The Centrality of Events Scale in Portuguese adolescents: Validity evidence based on internal structure and on relations to other variables

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Abstract

We explored the measurement model of the <mark>adolescent version of the</mark> Centrality of Event scale and its invariance across community (n = 1079; 42.8% male), referred for foster care (n = 205; 58.0% male) and detained (n = 206 male participants) adolescent participants. Results indicated a three-factor measurement model, including all three functions that memories of significant life events may have, as a good fit to our data, particularly for male participants. This measurement model was invariant across boys taken from those different samples but not across gender. As for the short version of the instrument, a one-factor solution was the best fit to our data. It was invariant across boys taken from those different samples and across gender. Boys and girls expressed similar experiences, whereas community male adolescents reported the lowest impact of a meaningful event, in comparison to referred or detained boys. These findings provide evidence on the validity of the scale for use with diverse adolescent samples, which may contribute for a better understanding of the impact that significant life events may have on the development of gender-specific and group-specific vulnerabilities.

Keywords: centrality of event, adolescence, confirmatory factor analysis, externalizing behaviors, group comparison, psychometrics

The Centrality of Events Scale in Portuguese adolescents: Validity evidence based on internal structure and on relations to other variables

Autobiographical memories help to anchor and stabilize our self-concept, and to give meaning, structure, and balance to our personal life narratives (Berntsen & Rubin, 2006). They are repeatedly recalled (or reflected upon) and generally are linked to profound life changing events, either positive or stressful/traumatic (Berntsen & Rubin, 2006; Boals, 2010). According to the Centrality of Event Theory (Berntsen & Rubin, 2006, 2007), such memories of personally significant events may have three functions. First, those memories can become a reference point for interpretations of everyday events; that is to say they become an anchoring event for the perception and attribution of meaning to current and future experiences and expectations, thus validating current beliefs and feelings, and guiding one's thoughts and behavior. Second, those memories can become a turning point in one's personal life story, capable of modifying or redirecting the course of such a story, and also being capable of changing beliefs about ourselves. Finally, memories of a highly relevant event can become a central component of personal identity, turning up to be an emblematic episode for the self and for self-understanding (Berntsen & Rubin, 2006, 2007).

Most individuals tend to remember considerably more positive than negative events of their lives, at the same time as highly negative life events are relatively rare in the general population (Boals, 2010). Nevertheless, such stressful experiences can function as traumatic memories that become central to one's life, and so it is important to assess not only the presence and history of trauma, but also, most importantly, the extent to which a memory of a stressful event represents a core topic for personal identity and for the attribution of meaning to other life experiences (Berntsen & Rubin, 2006, 2007). There are several measures to assess trauma exposure and the impact of

such traumatic experiences (Rubin, Boals, & Hoyle, 2014). However, to our knowledge, there is only one measure in accordance with the Centrality of Event theoretical framework (i.e., considering how one event may become a central memory in one's identity and life story): the Centrality of Event Scale (CES; Berntsen & Rubin, 2006).

The CES was designed taking into consideration the three functions of autobiographical memories, meaning the extent to which a memory for a stressful event becomes: a) a reference point for everyday inferences, b) a turning point in one's life story, and c) a central component of personal identity (Bernstein & Rubin, 2006).The authors suggest this measure to be unifactorial, though their exploratory factor analyses on the scores taken from an adult sample returned three factors with eigenvalues higher than one; this three-factor solution was not further explored. Berntsen and Rubin (2006) also suggested the use of a short version of the CES, composed of the seven items that correlated the highest with the total score of the scale. The 20-item (e.g., Groleau, Calhoun, Cann, & Tedeschi, 2013; Robinaugh & McNally, 2011; Schuettler & Boals, 2011) and the short (e.g., Boals, 2010; Rubin et al., 2014; Rubin, Hoyle, & Leary, 2012) versions of the CES were used in subsequent studies, all of which found good psychometrical proprieties for their results using them as unifactorial measures.

Alternatively, Gauer, Ávila-Souza, Silveira, and Sediyama (2013) proposed the 20-item CES version to be a three-factor measure, which they found via Exploratory Factor Analysis using the results of a sample of 195 Brazilian undergraduate students. The semantic content of the three factors were in line with the functions of central events (Bernstein & Rubin, 2006). Gauer and colleagues (2013) also proposed a short version of the CES, comprising the seven items that correlated the highest with the total score of the scale in their study. This short version of the CES was very similar to the original one, the only exception being the replacement of one item by another.

Due to the increasing interest by clinicians and researchers on the role that autobiographical memories may hold for psychological functioning in youth, the 20-item CES version has also been adapted to the adolescent population (CES-A; Cunha, Xavier, Matos, & Faria, 2015). Similarly to what was found for adults, a one-factor solution was put forward as an adequate measurement model for this age group.

Though addressing the centrality of events with participants who are still developing their identities and life stories may seem contra intuitive, research suggests that meaning-making processes are present as early as adolescence, namely the integration of memories in the personal identity (McLean, Breen, & Fournier, 2010). Furthermore, adolescents struggle with developmental demands associated with their future adult identity and roles (Kroger, 2004), which are tasks they have to undertake while facing an intense emotional experience (Zeman, Cassano, Perry-Parrish, & Stegall, 2006) and possessing a less than effective repertoire of emotion regulation strategies (Garnefski & Kraaij, 2006; McRae et al., 2012; Zimmermann & Iwanski, 2014). Achieving these developmental tasks may prove particularly challenging for those adolescents who face peculiar life circumstances that may represent a central event to their personal identity and life story. Youth with disruptive behaviors are one of such cases. So, the validation of the CES-A within externalizing samples of adolescents, which has not been accomplished before, seems paramount mainly for three reasons: (1) trauma exposure is highly prevalent in youth with disruptive disorders (Abram et al., 2004; Brigs et al. 2013; Dierkhising et al., 2013; Willis, Best, & Aalsma, 2013); (2) environmental factors (particularly early toxic experiences) seem to play a key role in the development of behavioral problems (Ribeiro da Silva, Rijo, & Salekin, 2015); and (3) it seems important to address how some life experiences can concur to mold these youth's identities. Moreover, it would be important to investigate the differences in the

results of the CES-A between community adolescents and youth with externalizing problems; to accurately grasp these differences, measurement invariance must be considered, in order to guarantee that researchers are assessing the same constructs across those groups and, thus, avoid inference problems (Chen, 2007).

Given the inconsistent results found when comparing scores of the CES between male and female participants, it also seems relevant to better explore these differences. Previous works using the seven-item CES version with an adult sample, found that females scored significantly higher than males (Boals, 2010). According to the Centrality of Event theory, the differential childhood socialization practices for boys and girls probably lead to more complex and enriched cognitive representations of emotional events in females (Berntsen & Rubin, 2006; Boals, 2010; Davis, 1999). In contrast with males, females tend to more easily recall past events, develop more detailed representations of past experiences, and transform both positive and negative/traumatic emotional events into central points to their identities (Bloise & Johnson, 2007; Boals, 2010). The fact that females are more likely than males to take negative experiences (and not only positive ones) as central to their identity may help to explain why women are particularly vulnerable after a stressful event (Berntsen & Rubin, 2006; Bloise & Johnson, 2007; Boals, 2010). Still, some works do not concur with these gender differences, either with undergraduate (Gauer et al., 2003) or adolescent samples (Cunha et al., 2015). Thus, exploring if (and why) gender differences actually exist is still relevant, for which gender invariance must first be ascertained.

This work proposed to evaluate the psychometric proprieties of the CES-A using a combined sample of Portuguese adolescents, including community participants and participants either referred or detained for externalizing behavior. The CES-A has not

been studied with such specific samples and so, before it can be used to understand the effects of traumatic events in their autobiographical memories, there must be evidence that such effects are being assessed properly. In particular, the internal structures of the 20-item and of the short seven-item versions of the CES were investigated as applied to adolescent samples. For the 20-item version of the CES, three alternative measurement models were investigated and compared: a one-factor solution as proposed by Bernsten and Rubin (2006), a three-factor empirically derived solution as proposed by Gauer et al., (2013), and a three-factor theoretically derived solution based on the contents Bernsten and Rubin (2006, p. 23-24) attributed to each item (i.e., reference point for ones' life, turning point in ones' life story, and central to ones' personal identity). For the seven-item version of the CES, three competing measurement models were also tested: a one-factor solution composed by the items showing higher item-total correlation values within a North American sample of university students (Bernsten & Rubin, 2006), a one-factor solution constituted by the items found to have the highest item-total correlation values using a Brazilian sample of undergraduate students (Gauer et al., 2013; interestingly, only one item differed between these two short versions), and a similar three-factor theoretically derived solution. Scores on the resulting measures were then analyzed for internal consistency, measurement invariance and latent mean comparison across gender and type of sample.

We expected that the same measurement structure would adequately represent the centrality of event experiences of boys and girls on one hand, and of boys who exhibit behavioral problems to different degrees on the other hand. Moreover, following the results previously obtained with Portuguese adolescent samples (Cunha et al., 2015), we expected to find no significant gender differences. As for comparisons between male samples of youth with behavioral problems to different degrees, and considering that

adolescents with externalizing problems have a history of more exposure to traumatic events (e.g., Willis, Best, & Aalsma, 2013), we expected that those participants would score significantly higher than community participants. Finally, validity evidence based on relation to external variables was also explored, concerning self-criticism, self-reassurance and experiential avoidance. Like in previous studies, we expected scores on the CES-A to be positively associated with experiential avoidance (Rubin et al., 2014; Schuettler & Boals, 2011). Given that self-criticism and self-reassurance have been associated with various psychopathological symptoms (Castilho & Pinto-Gouveia, 2011), which in turn have been related to results on the CES-A (Berntsen & Rubin, 2006; Boals, 2010; Schuettler & Boals, 2011), the CES-A scores were expected to associate positively with self-criticism and negatively with self-reassurance in the current work.

Method

Participants and Procedures

The current work included a combined sample of adolescents recruited from school settings, adolescents referred for behavioral problems, and adolescents detained by the judicial system. In addition to institutional authorizations, all participants were informed of the goals of the study and the confidentiality and anonymity of their responses were guaranteed. After this, all participants under 18 years of age verbally consented to their own participation in addition to their parents/legal guardians written consent. In turn, participants over 18 years old provided verbal and written consent for their own participation. No adolescent in the community sample refused to participate. In the referred and detained samples, 15 and 14 adolescents declined to participate, respectively.

A total of 1526 participants were thus recruited, 36 of which returned evaluation protocols with missing values to between one to four items of the CES-A. Though not

being missing completely at random ($\chi 2(337) = 449.59$, $p < .001$), these missing values represented only 0.13% of the total response pool. For this reason, and because exploring missing value patterns were beyond the scope of the current work, a listwise deletion approach was applied to handling missing values.

So, the final sample for this study included 1490 Portuguese adolescents, aged between 12 and 21 years old (*i.e.*, combined sample). Boys and girls taken from this combined sample had similar mean ages ($t(1487) = -0.23$, $p = .08$) and were evenly distributed by socioeconomic status (SES; $\chi 2(2) = 3.07$, $p = .22$). Of those participants, 1079 adolescents were recruited from several national public schools located in the center and north regions of Portugal, after the national ethics committee and/or the executive boards of the schools approved the study (*i.e.*, community samples). All of these students filled in the Centrality of Event Scale. Additionally, a subsample of 202 adolescents was randomly selected (4/5 subjects per class) and also filled in The Forms of Self-Criticising/Attacking & Self-Reassuring Scale (subsample 1); of these, another 139 students were again randomly selected (2/3 from the initial 4/5 students per class) and also completed the Acceptance and Action Questionnaire (subsample 2). This data was collected in group (during classes), in the presence of the researchers.

Participants in this study also included 205 adolescents placed in Azores foster care institutions, which were referred for disruptive behavior (*i.e.*, referred sample). Finally, 206 male young offenders placed in all of the 8 Portuguese juvenile detention facilities due to criminal behavior were randomly selected to participate in this study (*i.e.*, detained sample). These participants filled in only the CES-A after the study was approved by the institutions' boards, and were evaluated individually by the authors or by psychologists from foster care/detention facilities.

Table 1 presents the demographic characteristics of the samples and subsamples.

[Insert Table 1]

Detained participants were significantly older than both community (t(322.3) = -5.03, $p < .001$) and referred participants (t(408) = -3.68, $p < .001$); alternatively, community and referred participants had similar mean ages (t(1282) = 0.28, $p = .78$). Participants in these samples were not similarly distributed either by gender (χ2(2) = 229.57, $p < .001$) or by SES (χ2(4) = 296.51, $p < .001$). Girls were more frequent than expected in the community sample whereas boys were more prevalent than expected in the referred and detained samples. In relation to what was statistically expected, more community participants descended from a high SES, more referred participants came from a low SES, and, finally, more detained participants derived from a medium SES.

Measures

    Centrality of Event Scale - Adolescents (CES-A; Berntsen & Rubin, 2006; Portuguese version for adolescents by Cunha et al., 2015): is a 20-item scale that measures the extent to which a memory of a stressful or traumatic event becomes (1) a reference point for individual's everyday references (*e.g.*, "This event has become a reference point for the way I understand new experiences"), (2) a turning point in one's life story (*e.g.*, "I feel that this event has become a central part of my life story"), and (3) a central component of personal identity (*e.g.*, "This event tells a lot about who I am") (Berntsen & Rubin, 2006). The CES-A gives the following prompt to participants: "Please think back upon the most stressful or traumatic event in your life and answer the following questions"; it further presents a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree) for them to do so. The original study on the psychometric properties of the scale using an adult sample revealed a high internal consistency (α = .94) and one factor solution (Berntsen & Rubin, 2006). The Portuguese version was studied with 397 adolescents and showed a Cronbach's alpha of .95 and a single factor

structure (Cunha et al., 2015), similar to the original version of the scale. Analyses of the psychometric properties of the CES-A with the current samples will be presented in the results section.

The Forms of Self-Criticising/Attacking & Self-Reassuring Scale (FSCRS; Gilbert, Clark, Hempel, Miles, & Irons, 2004; Portuguese version by Castilho & Pinto-Gouveia, 2011): is a 22-item scale that assesses two forms of self-criticism, namely (1) inadequate self, which focuses on a sense of personal inadequacy (*e.g.*, "I am easily disappointed with myself") and (2) hated self, which measures the desire to hurt or persecute the self (*e.g.*, "I have become so angry with myself that I want to hurt or injure myself"). The scale also assesses self-reassurance (*e.g.*, "I am able to care and look after myself"). Participants are asked to rate how much each item is true for them using a five-point Likert scale ranging from 0 (not at all like me) to 4 (extremely like me); items portray ways in which people may have negative and self-critical thoughts and feelings or, alternatively, be supportive of themselves (Gilbert et al., 2004). The original version of the FSCRS presented good psychometric properties, with alphas of .90 for the inadequate self and .86 for both the hated self and self-reassurance (Gilbert et al., 2004). In the Portuguese version, Cronbach's alphas ranged from .62 to .89 (Castilho & Pinto-Gouveia, 2011). In the present study, internal consistency values using the combined sample were .89 for the inadequate self, .81 for the hated self, and .88 for self-reassurance.

The Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011; Portuguese version by Pinto-Gouveia, Gregório, Diniz, & Xavier, 2012): is a 7-item scale that measures a person's experiential avoidance and immobility, as well as acceptance and action. Participants are asked to rate how true each item is for them, using a seven-point Likert scale ranging from 1 (never true) to 7 (always true). Higher

scores in AAQ-II are reflective of greater experiential avoidance and immobility, whereas lower scores reflect greater acceptance and action. The AAQ-II has been found to have adequate reliability and validity with college student and clinical samples (Bond et al., 2011; Pinto-Gouveia et al., 2012). In both the Portuguese validation study and the current work, internal consistency was .89.

Data analysis

Data was analyzed with the IBM SPPS Statistic 21 and Mplus v6.0 (Muthén & Muthén, 2010) softwares. The IBM SPPS Statistic 21 software was used for calculating the Cronbach Alfa, as representative of internal consistency, and correlation values between the measures of the CES-A and the external variables considered in the current work, as representative of validity evidence in relation to other variables. Moreover, this software was also used for computing descriptive measures considering the sum of the items composing each measure of the CES-A, as these are the mostly commonly used in clinical/applied settings.

Mplus was used for confirmatory factor analyses, as well as for multi-group analyses and latent mean comparisons. Confirmatory factor analyses (CFA) were applied to test the competing measurement models proposed either for the complete version or for the short version of the CES-A; results from the combined sample (n = 1490) were used for these analyses. After the best internal structure solution was defined, CFA was further applied separately to the combined male and female samples and to each one of the male samples (*i.e.*, community, referred, and detained).

The fit of the models resulting from these CFAs was considered on the basis of a two-index approach. Following the guidelines provided by Hair, Black, Babin, & Anderson (2005), the acceptability thresholds were different according to the number of items and sample size under consideration. When analyzing the complete version of the

CES-A (*i.e.*, between 12 and 30 items), and using the combined and community samples (sample size > 250), we considered a *Comparative Fit Index* (CFI) higher than .92 combined with either a *Root Mean Square Error of Approximation* (RMSEA) lower than .07 or a *Standardized Root Mean Square Residual* (SRMR) lower than .08. For the referred and detained samples (n < 250) we considered CFI > .95 combined with either a RMSEA < .08 or a SRMR < .08. When analyzing the short version of the CES-A (*i.e.*, less than 12 items) with the combined or community samples, acceptability was based on CFI higher than .97 combined with RMSEA lower than .07; with the referred or detained samples, acceptability was based on CFI higher than .97 combined with RMSEA lower than .08. Additionally, when comparing competing non-nested models, the *Akaike's Information Criterion* (AIC) value was considered; lower AIC values were considered as indicative of better fit.

Multi-group analyses were applied to gender in the combined sample and to the male community, referred and detained groups. A forward approach as suggested by Dimitrov (2010) was used, which suggests starting with testing configural invariance, followed by metric invariance, and, lastly, scalar invariance. Configural invariance refers to the measurement model being an adequate fit for each group separately. Metric invariance adds to this the constraint that item loading values also are of similar magnitude for the groups being compared. Scalar invariance, in turn, also constrains the intercepts of the items to be similar across groups. At least partial invariance should be obtained before groups can be compared based on the factor variables, meaning that only about 20% of the parameters being estimated should be variant across groups (Dimitrov, 2010). To determine measurement invariance, differences on the same fit indicators (*i.e.*, RMSEA, CFI and SRMR) were considered. Following the guidelines provided by Chen (2007), metric invariance was determined based on ΔCFI $\leq$ -.01

combined with ΔRMSEA $\leq$ .015 or ΔSRMR $\leq$ .03, whereas scalar invariance was determined based on ΔCFI $\leq$ -.01 combined with ΔRMSEA $\leq$ .015 or ΔSRMR $\leq$ .01.

Following at least partial invariance being achieved, latent mean comparisons were conducted across gender and across different male samples. The guidelines provided by Dimitrov (2006) were followed, by setting one group as the reference group against which the other groups' latent mean would be compared.

Results

Preliminary analysis on the multivariate normality of the data indicated that the distribution was not multivariate normal (Mardia's multivariate normality test = 5984.72, p < .001; Korkmaz, Goksuluk, & Zararsiz, 2014). So, all confirmatory and multi-group analyses were conducted using the *Maximum Likelihood Roubust* estimator.

Centrality of Event for Adolescents – Complete Version

Factor structure.

Taking into account that a one-factor solution had been previously validated for a Portuguese adolescent sample, we conducted a confirmatory factor analysis (CFA) on this measurement model. It did not achieve an acceptable fit for the data taken from the combined sample (see Table 2, AIC = 83376.138).A CFA was next applied to the three factor model proposed by Gauer et al., (2013). It also did not achieve acceptable fit indicators (see Table 2; AIC = 82826.808). Finally, a third CFA was conducted on a three factor model that reflected the diverse contents that Berntsen and Rubin (2006) refer to have intended to address when developing the items of the CES; item 11 is not mentioned in this regard and so was not included in this analysis. Once again, the fit indicators were below the acceptability cutoff values (see Table 2; AIC = 78690.187).

[Insert Table 2]

Of the three internal structures tested for the complete version of the CES-A, the three-factor model based on item content presented the best fit indicators and lower AIC value, and therefore seemed the best choice for further improvement. For this three-factor measurement model to achieve acceptable fit, modification indices suggested allowing the residuals of items 1 and 2 to covariate. We could not find an ad hoc reason for allowing this correlation, other than the items belonging to the same factor. So, rather than generalizing that reason to allowing errors of all items composing that factor to covariate, we opted to exclude one of these items at a time. Excluding item two produced acceptable fit indicators (see Table 2; AIC = 74570.148), and so this 18-item three factor model was hence forth considered when testing for measurement invariance, latent mean comparisons and correlations with external variables.

According to the authors of the CES (Berntsen & Rubin, 2006), the first factor addresses whether the event became a reference point for the generation of expectations and attribution of meaning to other events in the person's life; the second factor refers to whether the event is regarded as a turning point in one's life story; and the third factor considers whether the event is perceived as a central component of personal identity. Table 3 presents the loading values for each item and the internal consistency values for each factor, which were always very good.

[Insert Table 3]

Measurement invariance.

Fit indicators obtained for the male and female combined samples separately were acceptable only for the male sample (see Table 2). Thus, configural invariance across gender could not be achieved and further measurement invariance analyses were not performed. On the other hand, fit indicators obtained for the male participants in each sample were always acceptable (see Table 2), and so further metric and scalar

invariance across samples were tested. When applying the 18-item three-factor measurement model to community, referred and detained male participants, we found full metric (ΔRMSEA = -.001; ΔCFI = -.003, ΔSRMR = .009) and full scalar invariance *(ΔRMSEA = .001; ΔCFI = -.007, ΔSRMR = .002).*

Latent mean comparisons.

Descriptive measures for the 18 item three-factor measurement models of the CES-A are reported in Table 4. We further computed latent mean comparisons between boys from the different samples. Community boys scored significantly less on all dimensions of the CES-A, when compared with referred boys (latent mean for *reference point* = .303, *p* = .007; latent mean for *turning point* = .612, *p* < .001; latent mean for *personal identity* = .292, *p* = .009) and detained boys (latent mean for *reference point* =.422, *p* < .001; latent mean for *turning point* = .583, *p* < .001; latent mean for *personal identity* = .238, *p* = .014). No significant differences were found between referred and detained participants for any of the three factors.

[Insert Table 4]

Construct validity in relation to other variables.

Positive and significant correlation values were found between the 18-item three-factor measurement model of the CES-A and experiential avoidance, the perception of an inadequate self and the perception of a hated self. Alternatively, negative and significant correlation values were found between this measurement model of the CES-A and the perception of a tranquilizing self (see Table 5).

The magnitude of the correlations was similar across all CES-A dimensions, being moderate for the associations between the CES-A and the experiential avoidance and low between the CES-A and perceptions of the self. All CES-A S dimensions were also correlated significantly among each other (*p* < .001): *r* = .81, between reference

point and turning point, $r = .85$, between reference point and personal identity, and $r = .74$ between turning point and personal identity.

[Insert Table 5]

Centrality of Event for Adolescents – Short Version

Factor structure.

A CFA was applied to the seven items that Berntsen and Rubin (2006) suggested as composing a short version of the CES. It did not achieve acceptable fit indicators (see Table 2; AIC = 29712.818). Gauer et al. (2013) also suggested a short version of the CES, which proved to be an acceptable fit to the combined sample used in the current work (see Table 2; AIC = 29415.849). Lastly, a three-factor measurement model allocating each of the seven items selected by Berntsen and Rubin (2006) to their intended content was also tested via CFA. It did not obtain acceptable fit indicators (see Table 2; AIC = 29606.338). So, the short version of the CES as proposed by Gauer et al. (2013) achieved the best fit when applied to the current adolescent sample and was subsequently used for measurement invariance, latent mean comparisons and correlational analyses. The loading values for this measurement model as applied to Portuguese adolescents are presented in Table 6, along with the internal consistency values, which were always very good.

[Insert Table 6]

Measurement Invariance.

Configural gender invariance was established based on the optimal fit indicators obtained for the combined sample of male participants and for the combined sample of female participants (see Table 2 for fit indicators and Table 6 for loading and internal consistency values). Full metric invariance across gender was also found (ΔRMSEA = -

.004; ΔCFI = -.002, ΔSRMR = .005), as well as full scalar invariance (ΔRMSEA = .005; ΔCFI = -.009, ΔSRMR = .004).

Concerning the diverse male samples, each of them separately achieved very good or good fit indicators (see Table 2 for fit indicators and Table 6 for loading and internal consistency values) and so we continued with metric and scalar invariance analyses. Full metric invariance was found (ΔRMSEA = -.002; ΔCFI = -.009, ΔSRMR = .026). Partial scalar invariance was also found after allowing the intercept of item nine to vary in the community group (ΔRMSEA = -.001; ΔCFI = -.008, ΔSRMR = .001).

Latent mean comparisons.

Descriptive measures for the short one-factor measurement model of the CES-A are reported in Table 4. Based on latent mean comparisons, no significant between-gender differences were found (latent mean for girls = .019; p = .74). Also based on latent mean comparisons between male samples, community boys were found to score significantly less than referred (latent mean = .527, $p < .001$) and detained boys (latent mean = .519, $p < .001$). No significant differences were found between referred and detained boys.

Construct validity in relation to other variables.

Correlation values found between the short version of the CES-A and the external variables under consideration were consistent with those found for every dimension of the 18-item three-factor model of the CES-A (see Table 5). The short CES-A also correlated highly and significantly ($p < .001$) with those three dimensions: r = .91 with reference point, r = .95 with turning point and r = .86 with personal identity.

Discussion

The main goal of this study was to assess the psychometric properties of the Centrality of Event Scale using a large and diverse sample of adolescents. Particularly,

the internal structure of the complete and short versions of the scale was investigated, along with analyses of the internal consistency, measurement invariance and latent mean comparison across gender and youth with behavioral problems to different degrees, and validity evidence in relation to others variables, namely self-criticism and self-reassurance, and experiential avoidance. We intended to further contribute to the validation of the CES-A, by examining alternative models to its internal structure and ascertaining their applicability to diverse adolescent samples (*i.e.,* community and referred boys and girls, and detained boys).

Concerning the internal structure of the complete version of the CES-A, we found evidence for a tree-factor theoretically derived measurement model, as the best solution for the data taken from the combined sample. This measurement model was directly taken from the contents of the original dimensions proposed by Berntsen and Rubin (2006), thus, providing evidence for the construct validity of the Portuguese version of the CES-A with Portuguese adolescents, based on internal structure. These contents are: the event representing a reference point for one's life, having become a turning point for one's life story, and having become part of the personal identity. Alternatively, a one-factor solution, though previously advocated either with adults (Berntsen & Rubin, 2006) and adolescents (Cunha et al., 2015) did not achieve acceptable fit for this sample. The three-factor statistically derived solution proposed by Gauer and colleagues (2013) using an undergraduate sample was also not a good fit for this sample; though proposed as addressing the same contents, the constitution of these three factors did not fully overlap with the constructs Berntsen and Rubin (2006) stated to have had in mind when phrasing the items.

The theoretically derived measurement model was not invariant across gender. In fact, it only represented a good fit for the male participants, indicating that boys may

more easily split the negative effect of a stressful experience in each of its components. On the other hand, girls may have more difficulties in marking out the different effects that traumatic events may have had on their life stories. This may explain why girls, although tending to have more complex and enriched cognitive representations of emotional events (Berntsen & Rubin, 2006; Boals, 2010; Davis, 1999), are more vulnerable when experiencing a traumatic/stressful event compared to boys (Berntsen & Rubin, 2006; Bloise & Johnson, 2007; Boals, 2010; MacMillan et al., 2014). Future research should address this issue, in trying to understand the role of the three functions of memories of a traumatic event, assessed with the CES, for both males and females across the lifespan. For instance, it seems relevant to investigate if the vulnerability of females after experiencing a traumatic event is somehow related to the fact that they become overwhelmed in all functions of memories, whereas males more easily differentiate the harm related to a traumatic event in each of these functions, and, thus, present diminished trauma vulnerability.

The CES-A had not been examined with particular groups, namely adolescents with disruptive behaviors. Our findings with two samples of youth with externalizing symptoms (one referred and one detained) provides evidence for the accuracy and invariability of a three-factor measurement model for the complete version of the CES-A to be used with such samples and with community adolescent samples. Referred and detained boys reported similar perceptions on the traumatic effect of the event, and both reported them more intensely than boys from the community. This is in line with the literature, which reports a higher prevalence (frequency and diversity) of trauma exposure in referred and detained samples, when compared to community samples (Abram et al., 2004; Brigs et al., 2013; Dierkhising et al., 2013; Willis et al., 2013). Nonetheless, these differences were not as pronounced for the personal identity factor as

for the reference point and the turning point factors. This may be due to the fact that adolescents are still developing their sense of identity (Kroger, 2004; McLean et al., 2010).

Concerning the short version of the CES-A, a one-factor solution as proposed by Gauer and colleagues (2013) was the best fitting model to the data taken from the combined sample, in comparison to a previously proposed one-factor solution (Bernsten & Rubin, 2006) and to a three-factor theoretically derived factor solution. The short version of the CES-A had not previously been investigated and these results may represent the fact that the items included in this version of the scale are not sufficient (either because of their content or because of their number) to discriminate between related constructs. Given their particular intense emotional experience (Zeman et al., 2006) combined with restricted repertory of emotion regulation strategies (Garnefski & Kraaij, 2006; McRae et al., 2012; Zimmermann & Iwanski, 2014), adolescents may need more incisive items to be able to adequately discriminate their experience of emotionally intense traumatic experiences.

This short version of the CES-A proved to be gender invariant, allowing for gender comparisons. No significant gender differences were found. These results are contrary to the ones found by Boals (2010), where adult females were found to have a greater tendency to construe negative events as central to their identity when compared to adult males, but it is in line with previous findings with Portuguese adolescents (Cunha et al., 2015). This may be explained by sample features: adolescents *vs* adults. The emotional experience of adolescents is especially intense, with adolescents more frequently experiencing intense emotions, more so than younger or older individuals (Kroeger, 2004; Zeman et al., 2006). Moreover, their ability to use cognitive reappraisal and other cognitive strategies to regulate emotions increases linearly with age, with a

general trend of increasing adaptive emotion regulation in adulthood (Garnefski &

Kraaij, 2006; McRae et al., 2012; Zimmermann & Iwanski, 2014). These differences in

emotional experience and emotional regulation may help to understand our findings on

adolescent gender comparisons. Future research should address this issue, in trying to

understand the emotional development from infancy through adolescence and

adulthood, considering also gender. Specifically, it would be of major interest to test if

the construction of a negative event as central to one's identity differs throughout the

lifespan, and if these differences are consistent for males and females in each

developmental period.

Overall, our findings suggested that a three-factor model might be considered

when comparing diverse samples based on externalizing characteristics, whereas a

short-version of the CES-A might be a better option when intending to also analyze

gender differences across diverse samples. We did not consider other sociodemographic

or clinical variables that may further impact on the measurement models of the CES-A.

Developmental stage could be one of them, once it is known that childhood trauma is

considered to be one of the strongest risk factors for psychopathology and could predict

deficits in emotion regulation (Marusak, Martin, Etkin, & Thomason, 2015). However,

this could be compensated by the fact that emotion regulation strategies (Garnefski &

Kraaij, 2006; McRae et al., 2012; Zimmermann & Iwanski, 2014) and the integration of

memories into one's personal identity (McLean et al., 2010) tend to increase linearly

with age. These nuances could help to understand age differences in the effects of a

traumatic event in autobiographical memory development. As a relevant clinical

variable, the age at the time of the trauma exposure seems to be particularly important,

as well as the age of the assessment of effects caused by the traumatic event

(McCutcheon et al., 2010; McLean et al., 2010).

Both the short version of the CES-A and the three factors of its longer version (*i.e.,* 18 items) showed validity in relation to other external variables. In particular, it seems that the more a traumatic event has become central in one's life (both generally or, alternatively, becoming a reference and turning point in one's life crucial to defining the personal identity), the more the individual engages in experiential avoidance and self-criticism. In contrast, the less the centrality of this event, the more he/she reassures him/herself when coping with daily experiences. This is in line with findings that a traumatic memory, particularly a shaming one, can become central to one's identity, placing the individual (adolescent or adult) at risk for psychopathology (Cunha, Matos, Faria, & Zagalo, 2012; Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006; Matos & Pinto-Gouveia, 2010; Pinto-Gouveia & Matos, 2011).

These associations between the centrality of a traumatic event and psychopathology may be mediated (at least partially) by the adoption of unsuccessful ways of coping with daily hardships. The higher the prevalence of traumatic experiences in one's life story, the more individuals tend to cope with them by avoiding the integration of their effects into their identity (Rubin et al., 2014; Schettler and Boals; 2011) and possibly by adopting a self-critical posture towards themselves, instead of a self-reassuring one. This may represent a way of self-protection, though only partially successful, because it prevents the individual of working through and psychologically resolve these traumatic experiences. Alternatively, coping with the event and oneself in a more compassionate way may represent a healthier alternative (Gilbert et al., 2006).

This study is not without limitations, namely the fact that it included only detained boys. Gender comparisons may have been biased by the fact that only the male group included participants who are known to have had a more traumatic life story (Abram et al., 2004). Besides, we can only advocate for the representativeness of the

current community adolescent sample, but not of the referred (due to it being gathered only in one region of Portugal) or the detained (due to it including only boys) samples; the detained sample stands, nevertheless, representative of the male detained Portuguese youth and it should also be noted that girls represent only 14% of the youth detained population in Portugal (Direção-Geral de Reinserção e Serviços Prisionais, 2014). Though the results presented in this work may, thus, be seen as relatively circumscribed to the Portuguese context, they still represent a valuable stepping stone for further works investigating larger, more diverse, and more representative samples.

Overall, this study contributed to validating the CES-A for use with adolescents, either with or without behavioral problems. Due to the fact that adolescents with behavioral problems are known to having been exposed to a greater prevalence of traumatic experiences (Abram et al., 2004; Brigs et al., 2013; Dierkhising et al., 2013; Willis et al., 2013), such as shameful ones, it is important to develop credible and valid instruments that may accurately address these experiences and their impact in the adolescents' life; such had not been done previously with the CES-A. So, the current study thoroughly explored alternative measurement models of the CES-A in a diverse adolescent sample, both in its complete and short versions. We offer two alternatives (i.e., a three-factor measurement model for the complete version of the CES-A and one-factor measurement model for the short version of the CES-A). One allows for a more thorough report on the impact of a significant life event onto ones' life story, as given by adolescents both exhibiting or not exhibiting externalizing problems; the other provides a faster but more generic assessment of the significance of such an event, by which boys and girls can be compared, as well as adolescents presenting diverse degrees of behavioral problems. It will be up to the researcher or clinician to choose at each time which version of the instrument best suits his/her goals.

Acknowledgments

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Table 1.

Demographic Characteristics of the Samples and Subsamples

	Gender		Age	Socioeconomic status		
	Male	Female		Low	Medium	High
Combined sample	787 (52.8)	703 (47.2)	16.15 (1.52)	378 (25.4)	762 (51.1)	350 (23.5)
Community sample	462 (42.8)	617 (57.2)	16.08 (1.52)	219 (20.3)	552 (51.2)	308 (28.5)
Subsample 1	84 (41.6)	118 (58.4)	16.82 (1.08)	73 (36.1)	-	129 (63.9)
Subsample 2	58 (41.7)	81 (58.3)	16.87 (1.11)	-	51 (36.7)	88 (63.3)
Referred sample	119 (58.0)	86 (42.0)	16.05 (1.66)	159 (77.6)	45 (22.0)	1 (0.5)
Detained sample	206 (100)	-	16.59 (1.28)	164 (79.6)	42 (20.4)	-

Note. Information for gender and socioeconomic status are presented as n (%); information for age is presented as M (SD). Socioeconomic status was measured by parents' profession, taking into account the Portuguese profession classification (Instituto Nacional de Estatística, 2011). Examples of professions in the high socioeconomic status groups are judges, higher education professors, or M.D.s; in the medium socioeconomic status group are included nurses, psychologists, or school teachers; in the low socioeconomic group are included farmers, cleaning staff, or undifferentiated workers.

Table 2.

Fit Indicators for CFA and Multi-Group Configural Invariance Analyses of the CES-A By Samples

	RMSEA	*95% CI for RMSEA*	*CFI*	*SRMR*
Complete version of the CES-A				
1 factor model (0)				
Combined sample	0.074	0.071; 0.078	0.881	0.052
3 factor model (1)				
Combined sample	0.065	0.061; 0.068	0.911	0.050
19 item 3 factor model (2)				
Combined sample	0.067	0.063;0.070	0.911	0.047
18 item 3 factor model (2)				
Combined sample	0.063	0.059; 0.067	0.926	0.041
Male participants	0.059	0.053; 0.064	0.933	0.040
Female participants	0.071	0.66; 0.077	0.911	0.046
Community male sample	0.069	0.062; 0.077	0.915	0.047
Referred male sample	0.065	0.045; 0.083	0.927	0.050
Detained male sample	0.061	0.048; 0.074	0.925	0.053
Short version of the CES-A				
1 factor model (0)				
Combined e sample	0.088	0.076; 0.100	0.949	0.039
1 factor model (1)	0.090	0.074; 0.106	0.944	0.042
Combined sample	0.063	0.053; 0.075	0.974	0.027
Male participants	0.064	0.047; 0.081	0.973	0.030
Female participants	0.059	0.042; 0.078	0.979	0.026
Community male sample	0.063	0.041; 0.087	0.974	0.030
Referred male sample	0.000	0.000; 0.086	1.000	0.034
Detained male sample	0.073	0.036; 0.110	0.964	0.039
3 factor model (2)	0.077	0.064; 0.091	0.969	0.030

Note: CES-A = Centrality of Event for Adolescents; CFA = confirmatory factor analysis; (0)

refers to the measurement models suggested by Bernstein and Rubin (2006); (1) refers to the

measurement models suggested by Gauer et al., (2013); (2) refers to the measurement models

proposed based on item content.

Table 3.

Loading and Internal Consistency Values for the Short One Factor Model of the <mark>*Centrality of Event Scale - Adolescent*</mark> *By Samples*

	Combined sample	Community male sample	Referred male sample	Detained male sample
F1: Reference point	α = .87	α = .87	α = .86	α = .86
1 This event became a reference point (…)	.58	.55	.61	.44
4 This event can be seen as a symbol (…)	.71	.71	.76	.67
9 I often see connections (…)	.60	.60	.59	.43
12 This event has colored the way I think (…)	.73	.72	.77	.71
13 This event became a reference point (…)	.72	.72	.59	.65
17 I think of the effects of this event (…)	.78	.77	.72	.75
20 When I reflect upon my future (…)	.76	.75	.67	.76
F2: Turning point	α = .89	α = .89	α = .86	α = .87
10 I feel this event became central (…)	.78	74	.75	.76
14 If I were to weave a carpet of my life (…)	.76	.76	.66	.68
15 My life story can be divided in two (…)	.79	.81	.79	.71
16 This event (…) changed my life	.81	.79	.76	.82
18 This event was a turning point (…)	.82	.81	.76	.81
F3: Personal identity	α = .85	α = .85	α = .87	α = .79
3 I feel this event became part of my identity	.72	.73	.78	.61
5 This event is making my life different (…)	.72	.74	.79	.63
6 This event became a reference point (…)	.73	.73	.80	.58
7 People who haven't experienced this (…)	.57	.57.	.49	.57
8 This event tells a (…) who I am	.70	69	.75	.65
19 If this had not happened to me (…)	.74	.71	.74	.70

Note. All loading values were significant at *p* < .001. Short paraphrases of the items are presented; for the full version of the items please see Appendix A of the Berntsen & Rubin (2006) study. Loading values presented for male and female samples are taken from the configural invariance analysis.

Table 4.

Descriptive Measures for the Three-Factor and Short One Factor Model of the

<mark>*Centrality of Event Scale - Adolescent*</mark> *By Samples*

| | 18-item three-factor model | | | | | | 7-item one-factor model | |
| | Reference point | | Turning point | | Personal identity | | | |
	M	SD	M	SD	M	SD	M	SD
Combined sample	18.79	6.59	11.49	5.43	15.60	5.86	16.99	7.05
Male	18.68	6.46	11.82	5.41	15.77	5.85	17.21	7.02
Female	18.86	6.76	11.13	5.44	15.41	5.89	16.76	7.09
Community male sample	17.82	6.34	10.55	4.89	15.13	5.71	15.87	6.51
Referred male sample	19.46	6.42	13.64	5.49	16.97	6.17	19.10	7.25
Detained male sample	20.17	6.43	13.62	5.67	16.52	5.80	19.16	7.30

Table 5.

Correlation Values Between the CES-A and the AAQII and FSCRS

	18-item three factor model			7-item
	Reference point	Turning point	Personal identity	one-factor model
AAQII	.57***	.43***	..52***	.52***
FSCRS				
Inadequate Self	.40***	.27***	.38***	.35***
Hated Self	.37***	.38***	.36***	.40***
Reassure Self	-.18**	-.19**	-.16*	-.20**

Note: CES-A = Centrality of Event Scale - Adolescents; AAQII = 7 item Acceptance and Action Questionnaire; FSCRS = The Forms of Self-Criticising/ Attacking & Self-Reassuring Scale

*** p < .001, ** p < .01, * p < .05

Table 6.

Loading and Internal Consistency Values for the Short One Factor Model of the CES-A By Samples

		Combined sample			Community	Referred	Detained
		Total	Male	Female	male sample	male sample	male sample
		α = .90	α = .89	α = .91	α = ..89	α = ..89	α = ..87
6	This event became a reference point (…)	.62	.60	.64	.65	.76	.46
10	I feel this event became central (…)	.78	.75	.80	.73	.76	.73
12	This event has colored the way I think (…)	.68	.67	.71	.66	.72	.66
14	If I were to weave a carpet of my life (…)	.75	.72	.79	.74	.67	.67
16	This event (…) changed my life	.81	.82	.80	.81	.78	.83
17	I think of the effects of this event (…)	.79	.79	.81	.79	.71	.78
18	This event was a turning point (…)	.80	.80	.80	.78	.78	.82

Note. All loading values were significant at *p* < .001. Short paraphrases of the items are presented; for the full version of the items please see Appendix A of the Berntsen & Rubin (2006) work. Loading values presented for male and female samples are taken from the scalar invariance analysis.