell, Assanand, and Paula (2003), the content of the self-concept is a person's self-beliefs and self-evaluations, whereas structures of the self-concept refer to the way in which these contents are organized, such as whether they show unity or pluralism.

There are many ways in which a highly central negative event may affect the self-concept. For example, having a negative event central to one's life story and identity may be associated with a reduced complexity of self-representations. A complex organization of the self in terms of a diversity of self-aspects that are relatively independent from one another, such as a diversity of social roles, is assumed to act as a buffer against being strongly affected by failures or successes (Linville, 1985). Accordingly, high self-complexity may protect against making a traumatic or stressful event central after exposure to such life events. In addition, if a negative event has become central, it may reduce self-complexity by making aspects of self-knowledge associated with the event (e.g., "I am an assault victim") highly accessible at the cost of other aspects of self-knowledge (Berntsen & Rubin, 2006a). Reduced self-complexity is often associated with negative psychological adjustment effects, but findings are mixed (for a review see Campbell et al., 2003; Hoyle, 2006). Analytically distinguishing between positively and negatively valenced self-knowledge appears important. In a meta-analysis, Hoyle (2006) found that the complexity of negative (but not positive) self-knowledge correlated negatively with self-esteem. Thus, multiple independent and negatively valenced self-representations are associated with lower levels of self-esteem.

Alternatively, it may be hypothesized that negative event centrality reduces self-concept clarity (Campbell, 1990) by introducing a dimension of self-knowledge that challenges a more well-established and conventional identity integration based on positive autobiographical events with a well-defined cultural meaning (Berntsen & Rubin, 2004; Berntsen et al., 2011). This is consistent with a recent study showing negative correlations between the CES and self-concept clarity (Boelen, 2017). In addition, having a negative event central to identity may reduce, or even eliminate, a self-protective down-regulation of negative affect (Ritchie et al., 2014) and pave the way for repeated rehearsal of the stressful event, which can reduce self-esteem (Çili & Stopa, 2015). However, these possibilities are largely speculations awaiting future research.

4.1.3. Mechanisms underlying event centrality

We know little about how event centrality develops over time and which factors contribute to its development and maintenance.

According to the present findings, it is evident that a salient memory of a negative event is a central component of event centrality, but also that it is unlikely to be a sufficient factor. Not everyone who encounters a highly stressful event will subsequently perceive this event as a turning point in their life story and a central component of their identity. Some will successfully put this event behind them. They may remember it perfectly well and vividly if asked, but they do not use it to structure their life and generate expectations for their future, whereas others will have such an event central to their life story and identity and use it to predict future events. Although we know little about which factors determine event centrality, some theoretically likely mechanisms can be identified. First, a tendency for self-focused attention in terms of an enhanced awareness of self-referent internally generated information (Ingram, 1990, p. 156) intensifies negative affect and therefore may boost the centrality of a negative event in autobiographical memory. This is also consistent with self-focused attention being a well-documented correlate of a range of emotional disorders (Ingram, 1990; Mor & Winquist, 2002).

Second, a disposition for unconstructive repetitive thought in terms of, for example, rumination or worry, is likely to support the development and maintenance of event centrality for a negative event. As pointed out by Watkins (2008), unconstructive repetitive thought can be separated by constructive forms of repetitive thoughts by involving abstract processing of negative thought content, such as decontextualized speculations about the personal meaning of a highly negative encounter or its consequences, consistent with several items of the CES. Only few studies have measured associations between the CES and rumination. These studies (too few to be included in our review) all found positive correlations between the CES and measures of rumination, such as correlations with brooding, ranging from .26 to .35 (Allbaugh et al., 2016; Wessel et al., 2014). Del Palacio-Gonzalez and Berntsen (2018) found that brooding over autobiographical events predicted concurrent and prospective depressive symptoms after controlling for event valence and dispositional brooding, but this relationship was only present if the autobiographical event was deemed central to the person's identity. Thus, an important question for future research is to pursue the relation between event centrality and constructive and unconstructive forms of repetitive thought (e.g., Watkins, 2008) in order to attain a deeper understanding of these processes and how they unfold over time.

4.2. Limitations

The present findings should be evaluated with a number of limitations in mind. First, many of the studies included in the present review employed samples of university students from the USA or Europe. Thus, it is unclear whether these findings generalize to other populations. Findings from studies with clinical populations show patterns similar to the overall patterns reported here (e.g., Rubin, Dennis, & Beckham, 2011), but more work is needed. Cross-cultural findings suggest that the positive association between event centrality and symptoms of PTSD and depression replicates, although that mean ratings of event centrality differ across cultures (Zaragoza Scherman et al., 2015). Additional studies are needed to examine these interactions.

Second, we did not include dissertations and unpublished reports in our systematic review. In our initial search, as described in the 'Inclusion and exclusion criteria' section, we found thirteen theses that would have added new results. These provided correlations in the range of the peer reviewed results. Including theses can generally provide a check against a failure to find negative results. However, this did not occur here. Moreover, given the potential drop in the quality caused by including theses and empirical studies in which adding results from dissertations demonstrated no effects on the conclusions of meta-analyses (Vickers & Smith, 2000), we excluded theses from our review.

Third, a number of theoretically relevant measures were not included in the systematic review because there were too few available studies. For example, we were unable to include analyses of rumination, although previous work suggests a positive relationship between the CES and a range of types and measures of rumination, with correlations ranging from .13 to .59 (e.g., Allbaugh et al., 2016; Boelen, 2012b; Groleau et al., 2013; Lancaster, Klein, Nadia, Szabo, & Mogerman, 2015; Newby & Moulds, 2011; Rubin, Hoyle, & Leary, 2012; Wessel et al., 2014). Future research should clarify these relations.

4.3. Conclusion

The present systematic review has demonstrated that the CES answered for past negative events is associated with a wide range of trauma-related measures and symptoms of affective disorders, such as PTSD, complicated grief, anxiety and depression, as well as negative affectivity more broadly. This implies that the CES probes aspects of memory that are of broad importance and interest to many areas of psychology.

An especially strong relationship was found between the CES and trauma-related measures. This is consistent with theoretical models of PTSD emphasizing a key role of the traumatic memory in the development and maintenance of PTSD symptoms (e.g., Berntsen & Rubin, 2008; Rubin, Berntsen, and Bohni, 2008) as well as recent findings suggesting event centrality as measured by the CES is a risk factor for PTSD development (Boals & Murrell, 2016; Boals & Ruggero, 2016; Blix et al., 2016). From an applied perspective, the present findings underscore the importance of clinicians paying attention to event centrality and how this relates to the experienced symptoms when working with patients who have been exposed to highly stressful or traumatic events in their past.

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Contributors

Author DCR and DB created the idea for the manuscript and the hypotheses. Author TBG conducted the literature searches, the statistical analyses and wrote the first draft of the manuscript. Author DCR supervised the literature searches. Author DCR and RHH supervised the statistical analyses. Author DB supervised the writing of the first draft. All authors contributed to subsequent revisions. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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Appendix A

Table A.1
Correlations between the CES and the Measurement Category PTSD (full scale measures only).

Study	Sample participants	Test	*N*	*r*
Allbaugh et al. (2016)	Undergraduates	PCL-C	163	.51
Barton et al. (2013) E1	Undergraduates	PCL-S	500	.57
Barton et al. (2013) E2	Women from outreach clinic	PCL-S	53	.48
Bishop et al. (2017)	Adults	PCL-5	193	.46
Berntsen & Rubin (2007) E1	Undergraduates	PCL	247	.39
Berntsen & Rubin (2007) E2	Undergraduates	PCL	442	.35
Berntsen & Rubin (2008) E1	Tourists experiencing tsunami	PCL	118	.65
Berntsen & Rubin (2014)	Undergraduates	PCL	1325	.50
Blix et al. (2013)	Adults	PCL	203	.68
Blix et al. (2016)	Adults - time 2	PCL	142	.69
Blix et al. (2016)	Adults - time 3 (one year later)	PCL	142	.57
Boals & Lancaster (2018)	Veterans	PCL-M	90	.68
Boals & Murrell (2016)	Adults	PCL-S	48	.35
Boals & Ruggero (2016) E1	Undergraduates - time 1	PCL	1438	.54
Boals & Ruggero (2016) E1	Undergraduates - time 2	PCL	1438	.45
Boals & Ruggero (2016) E2	Undergraduates - time 1	PCL	161	.53
Boals & Ruggero (2016) E2	Undergraduates - time 2	PCL	161	.44
Boals & Schuettler (2011)	Undergraduates	PCL-S	929	.55
Boals (2010) E1	Undergraduates	IES	170	.37
Boals (2014)	Students	PCL-S	312	.44
Boals et al. (2010)*	Students	PCL-S	2321	.52
Boals et al. (2012)	Undergraduates	PCL-S	119	.31
Boals et al. (2012)	Older adults	PCL-S	126	.36
Boals et al. (2017)	Spinal cord injury patients	PC-PTSD	55	.31
Boelen (2009)	Bereaved adults	PSS-SR	254	.28
Boelen (2012a)	Bereaved adults – time 1	PSS-SR	176	.34
Boelen (2012a)	Bereaved adults – time 2	PSS-SR	100	.40
Boelen (2012b)*	Bereaved adults	PSS-SR	264	.47
Boelen (2017)	Bereaved adults	PSS-SR	124	.71
Bottomley (2017)	Undergraduates	PCL-C	192	.58
Broadbridge (2018)	Undergraduates	PCL	400	.62
Brooks et al. (2017)	Adults	PTSD-8	250	.50
Brown et al. (2010)	Veterans	PCL-M	46	.58
Chukwuorji et al. (2017b)	Internally displaced individuals	HTQ	859	.34
Cunha et al. (2012)	Adolescents	IES-R	354	.47
da Silva et al. (2016)	Adults with PTSD	SPTSS	39	.42[a]
Duarte & Pinto-Gouveia (2017a)	Patients with eating disorder	IES-R	114	.72
Ferreira et al. (2014)	Patients with eating disorder	IES-R	34	.84
Galán et al. (2017)	Undergraduates	PCL-C	262	.36[b]
Gauer et al. (2013)	Undergraduates	SPTSS	195	.25
Groleau et al. (2013)	Undergraduates	PCL	187	.52
Hart et al. (2017)	Veterans	PDS	41	.53
Ionio et al. (2018)	Adolescents	IES-R	872	.58
Janssen et al. (2015)*	Students	PCL-C	103	.22
Lancaster et al. (2015)	Undergraduates	PCL-S	194	.49
Matos & Pinto-Gouveia (2014)	Adults – shame memory ‘others’	IES-R	230	.57
Matos & Pinto-Gouveia (2014)	Adults – shame memory ‘attachment figures’	IES-R	230	.65
Matos et al. (2012)	Undergraduates – fearful memory	IES-R	292	.54
Matos et al. (2012)	Undergraduates – sad memory	IES-R	292	.4
Matos et al. (2012)	Undergraduates – shame memory	IES-R	292	.45
Matos et al. (2013a)	Undergraduates, graduates	IES-R	178	.52
Matos et al. (2013b)	Adults	IES-R	328	.63
Matos et al. (2015a)	Patients with eating disorder – shame memory ‘others’	IES-R	36	.83
Matos et al. (2015a)	Patients with eating disorder – shame memory ‘attachment figures’	IES-R	36	.71
Matos et al. (2015b)	Undergraduates	IES-R	181	.52
Matos et al. (2017a)	Adults	IES-R	302	.61
O'Connor et al. (2014)*	Bereaved older adults	HTQ	192	.53
Ogle et al. (2013)	Adults	PCL-S	3575	.56

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Table A.1 (*continued*)

Study	Sample participants	Test	*N*	*r*
Ogle et al. (2016a)	Adults	PCL-S	1186	.52
Ogle et al. (2016c) E2	Adults	PCL-S	221	.50
Palgi et al. (2017) E1	Adults	PCL-C /IES-R	138	.41[b]
Palgi et al. (2017) E2	Adults	PCL-C /IES-R	128	.51[b]
Palgi et al. (2017) E5	Adults	PCL-C /IES-R	40	.37[b]
Pinto-Gouveia & Matos (2011)	Undergraduates, adults	IES-R	811	.63
Reiland (2017)	Undergraduates	PCL-C	314	.50
Robinaugh & McNally (2010)	Adults	PCL	140	.58
Robinaugh & McNally (2011)	Women with CSA	PCL	102	.69
Roland et al. (2014)	Teachers	LASC	257	.24
Rubin & Boals (2010)*	Undergraduates	PCL	1004	.52
Rubin & Feeling (2013) E1	Undergraduates	PCL	688	.53
Rubin & Feeling (2013) E2	Undergraduates	PCL	328	.54
Rubin & Feeling (2013) E4	Adults	PCL	75	.19
Rubin et al. (2008) E1-2	Undergraduates	PCL	115	.56
Rubin et al. (2008) E3	Undergraduates	PCL	533	.55
Rubin et al. (2009) E1	Undergraduates	PCL	100	.52
Rubin et al. (2009) E2	Undergraduates	PCL	111	.47
Rubin et al. (2011)*	Adults	DTS/PCL	117	.44[b]
Rubin et al. (2012)*	Undergraduates	PCL	433	.51
Rubin et al. (2014) E1	Undergraduates	PCL	2296	.51
Rubin et al. (2014) E2	Veterans	IES-R	104	.57
Rubin et al. (2014) E3	Undergraduates	PCL	488	.56
Rubin et al. (2014) E4	Undergraduates	PCL	987	.53
Schuettler & Boals (2011)	Undergraduates	PCL-S	2321	.52
Schuler & Boals (2016)	Undergraduates	PCL-S	882	.51
Smeets et al. (2010)	Undergraduates	PSS-SR	213	.46
Staugaard et al. (2015)*	Veterans – before deployment	PCL-C	199	.32
Staugaard et al. (2015)*	Veterans – during deployment	PCL-C	175	.33
Staugaard et al. (2015)*	Veterans – after deployment	PCL-C	200	.45
Thomsen & Berntsen (2009)	Older adults	PCL	56	.40
Webb & Jobson (2011)	Undergraduates, postgraduates	IES-R	134	.32[a]
Wessel et al. (2014)*	Women after childbirth	IES	61	.52
Zaragoza Scherman et al. (2015)*	Adults	PCL-C	549	.24

Note. PTSD = Post-traumatic Stress Disorder; CES = Centrality of Event Scale. E1 = Experiment 1; E2 = Experiment 2; E3 = Experiment 3; E4 = Experiment 4; E5 = Experiment 5; DTS = Davidson Trauma Scale; HTQ = Harvard Trauma Questionnaire; IES = Impact of Event Scale; IES-R = Impact of Event Scale – Revised; LASC = Los Angeles Symptoms Checklist; PCL -M, −C, −S, and − 5 = PTSD checklist; PC-PTSD = Primary Care PTSD Screen; PDS = Post-traumatic Diagnostic Scale; PSS-SR = PPTSD Symptom Scale – self-report; PTSD-8 = Post-Traumatic Stress Disorder – 8 items; SPTSS = Screening for Post-Traumatic Stress Symptoms; CSA = Childhood Sexual Assault.

[a] Please note, this correlation is expressed as rho.

[b] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.

* Data provided as additional information.

Table A.2
Correlations between the CES and the B, C and D Symptoms of PTSD in the DSM-IV.

Study	Sample participants	Test	*N*	*r*		
				Re-experiencing[a]	Avoidance	Arousal
Berntsen & Rubin (2008) E1*	Adults	PCL	115	.67	.49	.57
Boals (2010) E1	Undergraduates	IES	170	.39	.28	
Chukwuorji et al. (2017b)	Internally displaced individuals	HTQ	859	.31	.24	.24
da Silva et al. (2016)	Adults with PTSD	SPTSS	39	.36[b]	.30[b]	.46[b]
Ionio et al. (2018)	Adolescents	IES-R	872	.55	.33	.53
Lancaster et al. (2011)	Undergraduates	PCL-S	405	.48	.53	.52
Newby & Moulds (2011)	Adults	IES	94	.38	.21	
Pinto-Gouveia & Matos (2011)	Undergraduates, adults	IES-R	811	.63	.54	.59[a]
Rubin et al. (2008) E1–2	Undergraduates	PCL	115	.49	.56	.50[a]
Rubin et al. (2008) E3	Undergraduates	PCL	533	.53	.53	.39[a]

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Table A.2 (*continued*)

Study	Sample participants	Test	*N*	*r*		
				Re-experiencing[a]	Avoidance	Arousal
Smeets et al. (2010)	Undergraduates	PSS-SR	213	.43	.43	.38[a]
Webb & Jobson (2011)	Undergraduates, postgraduates	IES-R	134	.40[b]	.19 [b]	.32 [b]
Wessel et al. (2014)*	Women after childbirth	IES	61	.53	.36	

Note. PTSD = Post-traumatic Stress Disorder; CES = Centrality of Event Scale. E1 = Experiment 1; E2 = Experiment 2; E3 = Experiment 3; HTQ = Harvard Trauma Questionnaire; IES = Impact of Event Scale; IES-R = Impact of Event Scale – Revised; PCL and –S = PTSD checklist; PSS-SR = PPTSD Symptom Scale – self-report; SPTSS = Screening for Post-Traumatic Stress Symptoms.

[a] Re-experiencing also includes intrusions and reliving.

[b] Please note, this correlation is expressed as rho.

* Data provided as additional information.

Table A.3
Correlations between the CES and the A1 and A2 Criterion of PTSD in the DSM-IV.

Study	Sample participants	*N*	*r*	
			A1	A2
Berntsen & Rubin (2006b) E1	Older adults	423	.33	.29[a]
Berntsen & Rubin (2006b) E2	Adults	1021	.09	.26[a]
Berntsen & Rubin (2007) E2*	Undergraduates	442	.09	.22[a]
Berntsen & Rubin (2008) E1	Tourists experiencing tsunami	118	.24	.51[a]
Berntsen et al. (2011)	College alumni	2526	.22	.33[a]
Boals & Schuettler (2011)	Undergraduates	929	−.04	.18[a]
Boals et al. (2012)*	Undergraduates	145	.09	
Ogle et al. (2016a)	Adults	1186	.00	0.21
Rubin & Feeling (2013) E1*	Undergraduates	688	.10	.25[a]
Rubin & Feeling (2013) E2*	Undergraduates	328	.02	.18[a]
Rubin et al. (2008) E1–2*	Undergraduates	115		.42[a]
Rubin et al. (2008) E3	Undergraduates	533	.13	.32[a]
Rubin et al. (2011)*	Adults	117	.24	.37[a]
Schuettler & Boals (2011)*	Undergraduates	2311	.16	.23[a]

Note. PTSD = Post-traumatic Stress Disorder; CES = Centrality of Event Scale. E1 = Experiment 1; E2 = Experiment 2; E3 = Experiment 3.

[a] Correlation between the CES and the number of A2 emotions.

* Data provided as additional information.

Table A.4
Correlations between the CES and the Measurement Category PTG.

Study	Sample participants	Test	*N*	*r*
Barton et al. (2013) E1	Undergraduates	PTGI	500	.59
Barton et al. (2013) E2	Women from outreach clinic	PTGI	53	.01
Blix et al. (2015)*	Adults – time 1	PTGI	197	.49
Blix et al. (2015)*	Adults – time 2	PTGI	190	.51
Boals & Schuettler (2011)	Undergraduates	PTGI	929	.59
Boals et al. (2010)*	Students	PTGI	2321	.60
Brooks et al. (2017)	Adults	PTGI	250	.25
Currier et al. (2013)	Teachers	PTGI-SF	257	.39
Groleau et al. (2013)	Undergraduates	PTGI	187	.38
Johnson & Boals (2015)	Undergraduates	PTGI	1295	.57
Kuenemund et al. (2016)*	Stroke survivors	PTGI	42	.50
Kuenemund et al. (2016)*	Adults	PTGI	42	.67
Lancaster et al. (2015)	Undergraduates	PTGI	194	.52
Roland et al. (2014)	Teachers	PTGI	257	.39
Rubin et al. (2014) E3	Undergraduates	PTGI	488	.59
Rubin et al. (2014) E4	Undergraduates	PTGI	987	.60
Schuettler & Boals (2011)	Undergraduates	PTGI	2320	.61
Staugaard et al. (2015)*	Veterans – before deployment	PTGI	199	.18

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Table A.4 (*continued*)

Study	Sample participants	Test	*N*	*r*
Staugaard et al. (2015)*	Veterans – during deployment	PTGI	175	.21
Staugaard et al. (2015)*	Veterans – after deployment	PTGI	200	.34
Webster & Deng (2015)	Undergraduates	PTGI	320	.43
Wolfe & Ray (2015)	Adults	PTGI	175	.18

Note. CES = Centrality of Event Scale; PTG = Post-traumatic Growth; E1 = Experiment 1; E2 = Experiment 2; E3 = Experiment 3; E4 = Experiment 4; PTGI = Posttraumatic Growth Inventory; PTGI-SF = Posttraumatic Growth Inventory – short form.
* Data provided as additional information.

Table A.5
Correlations between the CES and the Measurement Category Trauma Cognitions.

Study	Sample participants	Test	*N*	*r*
Barton et al. (2013) E1	Undergraduates	PTCI	500	.41
Barton et al. (2013) E2	Women from outreach clinic	PTCI	53	.42
Currier et al. (2013)	Teachers	ISLES	257	.31[a]
da Silva et al. (2016)	Adults with PTSD	PTCI	39	.34[b]
Holland et al. (2010)	Bereaved Undergraduates	ISLES	150	.58[a]
Holland et al. (2010)	Undergraduates	ISLES	178	.38[a]
Lancaster et al. (2011)*	Undergraduates	PTCI	405	.46
Lancaster et al. (2015)*	Undergraduates	PTCI	194	.36
Palgi et al. (2017) E1	Adults	PTCI/STO	138	.55[c]
Palgi et al. (2017) E2	Adults	PTCI/STO	128	.61[c]
Palgi et al. (2017) E5	Adults	PTCI/STO	40	.48[c]

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2; E5 = Experiment 5; ISLES = Integration of Stressful Life Experiences Scale; STO = Subjective Trauma Outlook; PTCI = Posttraumatic Cognitions Inventory.
[a] Please note that the scores on the ISLES are reversed to match the direction of the PTCI.
[b] Please note, this correlation is expressed as rho.
[c] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.
* Data provided as additional information.

Table A.6
Correlations between the CES and the Measurement Category Depression.

Study	Sample participants	Test	*N*	*r*
Allbaugh et al. (2016)	Undergraduates	CES-D	163	.38
Berntsen & Rubin (2007) E1	Undergraduates	BDI-II	247	.39
Berntsen & Rubin (2007) E2	Undergraduates	BDI-II	442	.27
Berntsen & Rubin (2014)	Undergraduates	BDI-II	1325	.29
Berntsen et al. (2011)	College alumni	PHQ	2526	.21
Blix et al. (2013)	Adults	HSCL	203	.59
Boals & Murrell (2016)	Adults	BDI-II	48	.29
Boals & Schuettler (2011)	Undergraduates	QIDS-SR	929	.29
Boals (2010) E1	Undergraduates	BDI	170	.32
Boals (2014)	Students – time 1	CES-D	312	.33
Boals (2014)	Students – time 2	CES-D	312	.23
Boals et al. (2010)*	Students	QIDS	2321	.21
Boals et al. (2017)	Spinal cord injury patients	PHQ	55	.21
Boelen (2009)	Bereaved adults	SCL	254	.28
Boelen (2012a)	Bereaved adults – time 1	HADS-D	176	.40
Boelen (2012a)	Bereaved adults – time 2	HADS-D	100	.49
Boelen (2012b)*	Bereaved adults	HADS-D	264	.48
Boelen (2017)	Bereaved adults	HADS-D	124	.60
Bohn (2010)	Undergraduates	GDS-SF	96	.33
Bohn (2010)*	Older adults	GDS-SF	72	.18
Bottomley (2017)	Undergraduates	PHQ	192	.23
Brown et al. (2010)	Veterans	BDI-II	46	.58
Carvalho et al. (2015)	Adults	DASS	161	.35

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Table A.6 (*continued*)

Study	Sample participants	Test	*N*	*r*
Cunha et al. (2012)	Adolescents	DASS	354	.49
da Silva et al. (2016)	Adults with PTSD	BDI-II	39	.37[a]
Duarte & Pinto-Gouveia (2017b)	Undergraduates, adults - men	DASS	109	.21
Duarte & Pinto-Gouveia (2017b)	Undergraduates, adults - women	DASS	222	.34
Galán et al. (2017)	Undergraduates	HADS-D	262	.28
Hart et al. (2017)	Veterans	BDI-II	41	.41
Janssen et al. (2015)*	Students	CES-D	103	.12
Kuenemund et al. (2016)*	Stroke survivors	CES-D	42	.14
Kuenemund et al. (2016)*	Adults	CES-D	42	.34
Matos & Pinto-Gouveia (2014)	Adults – shame memory 'others'	DASS	230	.23
Matos & Pinto-Gouveia (2014)	Adults – shame memory 'attachment figures'	DASS	230	.27
Matos et al. (2012)	Undergraduates – fearful memory	DASS	292	.31
Matos et al. (2012)	Undergraduates – sad memory	DASS	292	.35
Matos et al. (2012)	Undergraduates – shame memory	DASS	292	.33
Matos et al. (2013a)	Undergraduates, graduates	DASS	178	.26
Matos et al. (2015b)	Undergraduates	DASS	181	.26
Matos et al. (2017a)	Adults	DASS	302	.43
Matos et al. (2017b)	Heterosexual men	DASS	52	.10
Matos et al. (2017b)	Gay men	DASS	53	.78
Newby & Moulds (2011)	Adults	BDI-II	94	.15
O'Connor et al. (2014)*	Bereaved older adults	BDI-II	192	.48
Ogle et al. (2016a)	Adults	PHQ	1186	.22
Pinto-Gouveia & Matos (2011)	Undergraduates, adults	DASS	811	.31
Pinto-Gouveia et al. (2013)	Adults	DASS	204	.26
Reiland (2017)	Undergraduates	BDI	314	.23
Robinaugh and McNally (2011)	Adults	CES-D	140	.27
Robinaugh & McNally (2011)	Women with CSA	BDI-II	102	.47
Roland et al. (2014)	Teachers	LASC	257	.19
Rubin & Boals (2010)*	Undergraduates	QIDS	1004	.21
Rubin & Feeling (2013) E1*	Undergraduates	BDI-II	688	.29
Rubin & Feeling (2013) E2*	Undergraduates	BDI-II	328	.27
Rubin & Feeling (2013) E4*	Adults	BDI-II	75	.35
Rubin et al. (2008) E1-2*	Undergraduates	BDI-II	115	.40
Rubin et al. (2009) E1	Undergraduates	BDI-II	100	.42
Rubin et al. (2009) E2	Undergraduates	BDI-II	111	.34
Rubin et al. (2011)*	Adults	BDI-II	116	.46
Rubin et al. (2012)*	Undergraduates	BDI-II	433	.29
Rubin et al. (2014) E4	Undergraduates	QIDS-SR	987	.22
Schuettler & Boals (2011)*	Undergraduates	DASS	108	.34
Webb & Jobson (2011)	Undergraduates, postgraduates	CES-D	134	.32
Wessel et al. (2014)*	Women after childbirth	BDI-II	61	.13
Zaragoza Scherman et al. (2015)*	Adults	CES-D	539	.22

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2; E4 = Experiment 4; BDI-II = Beck Depression Inventory-II; CES-D = Center for Epidemiological Studies Depression scale; DASS = Depression, Anxiety and Stress Scale; GDS-SF = Geriatric Depression Scale - Short Form; HADS-D = Hospital Anxiety and Depression Scale - Depression subscale; HSCL = Hopkins Symptom Checklist; LASC = Los Angeles Symptoms Checklist; PHQ = Patient Health Questionnaire; SCL = Symptom Check List; QIDS-SR = Quick Inventory of Depressive Symptomatology – self-report; CSA = Childhood Sexual Assault.

[a] Please note, this correlation is expressed as rho.

* Data provided as additional information.

Table A.7
Correlations between the CES and the Measurement Category Anxiety.

Study	Sample participants	Test	*N*	*r*
Allbaugh et al. (2016)	Undergraduates	ZSRAS	163	.26
Berntsen & Rubin (2007) E1	Undergraduates	STAI-S/-T	247	.34[b]
Boals et al. (2012)*	Students	STAI-S	2321	.17
Bottomley (2017)	Undergraduates	GADS	192	.24
Cunha et al. (2012)	Adolescents	DASS	354	.48
da Silva et al. (2016)	Adults with PTSD	BAI	39	.35[a]

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Table A.7 (*continued*)

Study	Sample participants	Test	*N*	*r*
Galán et al. (2017)	Undergraduates	HADS-A	262	.29
Matos et al. (2012)	Undergraduates – fearful memory	DASS	292	.36
Matos et al. (2012)	Undergraduates – sad memory	DASS	292	.29
Matos et al. (2012)	Undergraduates – shame memory	DASS	292	.28
Matos et al. (2013b)	Adults	SIPAAS	328	.19
Matos et al. (2017a)	Adults	DASS	302	.44
Newby & Moulds (2011)	Adults	BAI	94	.21
Pinto-Gouveia & Matos (2011)	Undergraduates, adults	DASS	811	.32
Rubin et al. (2014) E2	Veterans	GADS	104	.46
Schuettler & Boals (2011)*	Undergraduates	DASS	108	.39

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2; BAI = Beck Anxiety Inventory; DASS = Depression, Anxiety and Stress Scale; GADS = Generalized Anxiety Disorder Scale; HADS-A = Hospital Anxiety and Depression Scale; SIPAAS = Social Interaction and Performance Anxiety and Avoidance Scale; STAI-S and –T = State-Trait Anxiety Inventory; ZSRAS = Zung Self-Rated Anxiety Scale.

[a] Please note, this correlation is expressed as rho.

[b] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.

* Data provided as additional information.

Table A.8
Correlations between the CES and the Measurement Category Dissociation.

Study	Sample participants	Test	*N*	*r*
Berntsen & Rubin (2007) E1	Undergraduates	DES	247	.09
Berntsen & Rubin (2007) E2	Undergraduates	DES	442	.18
Boals (2010) E1	Undergraduates	DES	170	.17
Brown et al. (2010)	Veterans	DES-II	46	.51
Matos et al. (2012)	Undergraduates – fearful memory	DES-II	292	.28
Matos et al. (2012)	Undergraduates – sad memory	DES-II	292	.28
Matos et al. (2012)	Undergraduates – shame memory	DES-II	292	.32
Robinaugh & McNally (2011)	Women with CSA	DES	102	.49
Rubin et al. (2008) E1-2*	Undergraduates	DES	115	.40
Smeets et al. (2010)	Undergraduates	DES	213	.14

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2; DES = Dissociative Experiences Scale; DES-II = Dissociative Experiences Scale – Revised; CSA = Childhood Sexual Assault.

* Data provided as additional information.

Table A.9
Correlations between the CES and the Measurement Category Shame.

Study	Sample participants	Test	*N*	*r*
Duarte & Pinto-Gouveia (2017a)	Patients with eating disorder	OAS/BISS	114	.22[a]
Duarte & Pinto-Gouveia (2017b)	Undergraduates, adults - men	BISS	109	.46
Duarte & Pinto-Gouveia (2017b)	Undergraduates, adults - women	BISS	222	.47
Carvalho et al. (2015)	Adults	SES	161	.34
Cunha et al. (2012)	Adolescents	ISS/OAS	354	.52[a]
Matos & Pinto-Gouveia (2014)	Adults – shame memory ‘others’	ISS/OAS	230	.34[a]
Matos & Pinto-Gouveia (2014)	Adults – shame memory ‘attachment figures’	ISS/OAS	230	.32[a]
Matos et al. (2012)	Undergraduates – fearful memory	ISS/OAS	292	.34[a]
Matos et al. (2012)	Undergraduates – sad memory	ISS/OAS	292	.38[a]
Matos et al. (2012)	Undergraduates – shame memory	ISS/OAS	292	.45[a]
Matos et al. (2013a)	Undergraduates, graduates	ISS/OAS	178	.44[a]
Matos et al. (2013b)	Adults	ESS/OAS	328	.33[a]
Matos et al. (2017b)	Heterosexual men	ISS	52	.33
Matos et al. (2017b)	Gay men	ISS	53	.85
Pinto-Gouveia & Matos (2011)	Undergraduates, adults	ESS/OAS	811	.33[a]
Robinaugh and McNally (2011)	Adults	SSGI-s/-g	140	.22[a]

Note. CES = Centrality of Event Scale; BISS = Body Image Shame Scale; ESS = Experience of Shame Scale; ISS = Internalized Shame Scale; OAS = Other As Shamer; SES = Shame Experiences Scale; SSGI-s and -g = State Shame and Guilt Inventory.

[a] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.

Table A.10
Correlations between the CES and the Measurement Category Grief.

Study	Sample participants	Test	*N*	*r*
Boelen (2009)	Bereaved adults	ICG-R	254	.47
Boelen (2012a)	Bereaved adults - time 1	PGD	176	.50
Boelen (2012a)	Bereaved adults - time 2 (one year later)	PGD	100	.44
Boelen (2012b)*	Bereaved adults	PGD	264	.51
Boelen (2017)	Bereaved adults	PGD	124	.70
Holland et al. (2010)	Bereaved undergraduates	ICG-R	150	.63
O'Connor et al. (2014)*	Bereaved older adults	ICG-R	192	.55

Note. CES = Centrality of Event Scale; ICG-R = Inventory of Complicated Grief - Revised; PGD = Prolonged Grief Disorder.
* Data provided as additional information.

Table A.11
Correlations between the CES and Memory Vividness, Emotional Intensity and Physical Reaction to the Event.

Study	Sample participants	Test	*N*	*r*		
				Memory vividness	Emotional intensity	Physical reaction
Berntsen & Rubin (2006b) E1	Older adults	Single item	423	.51		
Berntsen & Rubin (2006b) E2	Adults	Single item	1021	.44		
Berntsen & Rubin (2008) E1*	Tourists experiencing tsunami	Single item	118	.02		
Boals (2010) E1	Undergraduates	AMQ	170		.33	.29[a]
Janssen et al. (2015)*	Students	AMQ	103	.25[a]	.20	.19
Newby & Moulds (2011)	Adults	MEQ/IMI	94	.28[a]	.26	
Ogle et al. (2016a)	Adults	AMQ	1186		.36	.30
Ogle, Siegler, et al. (2016) E2	Adults	AMQ	221		.44	.37
Rasmussen & Berntsen (2010) E2*	Undergraduates	AMQ	136	.27	.48	.37
Rasmussen & Berntsen (2013)*	Undergraduates	AMQ	158	.10	.54	.19
Schuettler & Boals (2011)*	Undergraduates	AMQ	108	.23[a]	.50	.43[a]

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2; AMQ = Autobiographical Memory Questionnaire; IMI = Intrusive Memory Interview; MEQ = Memory Experiences Questionnaire.
[a] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.
* Data provided as additional information.

Table A.12
Correlations between the CES and the personality traits agreeableness, conscientiousness, extraversion, neuroticism and openness.

Study	Sample participants	Test	*N*	*r*				
				A	C	E	N	O
Berntsen et al. (2011)	College alumni	NEO-PIR	2526	.03	−0.01	−0.03	.23	0.14
Boals & Lancaster (2018)	Veterans	PANAS	90				.31	
Boals & Ruggero (2016) E1	Undergraduates	PANAS	1438				.16	
Boals (2010)*	Students	PANAS	2321				.16	
Boals (2014)*	Undergraduates	AIM/BFI/PANAS	1108				.18[a]	
Boelen (2009)	Bereaved adults	EPQ	254				.23	
Broadbridge (2018)	Undergraduates	IPIP	400	−.11	−.25	−.27	.41	−.07
Janssen et al. (2015)*	Students	BFI	103				.13	
O'Connor et al. (2014)*	Bereaved older adults	NEO-PIR	190	.10	−.01	.01	.21	−.02
Ogle et al. (2016a)	Adults	NEO-PIR	1186				.19	
Ogle, Siegler, et al. (2016) E2	Adults	AIM/BFI/PANAS	221				.26[a]	
Rasmussen & Berntsen (2010) E2*	Undergraduates	PANAS	136				.17	
Rubin & Boals (2010)*	Undergraduates	PANAS	1004				.15	
Rubin & Feeling (2013) E1*	Undergraduates	BFI	688	−.08	−.07	−.05	.26	.04
Rubin & Feeling (2013) E2*	Undergraduates	BFI	328	.03	−.02	−.05	.22	.05

(*continued on next page*)

Table A.12 (*continued*)

Study	Sample participants	Test	*N*	*r*				
				A	C	E	N	O
Rubin & Feeling (2013) E4*	Adults	NEO-PIR	75	−.13	−.11	−.07	.22	.01
Rubin et al. (2009) E1-2*	Undergraduates	NEO-PIR	114	.11	−.10	−.26	.41	.15
Rubin et al. (2011)*	Adults	NEO-PIR	114	−.19	−.26	−.11	.42	.04
Rubin et al. (2011)*	Adults	PANAS	117				.38	
Rubin et al. (2012)	Undergraduates	AIM/PANAS	433				.25[a]	
Rubin et al. (2012)*	Undergraduates	BFI	433	−.09	−.05	−.08	.29	.11
Rubin et al. (2014) E1	Undergraduates	BFI	2296				.22	
Rubin et al. (2014) E3	Undergraduates	AIM/BFI/PANAS	488				.19[a]	
Rubin et al. (2014) E4	Undergraduates	PANAS	987				.15	
Schuettler & Boals (2011)*	Undergraduates	FFMRF	670	−.07	−.10	−.07	.06	−.08
Schuler & Boals (2016)	Undergraduates	PANAS	882				.22	
Staugaard et al. (2015)*	Veterans – after deployment	NEO-FFI	196	−.10	−.18	−.13	.36	.22
Staugaard et al. (2015)*	Veterans – before deployment	NEO-FFI	189	.00	−.05	.05	.16	.21

Note. CES = Centrality of Event Scale; A = Agreeableness; C = Conscientiousness; E = Extraversion, N = Neuroticism; O = Openness; E1 = Experiment 1; E2 = Experiment 2; E3 = Experiment 3; E4 = Experiment 4; AIM-NI = Affect Intensity Measure; BFI = Big Five Inventory; EPQ = Eysenck Personality Questionnaire; FFMRF = Five Factor Model Rating Form; NEO-PI, -PIR and -FFI = NEO Personality Inventory; PANAS = Positive and Negative Affect Schedule.

[a] More than one correlation for this conceptual category was provided, therefore the average correlation is displayed.

* Data provided as additional information.

Table A.13
Correlations between the CES and the Measurement Category Social Support.

Study	Sample participants	Test	*N*	*r*
Boals & Lancaster (2018)	Veterans	MSPSS	90	.05
Bottomley (2017)	Undergraduates	MSSS	192	−.11
O'Connor et al. (2014)*	Bereaved older adults	CSS	192	−.22
Ogle et al. (2014)	Adults	Single item	2515	−.11
Ogle et al. (2016a)	Adults	MACS	1186	−.16
Rubin et al. (2011)*	Adults	ISEL	117	−.29
Schuettler & Boals (2011)*	Undergraduates	MSPSS	2341	.00
Staugaard et al. (2015)*	Veterans – before deployment	PSSS	197	−.04
Staugaard et al. (2015)*	Veterans – during deployment	PSSS	172	−.05
Staugaard et al. (2015)*	Veterans – after deployment	PSSS	197	−.06
Wolfe & Ray (2015)*	Adults	MSPSS	175	−.14

Note. CES = Centrality of Event Scale; CSS = Crisis Support Scale; ISEL = Interpersonal Support Evaluation List; MACS = Middle Age Concerns Scale; MSPSS; Multidimensional Scale of Perceived Social Support; MSSS = MOS Social Support Survey; PSSS = Perceived Social Support Scale.

* Data provided as additional information.

Table A.14
Correlations between the CES and the Measurement Category Satisfaction with Life.

Study	Sample participants	Test	*N*	*r*
Boals et al. (2012)*	Undergraduates	SWLS	245	−.12
Boals & Lancaster (2018)	Veterans	SWLS	90	−.30
Bohn (2010)*	Older adults	TSWL	72	−.44
Bohn (2010)*	Undergraduates	TSWL	96	−.37
Johnson & Boals (2015)	Undergraduates	SWLS	1295	−.13
Kuenemund et al. (2016)*	Adults	SWLS	42	−.53
Kuenemund et al. (2016)*	Stroke survivors	SWLS	42	.12
O'Connor et al. (2014)*	Bereaved older adults	SWLS	191	−.43
Schuler & Boals (2016)	Undergraduates	SWLS	882	−.11
Zaragoza Scherman et al. (2015)*	Adults	SWLS	554	−.21

Note. CES = Centrality of Event Scale; SWLS = Satisfaction with Life Scale; TSWLS = Temporal Satisfaction With Life Scale.

* Data provided as additional information.

Table A.15
Correlations between the CES for Negative Past Events and the CES for Positive Past Events.

Study	Sample participants	*N*	*r*
Berntsen et al. (2011)	College alumni	2526	.18
Boals (2010) E1	Undergraduates	169	.10
Janssen et al. (2015)*	Students	103	.28
Rasmussen & Berntsen (2010) E2*	Undergraduates	136	.24
Rasmussen & Berntsen (2013)*	Undergraduates	157	.08
Staugaard et al. (2015)*	Veterans – before deployment	186	.30
Staugaard et al. (2015)*	Veterans – during deployment	144	.43
Staugaard et al. (2015)*	Veterans – after deployment	179	.49
Zaragoza Scherman et al. (2015)*	Adults	556	.24

Note. CES = Centrality of Event Scale; E1 = Experiment 1; E2 = Experiment 2.
* Data provided as additional information.

Table A.16
Correlations between the CES and the Gender of the Participants.

Study	Sample participants	*N*	*r*[a]
Berntsen et al. (2011)	College alumni	2526	.19
Boals et al. (2017)	Spinal cord injury patients	55	−.05
Chukwuorji et al. (2017b)	Internally displaced individuals	859	−.04
O'Connor et al. (2014)*	Bereaved older adults	193	.12
Ogle et al. (2016a)	Adults	1186	.12
Perri & Keefe (2008)	Chronic pain patients	47	−.11
Rasmussen & Berntsen (2010) E2*	Undergraduates	136	−.12
Rasmussen & Berntsen (2013)*	Undergraduates	158	.08
Rubin & Boals (2010)*	Undergraduates	1004	.10
Rubin et al. (2011)*	Adults	117	.00
Rubin et al. (2012)*	Undergraduates	433	.12

Note. CES = Centrality of Event Scale; E2 = Experiment 2.
[a] For all correlations it applies that: male = 0, female = 1.
* Data provided as additional information.

Appendix B. References to studies included in the analyses but not cited in text

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Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cpr.2018.07.006.

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