

Factor Structure, Internal Consistency and Criterion Validity of the Full-form and Short-form Versions of the Centrality of Events Scale in Young People

Summary: The perceived centrality of a traumatic event has been hypothesized to impact subsequent responses to that event and shown to be positively associated to a number of psychological problems. In order to understand the role of this construct in adjustment to stress and trauma, reliable and valid measures are needed. The objective of this study was to evaluate the factor structure, internal consistency and convergent validity of the full-form and short-forms of the Centrality of Event Scale when used with young people. A sample of 262 undergraduate students completed this study. Confirmatory factor analyses, Cronbach alpha coefficients and Pearson correlation coefficients were performed. The findings support a one-factor structure of the full 20-item and the short 7-item versions. We also found that both versions provide reliable and valid scores when used with young people. We recommend the use of the 7-item version to minimize assessment burden.

INTRODUCTION

People often have vivid memories of traumatic and highly stressful events (Berntsen, 2001). The vividness of such memories may explain why people with a history of trauma are at a higher risk to overestimate both the frequency of these events and the likelihood of experiencing a similar trauma in the future (Tversky & Kahneman, 1973). Traumatic experiences can also change the view of oneself, especially if the person experiences persistent traumatic psychological effects (Sutherland & Bryant, 2008). In such instances, the trauma may come to occupy a central place in that person's individual identity (Berntsen & Rubin, 2006).

The perceived centrality of a traumatic/stressful event — that is, how central the event is to a person's identity and life story — has been shown to be positively related to a number of psychological problems, such as depressive (Peterson & Seligman, 1984) and Post-traumatic stress disorder (PTSD) symptoms (Greening, Stoppelbein, & Docter, 2002). These findings support the need for research to better understand the role that perceived centrality of an event plays in psychological function. Such research requires the availability of a valid and reliable measure of perceived centrality.

To address this need, Berntsen and Rubin (2006) developed the Centrality of Events Scale (CES). These authors found one factor structure for the 7-item version using the iterated principle factor analyses with a varimax rotation. For the 20-item version, although three eigenvalues were found to be greater than 1.00 (9.38, 1.41 and 1.02), given the very large decrease from the first to the second eigenvalue (i.e. scree test) the authors concluded that the items best represent a single factor. The scores from both measures have good ($\alpha =$

0.88; 7-item version) to excellent ($\alpha = 0.94$; 20-item version) internal consistency (Berntsen & Rubin, 2006). Scores from both the 20-item and 7-item versions of the CES have also evidenced construct validity via their significant and positive associations with PTSD symptom severity and depressive symptomatology in a sample of 707 undergraduate students from four different North American universities (Berntsen & Rubin, 2006).

The original English version of the CES has been used successfully in a number of studies in samples with a variety of conditions. For example, in one study with individuals with chronic pain, the CES was found to be a significant predictor of both psychological distress and pain interference (Perri & Keefe, 2008). CES scores have also been shown to be positively associated with important cognitive variables including memory intrusiveness and rumination in individuals with depression (Newby & Moulds, 2011). Moreover, in a study about romantic conflict and breakup, levels of event centrality for romantic conflicts prospectively predicted subsequent negative mental health outcomes in a sample of 312 community volunteers (Boals, 2014). CES scores have also been shown to be correlated with posttraumatic stress disorder symptom severity, depression severity and self-esteem in a sample of 102 women with a history of childhood sexual abuse (Robinaugh & McNally, 2011).

While the preliminary research with the CES is promising, there remains some controversy about its factor structure. For example, in an exploratory principal components analysis, the Brazilian Portuguese version of the 20-item evidenced three components with eigenvalues greater than one in a sample of young adults (Gauer, de Souza, da Silveira, & Sediya, 2013). Robinaugh and McNally (2011) also found that the 20-item version of the CES best represented three factors (Robinaugh & McNally, 2011). In a more recent study, using

Portugal Portuguese versions of the 7-item and 20-item versions of the CES with a sample of 1079 adolescents, confirmatory factor analyses (CFA) showed different structures for the two versions: a three-factor structure for the 20-item version and a one-factor structure for the 7-item version (Vagos, Ribeiro da Silva, Brazao, & Rijo, 2016).

It is unclear whether the reported differences in the structure of the CES items in different samples are related to inconsistent or inadequate translations of the questionnaire, possible cultural differences or other factors. The majority of studies have been conducted in English speaking samples in the United States and the only translated versions that have been evaluated are in Portuguese (from Brazil and Portugal). Furthermore, the limited number of translated versions of the CES means that the extent to which the role that event centrality plays in response to trauma in non-English or non-Portuguese speaking samples cannot be evaluated; that is, we cannot yet determine which findings are consistent across languages and cultures. To address these issues, additional translated and validated versions of the CES are needed.

In order to address the needs to (i) clarify the factor structure of the CES with a non-English speaking sample and (ii) further evaluate the association of the centrality of events scores with measures of adjustment, the current study sought to translate the CES into Spanish and evaluate the factor structure, internal consistency and criterion validity of the full-form and short-form versions of the CES in a sample of young people who speak Spanish, and then examine the associations of the CES scale or scales with measures of anxiety and depression. Based on the findings from previous research using the original English version of the CES, we hypothesized that (i) the CES items would evidence a single factor structure, (ii) the CES scores would have at least an adequate level of reliability (i.e. internal consistency coefficient of at least 0.70) and (iii) the CES scores would evidence concurrent criterion validity (defined as the concurrent association between the measure and measures of domains of related constructs; Higgins & Straub, 2006), operationalized here as moderate and positive associations (i.e. correlation coefficients of 0.30 or greater) with measures of depressive and anxious symptoms. Moreover, we anticipated that the CES scores would show a convergent validity, defined as moderate to strong associations between the measure being evaluated and measures that are thought to assess the same construct (Higgins & Straub, 2006), and here indicated by a moderate to strong and positive associations with scores from a measure of post-traumatic symptoms severity (i.e. correlation coefficients of 0.30 or greater).

MATERIAL AND METHODS

Participants

The study included a convenience sample of 262 undergraduates from the Universitat Rovira i Virgili (Catalonia, Spain). They were invited in the classroom to participate in

a study of stressful events. Potential participants had to be able to speak and read Spanish and to be between 18 and 24 years old. The average age was 20 years ($SD = 1.7$), and 207 (79%) were women. See Table 1 for additional sample descriptive information.

Procedures

Translation of the questionnaire

This translation and adaptation of the CES was authorized by its authors. The CES was translated into Spanish using a back-translation procedure as described by Miró (1997). That is, it was first translated from English into Spanish by two psychologists fluent in English. Next, a native professional translator translated the Spanish version back into English. Finally, the back-translated version was sent to one of the authors of the questionnaire to determine if the Spanish version was faithful to the original one. The original authors agreed that the back-translated version preserved the denotation and connotation of the instructions and items of the questionnaire. Thus, no additional work was required as both forms were found to be linguistically equivalent.

The study protocol was approved by the Internal Review Board of the Universitat Rovira i Virgili. The study questionnaires were administered to groups of students enrolled in different degrees at the Universitat Rovira i Virgili (Psychology, Teaching, Journalism, Publicity and Public Relations and Audiovisual Communication). We also sought permission from the teachers of these programmes to allow participants to self-administer the questionnaires during class time. Students interested in participating signed an informed consent form before responding to the survey. Approximately, it took 20 min for participants to complete the survey.

Measures

Demographic and descriptive variables

Questions about age, sex and university degree/studies were used to provide a description of the sample (see Table 1 for details).

Table 1. Demographic information of participants ($N = 262$)

Variable	Per cent (%)	N	Mean (SD)	Range
Age (years)		262	20.04 (1.72)	18–24
Sex				
Boys		21	55	
Girls		79	207	
Recently studies				
Psychology	44.7	117		
Teaching	18.3	48		
Journalism	12.6	33		
Publicity and public relations	10.3	27		
Audiovisual communication	9.9	26		
Others	4.2	10		
HADS anxiety		262	7.89 (3.48)	0–18
HADS depression		262	3.50 (2.67)	0–15
PCL-C		262	34.57 (14.7)	17–78

Note: HADS, Hospital Anxiety and Depression Scale; PCL-C, PTSD Checklist-Civilian

Centrality of Events Scale

The CES (Berntsen & Rubin, 2006) is a 20-item scale that measures the degree to which the memory of a stressful event is a point of reference for personal identity and the assignment of meaning to other experiences in the life of an individual. Respondents are asked in a 5-point scale, anchored with 1 (strongly disagree) and 5 (totally agree), about the degree of agreement with the statement contained in each of the items, taking into account the most stressful or traumatic event in their

lives. As mentioned previously, scores from the 20-item and 7-item versions of CES have shown good to excellent internal consistency in English speaking community samples (Berntsen & Rubin, 2006). Score from the full CES have been shown to correlate 0.38 with PTSD symptom severity and 0.23 with depression (Berntsen & Rubin, 2006). In order to evaluate the psychometric properties of both the original and shortened versions here, we computed scores for both using the participants' responses to the original version.

Post-traumatic symptom severity

We assessed post-traumatic symptom severity using the 17-item PTSD Checklist-Civilian version (PCL-C) (Miles, Marshall, & Schell, 2008); these 17 items correspond to the DSM-III-R symptoms of PTSD. This questionnaire can be used as a continuous measure of PTSD symptom severity by summing scores across the 17 items or can be used to derive a PTSD diagnosis by considering a score of 3 or greater on the responding scale as indicative of the presence of the symptom assessed by that item (Weathers, Litz, Herman, Huska, & Keane, 1993). Participants rated the degree to which they were bothered by each symptom on a scale ranging from 1 (not at all) to 5 (extremely). Scores from the Spanish version of the PCL-C have shown solid psychometric properties ($\alpha = 0.97$ and test-retest reliability of 0.96) (Weathers et al., 1993). In one study comparing the English and Spanish versions, the Spanish version also demonstrated good psychometric properties (Marshall, 2004). In the current sample, scores also demonstrated excellent internal consistency (Cronbach's alpha for the total scale = 0.93).

Depression and anxiety

Depressive and anxious symptomatology were assessed using the 14-item Hospital Anxiety and Depression Scale (HADS). This commonly used measure is a self-assessment scale for measuring symptoms of anxiety (seven items) and depression (seven items). HADS has been specifically designed for its use with medically ill patients (Zigmond & Snaith, 1983), but it has also been shown to be useful, valid and reliable with healthy individuals (Terol-Cantero, Cabrera-Perona, & Martín-Aragón, 2015). Respondents are requested to rate the severity of each symptom during the previous week on a variety of different 4-point Likert scales, depending on the item (e.g. for some items, 0 = 'not at all' and 3 = 'most of the time', 'very often', or 'very definitely' and 'quite badly'). The Spanish version of the HADS scales has shown adequate internal consistency in a sample of healthy individuals (anxiety, 0.77 and depression, 0.71) and test-retest stability over a 15-day period (anxiety, 0.77 and depression, 0.74). Sensitivity and specificity for diagnosing anxiety and depression are satisfactory when using the HAD

total scale score with adults ($>.80$) (Terol et al., 2007). In the current sample, the HADS scales scores also demonstrated adequate internal consistency (Cronbach's alpha for anxiety and depression were respectively 0.76 and 0.67).

Data analysis

We first computed descriptive statistics of the demographic variables (percentages, means and standard deviations) to describe the study sample. Before performing the planned factor structure analyses of the CES items for both the 7-item and 20-

item versions, we evaluated whether the data met the assumptions for the planned analyses by (i) examining the skewness and kurtosis of each item distribution (ii) performing the Kaiser-Meyer-Olkin test (KMO) (Kaiser, 1970) and (iii) computing the Bartlett's statistic (Bartlett, 1950). We then performed a confirmatory factor analyses (CFA) using the Mplus programme (<https://www.statmodel.com/orderonline/categories.php?category=Mplus-Software>) to evaluate the factor structure of the CES items for the two versions. We used the maximum likelihood mean adjusted as the extraction method because the data were not found to be normally distributed. The following indexes were used to test the goodness of fit of the solution: chi square (X^2), comparative fit index (CFI), standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA). The adjustment of the measurement model may be considered good if the CFI values range from 0.95 to 1.00, RMSEA <0.05 and SRMR <0.1 . Alternatively, it may be considered acceptable if CFI values range from 0.90 to 0.95, RMSEA values are less than 0.08 and SRMR values are lower than 0.10 (Schweizer, 2010).

We then computed Cronbach alpha coefficients to assess the internal consistency of the scores of the two versions of the CES and the alpha if items were deleted; the item-total correlations were also calculated. Finally, we performed Pearson correlation coefficients between scores on both versions of the CES and (i) depression and (ii) anxiety scores (convergent validity) and between scores on both versions of CES and post-traumatic symptom severity scores (criterion validity). All analyses were performed using SPSS 17.0 for Windows (IBM, <http://www01.ibm.com/software/analytics/spss/>), except for the computation of skewness, kurtosis, KMO and Bartlett's statistics, which were evaluated using Factor v.10.4. (<http://psico.fcep.urv.es/utilitats/factor/>) and CFA using Mplus 5.1 (<http://www.statmodel.com>).

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RESULTS

Factor structure analyses of the CES items

The 20-item version of the CES met criteria supporting the use of the planned factor analysis [KMO = 0.95 and Bartlett's statistic = 307.0 ($df = 190, p < 0.001$)]. Also, when using the MLM method, the data adjusted well to a one factor model in the CFA. The X^2 statistic was 413.9, $p < 0.0001$. The adequacy of a one factor model was shown by the CFI = 0.89 (it is considered adequate if >0.90), the SRMR = 0.080 (it is considered good if ≤ 0.10) and the RMSEA = 0.074 (it is considered good if ≤ 0.08).

The findings also indicated that the shortened 7-item version of the CES was suitable for factor analysis: KMO = 0.89, Bartlett's statistic = 711.8 (df = 21: $p < 0.001$). The results of the CFA supported a one-factor model, as indicated by the χ^2 statistic (30.628, $p < 0.005$), the CFI (0.97), the SRMR (0.031) and the RMSEA (0.067).

Internal consistency of the CES

The 20-item version CES scores showed excellent internal consistency (Cronbach's $\alpha = 0.93$). The values of alpha, when any one item was deleted, remained at 0.93, providing further support for the reliability of the total scale score. The item-total correlations ranged from 0.48 to 0.75, all of which were above the recommended cut point of 0.30 for retaining items (Field, 2013). The scores on the 7-item version of the CES also evidenced good internal consistency (Cronbach's $\alpha = 0.84$). All values of alpha when one item was deleted are 0.80. The correlation coefficients between each item and the total score ranged from 0.30 to 0.61. The minimum loading value of each version of the CES was .50 for the 7-item version and .52 for the 20-item version. See Table 2 for additional information.

Validity

Validity of the scores of both versions of the CES was evidenced by moderate and positive significant correlations

with anxiety (HADS anxiety, $r_s = 0.29$ and 0.29 , $p_s < 0.01$, 20-item and 7-item version, respectively) and depression symptoms (HADS depression, $r_s = 0.28$ and 0.28 , $p_s < 0.01$, 20-item and 7-item version, respectively). The CES scores also evidenced moderate and significant positive associations with post-traumatic symptom severity scores ($r_s = 0.37$ and 0.35 , $p_s < 0.01$, 20-item and 7-item versions, respectively).

DISCUSSION

The aim of this study was to evaluate the factor structure, internal consistency and criterion validity of the full-form and short-form versions of the Spanish version of the CES in a sample of young adults. The results show that the single factor model showed a good fit for both the full 20-item and the brief 7-item version of the CES in our sample. Scores from both versions showed good internal consistency and evidenced validity via their moderate and significant associations with measures of depressive, anxious and post-traumatic symptoms severity.

The original study (Berntsen & Rubin, 2006) concluded that a one factor structure was most appropriate for both the 20-item and 7-item CES. However, recent studies with non-English speaking samples with different cultural backgrounds have shown different factor structures. For example, the Brazilian Portuguese version of the 20-item CES (Gauer

et al., 2013) evidenced three factors for both versions, and the

Table 2. Spanish version of the items in the centrality scale

Item	Mean	SD	Loading values	
Este acontecimiento se ha convertido en un punto de referencia para la manera en la que yo entiendo nuevas experiencias	3.48	1.24	.74	
Automáticamente veo conexiones y similitudes entre este acontecimiento y las experiencias de mi vida actual	3.01	1.24	.58	
Siento que este acontecimiento se ha convertido en parte de mi identidad	3.30	1.34	.74	.70*
Este acontecimiento puede ser considerado como un símbolo o una marca de asuntos importantes en mi vida	3.37	1.26	.75	
Este acontecimiento está transformando mi vida en algo diferente a la vida de la mayoría de las otras personas	2.35	1.30	.66	
Este acontecimiento se ha convertido en un punto de referencia para la forma en la que me entiendo a mí mismo y al mundo	3.13	1.30	.72	.67*
Creo que las personas que no han experimentado este tipo de acontecimientos piensan diferente a mí.	2.90	1.48	.52	
Este acontecimiento explica mucho de quién soy yo	2.95	1.35	.77	
A menudo veo la conexión y las similitudes entre este acontecimiento y mi relación actual con otras personas	2.87	1.39	.71	
Siento que este acontecimiento se ha convertido en una parte central de la historia de mi vida	2.75	1.41	.75	.77*
Creo que las personas que no han experimentado este tipo de acontecimientos, tienen una manera diferente de mirarse a sí mismos de la que tengo yo	2.70	1.31	.65	
Este acontecimiento ha influido en la forma en la que pienso y siento sobre otras experiencias	3.40	1.22	.77	.74*
Este acontecimiento se ha convertido en un punto de referencia para la manera en la que veo mi futuro		3.05	1.37	.72
Si fuera a tejer una alfombra sobre mi vida, este acontecimiento estaría situado en el medio de ella con fibras saliendo en dirección hacia muchas otras experiencias	2.25	1.17	.66	
La historia de mi vida se puede dividir en dos capítulos principales: uno antes y otro después de que este acontecimiento sucediera.	2.59	1.40	.67	
Este acontecimiento cambió definitivamente mi vida	2.53	1.40	.80	.76*
A menudo pienso sobre los efectos que este acontecimiento tendrá sobre mi futuro	2.55	1.34	.67	.66*
Este acontecimiento fue un punto de inflexión en mi vida	3.11	2.30	.78	.50*
Si este acontecimiento no me hubiese pasado, yo sería una persona distinta hoy	3.18	1.49	.75	
Cuando reflexiono sobre mi futuro, a menudo pienso en este acontecimiento.	2.57	1.34	.63	

*Loading values for the seven

Portugal Portuguese Adolescent version showed a three-factor structure for the 20-item version but a one-factor structure for the 7-item version (Vagos et al., 2016). In addition, the study conducted by Robinaugh and McNally (2011) also found a three-factor structure with the original 20-item version (Robinaugh & McNally, 2011). Our findings are consistent with the original studies supporting a single-factor structure for both long and short versions of the CES. The differences in findings across studies may be related to the differences in analytic approaches used. The principal components analysis — the approach used by Gauer and colleagues (Gauer et al., 2013) and Robinaugh and McNally (2011) — is known to sometimes result in more factors than are truly represented in a data (Ferrando & Anguiano-Carrasco, 2010). Thus, on the basis of our results and those from others, we recommend using the one-factor structure for the Spanish version of the CES. By keeping in line with the one-factor structure the Spanish version, it may be more suitable for multicultural studies addressing the associations between centrality of events and psychopathology, given that previous works have used a one-factor solution.

The findings, including the results from this study, have shown that scores of the 20-item CES demonstrate a good to excellent internal consistency, in all versions and samples: the Cronbach's α was 0.94 in the original study, $\alpha = 0.95$ in the Brazilian Portuguese version, $\alpha = 0.87$ (factor 1), 0.89 (factor 2) and 0.85 (factor 3) in the Portuguese adolescent's version, $\alpha = 0.94$ in the Robinaugh and McNally's (2011) study and $\alpha = 0.93$ in our study. The Cronbach's α for the 7-item version was 0.88 in the measure development sample, 0.89 in the Brazilian Portuguese version, 0.90 in the Portuguese adolescent version and 0.84 in the current sample (Berntsen & Rubin, 2006; Gauer et al., 2013). These results indicate that the 7-item version is reliable across settings and cultures. Thus, the use of this version, instead of the full 20-item version, would be appropriate when there are concerns about subject assessment burden (i.e. large scale survey studies).

The finding of moderate associations between the CES scores and measures of both depression and anxiety symptoms provides evidence for the concurrent criterion validity of the scores obtained with the CES in our sample. Support for the convergent validity of the CES scores comes from their moderate and significant positive associations with post-traumatic symptom severity scores ($r_s = 0.37$ for the full version and 0.35 for the 7-item version). Our results are consistent with the study hypotheses and those from the original scale development sample, where a correlation between CES and the PTSD Checklist of 0.38 was reported (Berntsen & Rubin, 2006). In our study, the correlation values for centrality and traumatic symptomatology were of a higher magnitude than those for centrality and anxious or depressed symptomatology, although they were all statistically significant.

This study has a number of limitations that should be considered when interpreting the results. The study data were collected from a convenience sample of young adults. It is possible that the findings might have been different had we used a different group of participants; for example, a clinical sample of individuals diagnosed with PTSD. Additional research with clinical and healthy samples is needed to fully establish the reliability and validity of the CESs scores in Spanish speaking populations. In addition, although our findings supported a single factor consistent with the findings from the

measure development study, they were not consistent with a previous study which supported a three-factor structure for the CES items in a sample of youths (Gauer et al., 2013). Our results showed a good fit for the data for the single factor model, but we did not compare these to alternative models; therefore, on the basis of these results, it is not possible to know whether alternative models would or would not show a better fit. Thus, additional research would be useful to help evaluate the factor structure of the CES in different samples of individuals.

Despite the study's limitations, the findings provide important additional information regarding the validity and reliability of the scores obtained with the CES to assess centrality in a sample of Spanish young adults and its consistency across different languages and cultures. These results support the use of the CES across groups of individuals who speak different languages and from different cultures, to help determine the importance of centrality to adjustment to traumatic events, and evaluate what role, if any, language and culture may be playing in these relationships. According to our findings, the CES is a reliable and valid assessment tool in young people, and the 7-item version is highly recommended in order to minimize assessment burden.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest related to this study.

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