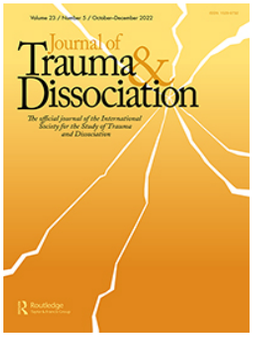

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The psychometric properties of the adolescent dissociative experiences scale (A-DES) in a sample of Portuguese at-risk adolescents

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ABSTRACT

Dissociation is a process that often occurs as a sequela of psychological trauma, and it is interrelated with psychological and behavioral problems. In the at-risk adolescent population, dissociation is often underdiagnosed and undertreated. Having reliable measures to assess this phenomenon can help in identifying adolescents at-risk and improve treatment outcomes. This study assessed the psychometric properties of the Adolescent Dissociative Experiences Scale (A-DES) with a sample of 402 Portuguese adolescents recruited from three at-risk populations. Participants completed self-report measures of trauma exposure, posttraumatic symptoms, psychological and behavioral problems, and the A-DES. A subset of the sample also completed test-retest measures. Confirmatory factor analyses revealed a best-fitting 3-factor model. Analyses revealed good internal consistencies and good agreement test-retest reliability for the scale overall and the factor-based sub-scales. Construct and predictive validity was supported with results showing that A-DES discriminates between youth reporting high versus low levels of cumulative trauma exposure and youth who meet or do not meet criteria for a probable PTSD diagnosis. Study findings replicate prior research supporting a 3-factor model of dissociation and the usefulness of A-DES to identify adolescents with dissociative symptoms. Clinical and research implications are discussed.

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Dissociation; adolescents; A-DES; psychometric properties

Introduction

Dissociation is a psychological phenomenon ranging from a continuum of normal to more maladaptive functioning in everyday life (Greenberg, 2020). As a psychobiological process that often occurs as a sequela of psychological trauma (Bernstein & Putnam, 1986; Kisiel & Lyons, 2001; Lyssenko et al., 2017; Zamir et al., 2018), the trauma-related dissociation has been found to occur across a wide range of types of trauma exposure (e. g., childhood physical

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abuse; sexual abuse; all-inclusive trauma-type; Dalenberg et al., 2012). Moreover, dissociation has been found to be associated with posttraumatic stress symptoms (Choi et al., 2017; Ford et al., 2018; Ross et al., 2020) as well as behavioral problems such as self-harm (Chaplo et al., 2015; Ford & Gómez, 2015), offending behaviors (Kerig & Modrowski, 2018), among others (D'Andrea et al., 2012; Dalenberg et al., 2012; Finkelhor et al., 2007; Ford et al., 2018; Leibowitz et al., 2011; Richmond et al., 2009; Silvern & Griese, 2012). Particularly among at-risk youth, dissociation is often underdiagnosed and undertreated (Leibowitz et al., 2011), negatively impacting on treatment outcomes (Brand et al., 2017; Leibowitz et al., 2011; Plattner et al., 2003; Walker, 2002).

One measure widely used to assess dissociation in adolescents is the Adolescent Dissociative Experience Scale (A-DES; Armstrong et al., 1997). The A-DES is a self-report instrument that aims to measure normal and pathological dissociative symptoms (Armstrong et al., 1997), and was initially validated with a clinical (Armstrong et al., 1997) and a non-clinical sample (Smith and Carlson, 1996). Since then, the A-DES psychometric properties have been tested worldwide, from America (Armstrong et al., 1997; Kerig et al., 2016; Martínez-Taboas et al., 2004) to Asia (Shin et al., 2009; Yoshizumi et al., 2010) and Europe (Farrington et al., 2001; Muris et al., 2003; Nilsson & Svedin, 2006; Schimmenti, 2016; Soukup et al., 2010; Tolmunen et al., 2007; Zoroglu et al., 2002).

Unlike the original psychometric result for the A-DES, which identified a four-factor structure (Armstrong et al., 1997), subsequent studies of the A-DES supported only a single-factor solution (e. g., Espirito-Santo et al., 2014; Farrington et al., 2001; Nilsson & Svedin, 2006; Schimmenti, 2016; Tolmunen et al., 2007). Additionally, two studies (Kerig et al., 2016; Yoshizumi et al., 2010) reported a 3-factor structure for the A-DES comprising depersonalization or derealization, loss of conscious control, and dissociative amnesia.

The structure of dissociation in adolescence is more complex when the relationship of dissociative and PTSD symptoms also is considered. A recent network analysis of at-risk adolescents' PTSD and dissociative symptoms found that symptoms were most strongly correlated within each domain, with five dissociative symptoms (assessed by a different measure than the A-DES) representing distinct but inter-related nodes: depersonalization, derealization, dissociative amnesia, dissociative avoidance, and dissociative disconnection (Ross et al., 2020). Depersonalization and derealization were strongly connected, as were amnesic, avoidant and disconnected dissociation, but the two sub-groups of dissociative symptoms were not connected except for a weak connection between derealization and dissociative avoidance. In contrast to prior findings of an adolescent version of the dissociative sub-type of PTSD which was characterized by depersonalization, derealization, and

dissociative amnesia (Choi et al., 2017), derealization and depersonalization were at most weakly connected with PTSD symptoms and only dissociative amnesia had a moderately strong connection with any PTSD symptom – and only with two highly similar symptoms, psychogenic amnesia and problems with concentration (Ross et al., 2020). These findings suggest the possibility of a two-factor model of dissociative symptoms (i.e., derealization-depersonalization and amnesia combined with loss of conscious control). Whether adolescent dissociation is associated with PTSD (i.e., dissociative PTSD) and, if so, what domains of dissociation account for that relationship, remains a question for investigation.

In view of adolescent dissociation's association with both internalizing and externalizing psychiatric and behavioral problems (Chaplo et al., 2015; D'Andrea et al., 2012; Finkelhor et al., 2007; Ford et al., 2018; Ford & Gómez, 2015; Leibowitz et al., 2011; Richmond et al., 2009; Silvern & Griese, 2012) the question of whether different domains of dissociation account for those relationships also warrants empirical investigation. Dissociation in childhood and adolescence also has been found to be associated with specific types and combinations of traumatic victimization (Putnam, 2009). Sexual abuse was shown to increase girls' risk of developing clinically significant dissociative symptoms eightfold (Collin-Vezina & Hebert, 2005), and a combination of sexual abuse and subsequent peer victimization increased children's risk of developing both clinically significant dissociation and PTSD symptoms threefold (Hébert et al., 2016). In an at-risk sample of juvenile justice-involved adolescents, exposure to multiple types of potentially traumatic events (i.e., poly-victimization) was associated with more severe dissociative symptoms, and dissociative symptom severity also was related to the severity of anxiety, depressive, and self-harm symptoms (Ford et al., 2018). Whether different types of dissociative symptoms are associated with different types or extents of victimization remains to be investigated.

Therefore, using confirmatory factor analysis, we aimed to assess the psychometric properties of A-DES and its validity and reliability in a sample of Portuguese at-risk youth. Considering Kerig et al. (2016) findings with a different (i.e., juvenile justice-involved) but similarly at-risk adolescent population, we expected to find the 3-factor structure to have better fit than alternative factor models. We also aimed to investigate how A-DES scores are associated with trauma history, posttraumatic symptoms, and psychological and behavioral problems. We expected to find moderate to strong correlations between A-DES scores and the assessed outcomes. Finally, we aimed to investigate if the A-DES differentiates between adolescents who report poly-victimization versus those with less extensive

victimization histories (Ford et al., 2018), and if the A-DES can differentiate between adolescents who meet or do not meet the criteria for probable PTSD diagnosis (Choi et al., 2017).

Method

Participants

Participants were 402 youth, 242 (60.2%) girls, 160 (39.8%) boys, recruited from Child Protective Services (CPS; n = 26; 6.5%), Foster Care Institutions (FCI; n = 102; 25.4%) and vocational schools (VS; n = 274; 68.2%), from the North of Portugal. In Portugal, it is common practice for youth with academic underachievement to attend vocational schools, either because the youth find the syllabus very demanding or due to risk behaviors such as high absenteeism rates, truancy, or dropout (Pinto et al., 2017). The regular educational system also is mandated to refer youth to CPS if youth present with the previously mentioned risk behaviors. Therefore, along with the CPS and FCI, VS were selected for participant recruitment because of the high-risk nature of the adolescents involved in these programs. On average, adolescents were 15.74 years old (SD = 1.20; range 12–17 years old). Regarding the education level, participants were between fifth grade and 12th grade, with the tenth grade being the modal frequency (n = 108; 27%). The monthly family income of this sample ranged between 250€ and 2,000€. However, an important number of the adolescents (n = 130; 32.3%) didn't know the answer to this question. Seventy-eight (28.7%) out of 272 (67.7%) participants reported a monthly income between 501€ to 750€.

As this is part of a longitudinal study, we used T2 data wave collection to test temporal reliability. Eighty (19.9%) participants completed the questionnaires at both T1 and T2; the time elapsed between the T1 and T2 was about nine months (range between 5 and 15 months). We run chi-square and *t-test* to assess differences between the participants of the T2 wave and those in the total sample considering demographic variables and their responses on all the other measures used in this study. The results showed that there were no differences (all $p > .05$).

Procedure

This study is part of a larger longitudinal research project on the impact of complex trauma on adolescents in the North of Portugal. The ethics committee of University of Minho approved the study, and all procedures performed followed the APA Ethical Standards. We recruited the participants after contacting seven local Child Protective Services (CPS), 58 Vocational Schools (VS), and 54 Foster Care Institutions (FCI). We contacted all the institutions

by e-mail and then by telephone to schedule an initial interview to explain the purpose of the study. From these, all CPS, 11 VS, and 12 FCI consent to participate. Data collection began upon authorization by these institutions and occurred between November 2018 and March 2020. The adolescents who agreed to participate were given more detailed information about the study and provided a written informed consent form for parents or legal guardians to sign to allow their participation in the study. Adolescents also signed an assent. We got the signed assents and informed consents before the administration of the questionnaires. To ensure confidentiality, participants filled the questionnaires in a private room with a trained psychologist to answer questions, clarify any doubts, or if afterward, the participants needed to talk about anything that may emerge after fulfilling the protocol. Also, we provide adolescents the project e-mail address if they wished to have access to their results or felt the need to talk with the researchers.

Measures

Trauma exposure

We assessed trauma exposure using the Traumatic Events Screening Inventory – Child/Self Report (TESI-C/SR; Portuguese version: Correia-Santos et al., 2021). TESI-C/SR is a 25-item self-report measure that dichotomously assesses the presence or absence of several potentially traumatic events (PTE) in youth between 11 to 18 years old. TESI has shown test-retest reliability and discriminant validity (Daviss et al., 2000; Ford et al., 2000). This questionnaire assesses accidents, natural disasters, severe injury/illness, interpersonal losses, physical and emotional abuse, domestic violence, community violence, and sexual abuse that participants' may have experienced, witnessed, or learned about. We categorized youth as poly-victims if they reported a number of types of PTEs that placed them in the top 10^{th} percentile of the sample (Finkelhor et al., 2007).

Posttraumatic stress symptoms

We assessed Posttraumatic Stress Symptoms (PTSS) using the Child PTSD Symptom Scale-V (CPSS-V; Gillihan et al., 2012; Portuguese Version: Pinto et al., 2019). CPSS-V assesses the severity of posttraumatic symptoms in children and adolescents, aged between 8 and 18 years old, exposed to one or more traumatic events, according to criteria A of DSM-5. CPSS-V comprises 20 items in a 5-point Likert scale (0 – "Never" to 4 – "6 or more times per week") ranging from 0 to 80 possible points. The original study presented an excellent internal consistency for the total score, Cronbach's $\alpha = .92$. The internal consistency for the present study was also excellent Cronbach's $\alpha = .93$. For the present study, we also considered a cutoff point of 31 as indicative of probable PTSD diagnosis, as stated by other studies (Foa et al., 2017; Pinto et al., 2019).

Psychological and behavioral problems

We assessed psychological and behavioral problems using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001). SDQ is a widely used behavioral screening self-report questionnaire for youth between 11 and 17 years old. The 25 items (ranging from 0 to 50 possible points) have three response options ("It is not true"; "It is a little true"; "It is very true") and comprise five subscales: conduct problems, hyperactivity/inattention, emotional symptoms, peer problems, and prosocial behavior. A total difficulty score, meaning more psychological and behavioral problems, is computed with the first four scales. The original study presented acceptable to good reliability: total score – $\alpha = 0.82$; emotional symptoms – $\alpha = 0.75$, conduct problems $\alpha = 0.72$, hyperactivity $\alpha = 0.69$; peer problems $\alpha = 0.61$; and prosocial behavior $\alpha = 0.65$. For the present study, we used the total score: $\alpha = 0.70$. We used the SDQ-SR's official Portuguese translation (http://www.sdqinfo.org).

Dissociative symptoms

The Adolescent Dissociative Experience Scale (A-DES; Armstrong et al., 1997; Portuguese Version: Espirito-Santo et al., 2014) assesses dissociative symptoms. A-DES is a 30-item self-report measure rated on an 11-point Likert scale ranging from 0 (never) to 10 (always). A total mean score can be computed, or it can be divided into four subscales: dissociative amnesia, absorption and imaginative involvement, passive influence, and depersonalization and derealization. A total mean score of 4 or higher indicates pathological dissociation (Kisiel & Lyons, 2001; Schimmenti, 2016). The internal consistency values for the present study are displayed in Table 3.

Data analysis

We performed descriptive statistics, Pearson correlations, and inspection on missing data using SPSS v.27 (United States, New York, IBM Corporation). Sixteen variables presented missing data. We conducted Little's missing-completely-at-random (MCAR) test (Little & Rubin, 1989) to examine missing data, whereas a non significant result indicates that data are missing completely at random. In our sample missing data presented to be completely-at-random ($\chi 2\ (344) = 335.69$, $p = .62$). Thus, we replaced missing values with the median (Petty, n.d.). We followed Kline's (2011) reference values to obtain variables with approximate normal distribution: skewness and kurtosis values were considered in this decision (skewness value $< |3|$ and kurtosis $< |8|$). To test the psychometric properties of A-DES and after looking at factor loadings values, we run confirmatory factor analysis (CFA).

We performed CFAs using a maximum likelihood estimation with robust standard errors using R (Version 4.0.3) and R studio Desktop (Version 1.4.1103) with the R packages "Lavaan" (Rosseel, 2012), "nFactors" (Raiche & Magis, 2020), "Parameters" (Lüdecke et al., 2020) and "Psych" (Revelle, 2018). Items with factor loadings above 0.3 are good items, whereas values below 0.3 indicate that the item needs revision or should be rejected (Janssen et al., 2014). As an indication of indices of good model fit, we examined the comparative fit index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR); and the relative chi-square test ($\chi 2/df$). Model was considered to have an acceptable fit if it presented values of: $\chi 2/df < 2$ (Tabachnick & Fidell, 2012); CFI ≥ .95; RMSEA ≤ .05; SRMR ≤ .08 (Kline, 2011). To compare nested models, we used the scaled chi-square difference ($\Delta S–B\chi 2$), following Satorra and Bentler's recommended algorithm (Satorra & Bentler, 2001). The one-factor model (Model A) was nested within both the three-factor (Model B) and the four-factor model (Model C), and the three-factor model was nested within the four-factor model.

We examined the internal consistency of each subscale with composite reliability (CR), as it is a more appropriate measure of internal consistency in the context of latent variable modeling (Raykov, 1998). We can obtain evidence of internal consistency if CR values are higher than .70. The Average Variance Extracted (AVE) of the factors provides an estimate of convergent validity. Validity is supported if CR presents values of .70 or higher and AVE, simultaneously, presents values of .50 or higher for all subscales (Fornell & Larcker, 1981). To assess predictive validity, we ran *t-tests* comparing adolescents with high *vs*. low levels of cumulative trauma exposure. To assess construct validity, we ran *t-tests* comparing adolescents with probable PTSD (*vs*. no probable PTSD). We ran *t-tests* for the total scale and each sub-scale of the A-DES.

Finally, to assess temporal reliability, we computed intraclass correlation coefficients agreement and consistency values (McGraw & Wong, 1996). Being the most appropriate measure to assess reliability parameter for repeated measurements on a continuous scale (De Vet et al., 2006), ICCs are designated as ≤ .40 indicative of poor to a fair agreement; .41–.60 indicative of moderate agreement; .61–.80 indicative of good agreement; .81–1.00 indicative of excellent agreement.

Results

Descriptive statistics

Over half of the participants (n = 206; 51.2%) reported having been exposed to at least six types of PTEs (range = 0–22), with five PTEs being the most reported number (n = 49; 12.2%) among all participants. Forty-seven participants (11.69%) comprised the poly-victims, reporting 12 or more types of PTEs. Only 12 participants (3%) reported not having been exposed to any

PTE. The most-reported PTE was "Have there been any other times when someone close to you was so badly injured or so sick that he/she almost died or had to go to the hospital?," reported by 233 (57.96%) participants. As for posttraumatic symptoms, from 393 (97.76%) participants that fully completed the CPSS-V, the reported mean was 23.44 (*SD* = 17.68; range = 0–79). Considering the cutoff point of 31 as indicative of probable PTSD diagnosis, 133 (33.8%) participants reported this much value or higher. As for psychological and behavioral problems, the mean was 13.59 (*SD* = 5.46; range = 2–29). The mean of dissociative experiences was 2.08 (*SD* = 1.79; range = 0–9), with 10 being the maximum possible average. Sixty-one participants (15.10%) reported a mean of dissociative experiences equal or higher than 4, indicative of possible pathological dissociation.

Factor structure and model fit comparisons

We assessed skewness and kurtosis of every item, and none presented values indicative of concern. The inspection of factor loadings across each model revealed that apart from item 1 (loading = .29), all items had values equal to or higher than .30. Three CFA models were conducted: Models A (1-factor), Model B (3-factor), and Model C (4-factor). Model B presented the best fit indices: ($\chi^2(374) = 1343.97$; $\chi^2/df = 3.59$; $p < .001$), with the highest CFI = .867, and the lowest RMSEA = .073; SRMR = .050; and AIC = 62944.83. Comparing nested models using the Satorra-Bentler chi-square difference, the results revealed that the three-factor model (i.e., Model B) was the best fitting model, presenting significantly better values than Models A and C. Although the total mean score and subscales of dissociation presented medium to high correlations with the study variables (range: r = [.328 – .676]), the selected statistical model had only marginally acceptable fit indices. Results are displayed in Table 1.

Table 1. Model Fit Indices and Model Comparison.

Model	χ^2/df	χ^2	*df*	RMSEA	90% CI	*p*-close	CFI	SRMR	AIC	ΔS-Bχ2 (df diff)
A	3.90***	1580.91	405	.078	[.074 – .082]	< .001	.847	.052	65046.41	236.93 (31)***
B	3.59***	1343.97	374	.073	[.069 – .078]	< .001	.867	.050	62944.83	-
C	3.78***	1507.65	399	.076	[.072 – .080]	< .001	.856	.051	64985.15	163.68 (25)***
D	2.95***	1281.28	435	.067	[.063 – .071]	<.001	.860	.051	22247.75	188.82 (31)***
E	2.92***	1092.46	374	.063	[.059 – .067]	<.001	.880	.049	21422.34	-
F	3.05***	1216.04	399	.065	[.061 – .069]	< .001	.869	.050	22194.51	123.58 (25)***

Note. Model A – 1-factor with 11-point response scale. Model B – 3-factor with 11-point response scale. Model C – 4-factor with 11-point response scale. Model D – 1-factor with 3-point response scale. Model E – 3-factor with 3-point response scale. Model F – 4-factor with 3-point response scale. RMSEA = root mean square error of approximation. CFI = comparative fit index. SRMR = standardized root mean square residuals. AIC = Akaike information criterion.

We then ran descriptive analyses by item to better understand these values. Based on the observed frequencies of the items, the "0" (never) category was the most reported. For every item, the values ranged from 0 to 10 – denoting a large dispersion in the answers – and therefore makes it challenging to find a pattern. Consequently, we discretized the response scale to minimize the distribution effect (Lustgarten et al., 2008). Considering that a mean of four or higher points may indicate pathological dissociation (Kisiel & Lyons, 2001), we create three response options "0 – Never happens," that only included this same value in the original form; "1 – Happens sometimes" that included reported values from "1 to 3" in the original form; and "2 – Happens quite often" that included values greater or equal to "4" in the original form. We inspected factor loadings for this new response format, and still, apart from item 1 (loading = .29), all items presented loading factors equal to or higher than .30. We performed the CFA's for the three models (i.e., Model D – 1-factor; Model E – 3-factor; Model F – 4-factor).

As with the 11-point response scale, the 3-factor Model E presented the best fit indices: ($\chi^2(374) = 1092.46$; $\chi^2/df = 2.02$; $p < .001$), with the highest CFI = .880, and the lowest RMSEA = .063; SRMR = .049; and AIC = 21422.34. Comparing nested models using the Satorra-Bentler chi-square difference, revealed that the 3-factor Model E reveals to be the best fitting-model, presenting significantly better values than Models D and F (see, Table 1). When comparing both 3-factor models (B *vs* E), Model E ($\chi^2/df = 2.92$; $\chi^2(374) = 1092.46$; $p < .001$; RMSEA = .063, 90% CI [.059 – .067]; CFI = .880; SRMR = .049; AIC = 21 422.34) also presents significantly better fit than Model B ($\chi^2/df = 3.59$; $\chi^2(374) = 1343.97$; $p < .001$; RMSEA = .073; 90% CI[.069 – .078]; CFI = .867; SRMR = .050; AIC = 62 944.83).

Correlation with the study variables

To assess if A-DES would be significantly associated with trauma exposure (TE), posttraumatic symptoms (PTSS), and psychological and behavioral problems (SDQ-TS), we performed one-tailed Pearson correlations. We correlated the A-DES total mean score and the factor scores from the two 3-factor models (B and E) with the study variables mentioned above. All correlations ranged from medium to large, as shown in Table 2, with lower diagonal presenting results for Model B and upper diagonal presenting results for Model E. Correlations were very similar for the two models, with large correlations among the dissociation variables (.60 – .96), medium to large between the

Table 2. Correlations of Studied Variables.

	1	2	3	4	5	6	7	8
1 – Total Mean – 11-point response scale	-	.960***	.929***	.833***	.850***	.420***	.676***	.630***
2 – Total – 3-point response scale	.960***	-	.954***	.889***	.889***	.383***	.658***	.631***
3 – DD	.961***	.912***	-	.772***	.764***	.381***	.681***	.623***
4 – LCC	.906***	.883***	.801***	-	.724***	.352***	.607***	.582***
5 – DA	.898***	.867***	.792***	.755***	-	.301***	.550***	.505***
6 – TE	.420***	.383***	.414***	.407***	.328***	-	.422***	.366***
7 – PTSS	.676***	.658***	.675***	.560***	.526***	.422***	-	.550***
8 – SDQ-TS	.630***	.631***	.622***	.608***	.497***	.366***	.550***	-

Note: N = 402. DD = Depersonalization and Derealization. LCC = Loss of Conscious Control. DA = Dissociative Amnesia. TE – Trauma Exposure. PTSS – Posttraumatic Stress Symptoms. SDQ-TS – Psychological and behavioral problems Total Score.
Below the diagonal correlations for Model B; Above the diagonal correlations for Model E.
*** $p < .001$. one-tailed.

dissociation variables with PTSS and the SDQ problems score (.50 – .63), and medium between the dissociation variables and the cumulative trauma score (.30 – .42).

Internal consistency, convergent validity, and temporal reliability

Table 3 presents results for internal consistency, convergent validity, and the temporal reliability of the best statistical model (Model E). As CR was higher than .70 in all subscales, internal consistency is supported, with CR values ranging from .76 (LCC) to .90 (DD). However, convergent validity is not supported, since AVE values did not reach the minimum established values of .50 (DD = .40; LCC = .29; DA = .38). ICC values reveal that A-DES presents good temporal reliability with values ranging from .73 (LCC) to .79 (Total Mean Score).

Predictive validity

To assess predictive validity, we performed independent *t-tests* to compare participants who were poly-victims (*vs* low-victimization) on levels of dissociation. Results show significant differences between groups for

Table 3. Internal Consistency, Convergent Validity, and Temporal Reliability of A-DES.

A-DES	CR	AVE	MSV	ASV	ICC	95% CI
Total A-DES	-	-	-	-	.788***	[.688 – .859]
Depersonalization and Derealization	.90	.40	.89	.84	.749***	[.634 – .831]
Loss of Conscious Control	.76	.29	.89	.84	.728***	[.606 – .817]
Dissociative Amnesia	.83	.38	.80	.80	.731***	[.609 – .819]

Note. N = 80. A-DES – Adolescent Dissociative Experience Scale. CR -Composite Reliability. AVE – Average Variance Extracted. MSV – Maximum Shared Variance. ASV – Average Shared squared Variance. ICC – Intraclass Correlation Coefficient. CI – Confidence Intervals.
*** $p < .001$

both variables. The poly-victims (n = 47; 11.69%) reported significantly higher levels of dissociation (M_{PV} = 3.52; SD = 2.26) than those on the category of low victimization (n = 355; 88.31%; M_{LV} = 1.89; SD = 1.63; t (52,50) = 4.793, p = .001; d = 1.709) with a large effect size. Similarly, when compared with the low victimization groups, the poly-victims reported significantly higher levels of dissociation in the different subscales: dissociative amnesia: (M_{PV} = 2.97; SD = 2.47; M_{LV} = 1.68; SD = 1.68; t(51,78) = 3.460, p = .001; d = 1.79): loss of conscious control (M_{PV} = 4.28; SD = 2.08; M_{LV} = 2.58; SD = 1.81; t(400) = 5.321, p < .001; d = 1.85); depersonalization and derealization (M_{PV} = 3.40; SD = 2.53; M_{LV} = 1.61; SD = 1.78; t(52.20) = 4.698, p < .001; d = 1.88).

Construct validity

To assess construct validity, we performed independent *t-tests* to compare youth with probable PTSD (*vs* no probable PTSD) on levels of dissociation. Youth with a probable PTSD diagnosis (n = 133; 33.84%) reported significantly higher levels of dissociation (M = 3.52; SD = 1.97) when compared to those not classified as probable PTSD (n = 260; 66.16%; M = 1.36; SD = 1.14; t (178.57) = 11.706, p < .001; d = 1.47) with a large effect size. Looking at each factor analytically-derived A-DES subscale, the results were similar, with all three subscales presenting similar large effect sizes: dissociative amnesia (M_{PTSD} = 3.01; SD = 2.23; M_{NoPTSD} = 1.24; SD = 1.24; t(175.37) = 8.482, p < .001; d = 1.65); loss of conscious control (M_{PTSD} = 4.18; SD = 1.97; M_{NoPTSD} = 2.08; SD = 1.46; t(208.17) = 10.872, p < .001; d = 1.65); depersonalization and derealization (M_{PTSD} = 3.44; SD = 2.22; M_{NoPTSD} = 1.01; SD = 1.19; t(171.81) = 11.762, p < .001; d = 1.61).

Discussion

The results of this study demonstrated strong psychometric properties (with one exception) for the A-DES (Armstrong et al., 1997; Farrington et al., 2001; Kerig et al., 2016; Muris et al., 2003; Schimmenti, 2016; Soukup et al., 2010; Zoroglu et al., 2002) with a high-risk sample of Portuguese adolescents. In addition to internal consistency and temporal stability reliability, the A-DES total score and factor-derived sub-scale scores were associated with poly-victimization, probable PTSD diagnoses, and both internalizing and externalizing problems, providing evidence of the predictive and concurrent validity of the A-DES. Only convergent validity failed to garner support, although this may be due to the wide dispersion in dissociation scores in this adolescent sample and a large sub-group denying any symptoms.

Study results also provided additional support for a three-factor conceptualization of adolescent dissociation with at-risk youths (Kerig et al., 2016; Yoshizumi et al., 2010), with both an expanded (11-point) and condensed (3-point) scoring of the A-DES. In addition to the core symptoms of depersonalization and derealization, loss of conscious control and dissociative amnesia also emerged as core domains that were strongly correlated with the study variables. Moreover, youth identified as having probable PTSD and those identified as poly-victims tend to report pathological dissociation indices on the loss of conscious control domain. This finding supports prior research (Choi et al., 2017; Ross et al., 2020), demonstrating the importance of assessing dimensions of dissociation extending beyond the dissociative PTSD sub-type symptoms of depersonalization and derealization (Armour et al., 2014; Brand et al., 2018, 2017; Choi et al., 2017; Kerig et al., 2016; Ross et al., 2020; Soukup et al., 2010).

The contrasting finding by Ross et al. (2020) of a generally weak network connection between PTSD and dissociation symptoms thus may be due to their inclusion of only five single items to measure dissociative symptoms rather than assessing the three primary domains identified based on a wider range of specific indicators as was done in the current study. A valid measure with multiple symptoms representing each of the three dissociation factors will allow to fully test the network of dissociative symptoms and their relationship to the network of PTSD symptoms.

The finding that Model B, despite having factors comparable to that of Model E, only to have a marginal fit statistically raises the possibility that adolescents who have experienced extensive adversities and PTEs may find the cognitive demand of rating an eleven-point scale difficult due to difficulty sustaining attention (DePrince et al., 2008, 2009; Dixit et al., 2019; Ranjan et al., 2016). Cognitive burden has been shown to occur when participants need to address many response choices (Bech et al., 2011). Moreover, dissociative symptoms may lead to memory disruptions (Gagnon et al., 2017) and executive function impairments (Bruce et al., 2007; DePrince et al., 2008; Li et al., 2013; Rivera-Vélez et al., 2014), which could add error variance to ratings of dissociation by those who are experiencing it at moderate to high levels. Therefore, we reduced the response scale to 3 points and tested the three structural models (Models D, E, and F), and the 3-factor Model E presented the best fit. Overall, the results seem to mirror that discretization of variables can help improve the statistical algorithms (Lustgarten et al., 2008). Although the CFI values did not reach the minimum recommended value, similar to another study (Kerig et al., 2016), this may be due to the sample size. CFI and RMSEA are complementary indexes, though CFI tends to be a better index for small samples sizes, as RMSEA is a better index for large sample sizes (Rigdon, 1996).

However, a statistical model is only a good choice if it aligns with the theoretical framework. The mean A-DES score on the 11-point scale for our Portuguese sample was 2.08, meaning that these youths often reach a pathological dissociation "status." This value is a little higher than in other central and southern European countries (e. g., Italia – Schimmenti, 2016; Czech Republic – Soukup et al., 2010), and much higher mean compared to northern European countries (e. g., Sweden – Nilsson & Svedin, 2006; Finland – Tolmunen et al., 2007). Methodological procedures from the different studies, such as sample selection criteria (e.g., community, clinical, at-risk, etc.) and/or different levels of cumulative trauma exposure also, may explain these differences between countries. Yet, as for this study, our results show that Model E highly correlates with cumulative trauma exposure, PTSD symptoms, and psychological and behavioral problems, as expected (Choi et al., 2017; Richmond et al., 2009; Silvern & Griese, 2012). The results thus show that, for A-DES, adjusting the model for a better statistical fit does not compromise the assessed construct – dissociation.

Limitations

Study limitations include the reliance on self-report to measure each construct. Further research should include additional informants, such as parents or legal guardians, and additional measures, such as clinical interviews and/or neuroendocrine and neurophysiologic measures. Some biases in reporting are possible, especially among at-risk youths (Pinto & Maia, 2014), and the use of validated measures and objectives assessments would clarify these results. Second, although a 3-factor model (Model B) is the one that seems to best represent the construct, it was necessary to decrease response amplitude so that the model would statistically fit better (Model E). However, this statistical adjustment may be an artifact and may not represent a true response intention. As more extensive traumatic exposure compromises attention span (DePrince et al., 2008, 2009; Dixit et al., 2019; Ranjan et al., 2016), that compromised attention span may increase the probability of answering the questionnaire arbitrarily (Bech et al., 2011). Therefore, it is important that future research test both versions of the questionnaire (3-point response scale and 11-point response scale) with at-risk youth.

Moreover, data collection settings may be playing a role in these results. Although participants were all considered at-risk youth, the risk level may be different considering each setting. Thus, future research should compare this factor model (including the response scale) considering different levels of contextual risks, such as community, clinical, foster care, institutionalized, and detained youth. Finally, the time elapsed between the T1 and T2

assessments was quite large. Despite the good test-retest reliability, a shorter period between assessments could have provided a more accurate estimate of its reliability.

Conclusions

In sum, this study extends the use of A-DES to assess dissociation to a Portuguese-speaking adolescent population, which is important not only for research purposes but also for clinical practice. Our results show that A-DES is a valid measure for this population, as it presents a factorial structure consistent with studies in other populations as well as good internal consistency, temporal reliability, and predictive validity. Clinically, although the A-DES is not set to be used for clinical diagnosis, it appears promising for discriminating between youth with better/worse posttraumatic stress and general psychological and behavioral outcomes after cumulative trauma exposure. Therefore, we highly suggest the assessment of dissociation regularly, especially in high-risk and often traumatized populations, to provide better and specific treatments. We also encourage further testing of the cross-cultural validity of the A-DES in order to extend its use across other languages, nationalities, and cultures.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability

The data supporting this study's findings are available from the corresponding author, Patricia Correia-Santos, upon reasonable request.

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