

# Role of attachment style in the association between childhood adversities and non-suicidal self-injury among young adults: a multigroup structural equation study

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## ABSTRACT

**Background** Non-suicidal self-injury (NSSI) is a significant health concern among adolescents and young adults, often resulting from adverse childhood experiences (ACEs). Dissociation, post-traumatic symptoms and attachment style may have a role in shaping such associations.

**Aims** This study aims to provide a unified model of the impact of ACEs on NSSI, exploring complex post-traumatic stress disorder (cPTSD) symptoms and dissociation as potential mediators and the role of the predominant attachment style in affecting such associations.

**Methods** 1010 young individuals attending the last year of high school participated in this cross-sectional study. ACEs, cPTSD, dissociation and NSSI were evaluated using self-report questionnaires. We fitted a path model of NSSI, with ACEs as exogenous variables and cPTSD and dissociation as sequential mediators. Secure, fearful and preoccupied attachment styles were modelled as grouping variables.

**Results** Our findings showed that dissociation mediated the impact of ACEs on NSSI in subjects with a fearful attachment style, as opposed to those with a preoccupied attachment for whom cPTSD symptoms mediated the ACEs-NSSI association.

**Conclusions** Attachment styles moderate the relationship between ACEs and NSSI, with either dissociation or post-traumatic symptomatology mediating the impact of ACEs on NSSI, depending on the predominant attachment style. Our results highlight the importance of attachment as a pathway modifier in the relationships between different psychopathology dimensions, providing a useful framework to better conceptualise the ACEs-NSSI association.

## INTRODUCTION

Non-suicidal self-injury (NSSI) is a critical health concern, especially among adolescents and young adults. NSSI is defined as the direct and deliberate destruction of one's own body without lethal intent, not only by slashing, burning and self-hitting but also by substance misuse or

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Non-suicidal self-injury (NSSI) is a critical health concern, especially among adolescents and young adults, and is associated with adverse childhood experiences (ACEs).

### WHAT THIS STUDY ADDS

⇒ This study provides a novel model integrating ACEs, complex post-traumatic stress disorder (cPTSD) symptoms, dissociation and insecure attachment to explain the relationship between ACEs and NSSI. The study highlights the mediating roles of cPTSD symptoms and dissociation in this relationship and identifies attachment styles as important moderators.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings emphasise the need for a trauma-informed approach in addressing NSSI and its underlying factors, including cPTSD and attachment styles, to improve treatment outcomes and develop preventive measures. Clinicians should consider these factors when treating individuals with a history of ACEs and NSSI behaviours.

deliberate engagement in humiliating relationships.<sup>1</sup> The clinical importance of NSSI is strictly related to two factors: on the one hand, its direct consequences, that is, heightened negative affect, severe injuries, hospitalisation and even death; on the other hand, it represents a significant risk factor for subsequent suicidal ideation, suicide attempts and psychiatric comorbidity.<sup>2</sup> The prevalence of NSSI shows a large variability across studies and samples, ranging between 7.5% (community samples) and 60% (clinical samples, especially in borderline personality disorder).<sup>3</sup> Risk factors for engaging in NSSI include cluster B personality disorders, feelings of hopelessness, internalising symptoms, emotional dysregulation and intrapersonal

factors, such as lack of social support from parents and peers.<sup>4</sup> In line with this, a recent meta-analysis found a global prevalence of NSSI among non-clinical adolescents of 22%.<sup>5</sup>

NSSI is a common outcome of people experiencing adverse childhood experiences (ACEs) and early traumatic events, especially interpersonal and intentional ones.<sup>6–8</sup> The psychological pathways leading from early traumatic experiences or ACEs to NSSI are complex and intricate, with several relevant psychological and psychopathological factors interacting with each other. Among others, post-traumatic symptoms and dissociation have been shown to mediate the relationship between trauma and NSSI. Concerning the role of trauma symptoms as mediators in the link between traumatic events and NSSI, indirect support comes from the established correlation between post-traumatic stress disorder (PTSD) symptoms and NSSI across diverse groups. This includes adolescents,<sup>9</sup> civilians<sup>10</sup> and military survivors of sexual assault.<sup>11</sup> It is hypothesised that trauma symptoms might be a contributing factor to NSSI, the latter serving as a coping mechanism for dealing with intrusive thoughts, memories, dissociation, or numbing.<sup>12</sup> Complex PTSD (cPTSD) is a relatively novel condition introduced by the International Classification of Diseases, 11th revision (ICD-11),<sup>13</sup> resulting from prolonged and repeated interpersonal traumatic experiences, such as child abuse or neglect. People with cPTSD, besides core PTSD symptoms (re-experiencing, hyperarousal and avoidance), endorse an adjunctive set of symptoms termed disturbances of self-organisation (DSO), which includes emotional dysregulation, negative self-concept and problems in interpersonal relationships.<sup>14–20</sup>

Preliminary evidence suggests that NSSI could be a common behaviour among individuals with cPTSD, who may engage in NSSI to cope with the overwhelming emotional states or memories associated with their traumatic experiences.<sup>15</sup> Dissociation, in particular, is a common trauma-related phenomenon that often occurs as a consequence of traumatic experiences, although it can also manifest independently. Dissociative experiences (DEs) are a group of symptoms related to dissociation, in which the individual experiences a loss of integration between thoughts, memories, emotions, perceptions and identity. These symptoms can include dissociative amnesia, alterations in identity and self-experience and somatoform dissociation.<sup>21</sup> The clinical presentation of DE may include acute (ie, functional neurological symptoms, brief psychosis, experience of possession or acute dissociative reaction to a stressful event) or chronic (mood and personality disorders) secondary syndromes.<sup>22</sup>

Dissociative symptoms represent a transdiagnostic feature that frequently occurs within the context of, among others, PTSD, cPTSD and borderline personality disorder.<sup>23</sup> In particular, DEs are commonly found in cPTSD, as they could represent a coping mechanism for individuals to deal with overwhelming emotions and traumatic memories associated with their experiences.<sup>24</sup>

Dissociative symptoms are a well-established correlate of NSSI.<sup>25</sup> One of the hypotheses that explain the association between NSSI and dissociation is that physical pain induced by NSSI is used to cope with the DE or as

a communication strategy for distress and needs.<sup>26</sup> This hypothesis can also explain the association of NSSI with stress-related disorders like PTSD/cPTSD, which are often characterised by dissociative symptoms.<sup>6</sup>

Considering the compelling evidence that establishes a distinct connection between ACEs, PTSD, dissociation and NSSI, our primary objective was to extend this framework to include cPTSD. The underlying reasoning is based on the recognised impact of PTSD and dissociation in this dynamic. Further evidence supporting our rationale regards the association of the individual components of DSO with trauma and NSSI, that is, emotional dysregulation, negative self-concept and disturbance in relationships. Indeed, all these constructs have been, in some form or another, found to mediate the impact of traumatic experiences on NSSI, with emotional dysregulation being the most explored.<sup>6,27</sup> However, such a model may differ among individuals depending on overarching regulatory factors such as insecure attachment. Insecure attachment refers to an emotional/behavioural pattern associated with the representation of a relationship as uncertain or threatening. A widely accepted model of attachment is a bi-dimensional model in which attachment avoidance and anxiety are related to the representations (internal working models) of the self as not lovable and the other as not trustworthy. According to Bartholomew and Horowitz's conceptualisation, insecure attachment can present in three styles: preoccupied, fearful and dismissing.

Insecure attachment is often the result of a harsh upbringing or ACEs, and it can be associated with hyper- or hypoactivation of emotional systems, with emotional dysregulation and/or dissociation,<sup>28</sup> which may lead to dysfunctional coping strategies for emotional distress, including NSSI.<sup>29</sup> However, attachment style (AS) can also be conceptualised as a protective/aggravating factor in response to trauma (for an extensive review, see Marshall and Frazier<sup>30</sup>). Indeed, if, on the one hand, traumatic experiences can interfere with the consolidation of a secure attachment, on the other hand, AS represents an important resilience factor when facing stressful or traumatic experiences.<sup>31</sup> These two perspectives are reflected by models in which AS is a mediator or moderator of trauma on a plethora of outcomes. Indeed, different ASs correspond to significant differences in emotional responses to stress, coping strategies and internal working models. Because of this, AS can shape (ie, moderate) traumatic reactions by selecting different sets of mediators, that is, qualitatively different psychological pathways.<sup>31</sup>

Insecure attachment has been suggested to be a risk factor for developing dissociative symptoms since the individual can use dissociation as a strategy to cope with anxiety and stress associated with insecure relationships.<sup>32</sup> In addition, an insecure attachment may be associated with childhood trauma, such as abuse or neglect, which in turn can increase the risk of developing dissociative symptoms.<sup>33</sup>

Indeed, recent evidence suggests that insecure attachment may moderate the association between traumatic experiences and subsequent dissociation and/or PTSD symptoms. Several studies confirm, in different samples, that the risk of

developing PTSD is increased in subjects with insecure attachment. For example, in female subjects, dismissing AS moderates the link between victimisation and PTSD.<sup>34</sup> In another study, attachment anxiety and dependency were found to moderate the relation between intimate partner violence and PTSD symptoms.<sup>35</sup> Sexually abused children with insecure attachment endorse more stress-related symptoms compared with children securely attached to their parents.<sup>36</sup> Among disadvantaged groups, attachment avoidance and anxiety moderate the association between childhood trauma and PTSD.<sup>37</sup>

Insecure ASs are also related to cPTSD.<sup>38,39</sup> Individuals with insecure ASs can have difficulty forming secure and trusting relationships, making it more difficult for them to cope with traumatic events and leading to a higher risk of developing cPTSD. In addition, individuals who have experienced childhood abuse or neglect, which can lead to insecure attachment, may be at a higher risk of developing cPTSD later in life.

### Hypothesis and aim

A relationship between childhood adversities, trauma, emotion dysregulation (as a proxy of cPTSD), DE, and NSSI has been previously described.<sup>40–41</sup> Individuals with cPTSD often have a history of ACEs that have resulted in insecure attachment patterns, dissociation, and NSSI. In line with this, three well-established theories by Yate posit that all these clinical features can act as facilitators of the pathway between ACEs and NSSI.<sup>42</sup> The regulatory pathway theory postulates NSSI as a maladaptive coping strategy for emotional dysregulation or DEs. Indeed, recent evidence has shown that DE mediates the association between childhood adversities and self-harm.<sup>43</sup>

Similarly, the reactive pathway theory implies post-traumatic hyperarousal arising from maltreatment as a concrete mediator of the relationship between ACEs and NSSI. NSSI may indeed function, easing and lessening the impact of post-traumatic hyperarousal symptoms.<sup>44</sup> Finally, the representational pathway theory underlines how ACE-induced insecure attachment can guide one's own dysfunctional representation as an individual unworthy of care, acting self-injuringly as a self-punishment strategy.<sup>45,46</sup> Consistently, a recent longitudinal study has underlined how insecure attachment was described as a risk factor for committing NSSI in response to childhood abuse.<sup>47</sup> These behaviours and symptoms can perpetuate each other, as NSSI can serve as a means of coping with the dissociation and emotional regulation difficulties that arise from insecure attachment patterns.

Although earlier studies have proposed different conceptualisations of the trauma-NSSI association, also considering other psychopathological domains, to our knowledge, no previous research has examined a complex model encompassing the role of insecure attachment in shaping the association between ACEs, NSSI, DE and cPTSD. As cPTSD is a relatively new diagnostic entity, the scientific literature on the association between cPTSD, dissociation, NSSI and insecure attachment needs to be explored in further detail.

This study aimed to provide a unified model of the impact of ACEs on NSSI through cPTSD symptoms and DE and to explore the role of the dominant AS in affecting such associations. We hypothesised that attachment anxiety could enhance the impact of child adversities on subsequent psychopathology and NSSI. Furthermore, we hypothesised that different insecure ASs may play a role in selecting different psychopathological mediators of the relationship between ACEs and NSSI, that is, playing a mediator role in a complex psychological pathway as a whole. The rationale of this study is to establish associations between a set of mediators (cPTSD and dissociation) and clinical outcomes. Such associations could deserve better elucidations in light of a potential moderator to better represent such psychological pathways to NSSI. The practical implications regard potential interventions on NSSI, as it could inform a trauma-focused therapy alongside more specific behavioural interventions on NSSI.

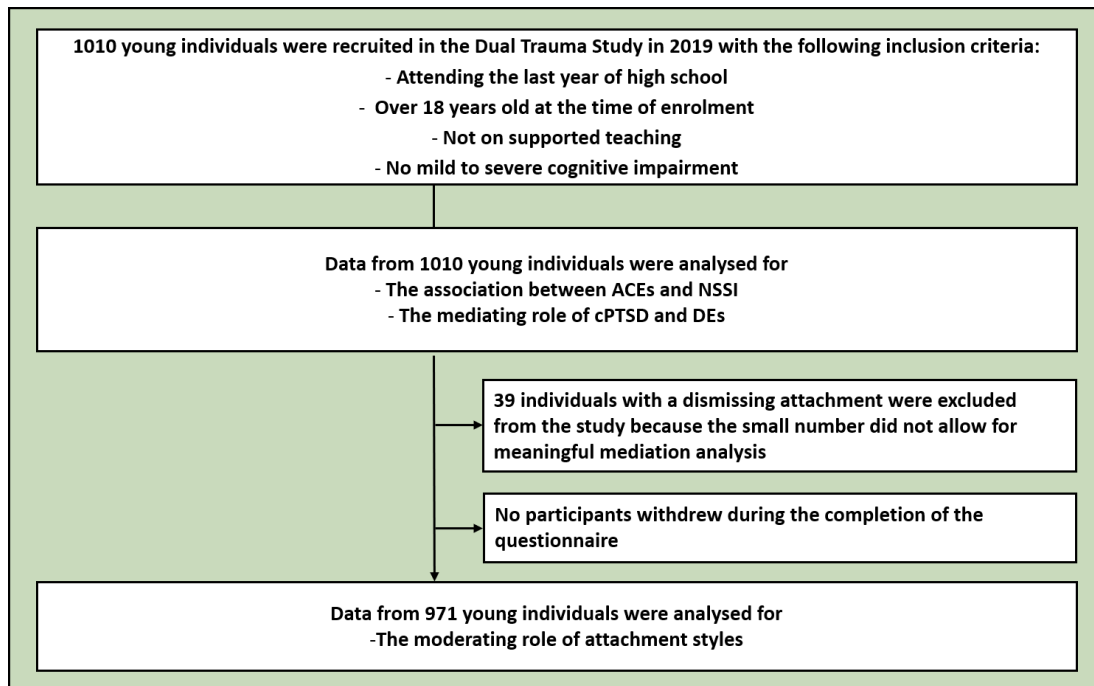
### METHODS

#### Design, participants and procedure

This study was conducted using the Dual Trauma study database. Dual Trauma is a cross-sectional study that aims to investigate the relationship between exposure to different traumatic experiences and multiple psychopathological and behavioural outcomes in an Italian sample of late adolescents. The Dual Trauma study was carried out in 2019 in a target population of all teenagers and young adults attending their senior year of high school in the province of L'Aquila in central Italy. The target population is thought to be 2000 people. The following criteria were used for inclusion: attending the last year of high school and being aged >18 years at the time of enrolment. Enrolment was limited to students aged >18 years to avoid introducing selection bias derived from parental consensus. Exclusion criteria included being on supported teaching as a proxy for mild to severe cognitive impairment (figure 1). A clustered sampling was conducted according to the geographic region (L'Aquila, Avezzano, and Sulmona), school and class.

After obtaining permission from schoolmasters, a systematic random sampling method was applied to select a specific number of classes from each school to cover 10% of the school population. The selection of classes was conducted randomly, ensuring a representative sample within each school. Subsequently, all students from the selected classes were invited to participate, encompassing 50%–100% of the final year classes, at the schoolmasters' discretion.

This methodological choice was deliberate and aimed to balance randomness and representativeness. By randomly selecting classes within schools and including all students from these selected classes, we sought to capture a diverse yet meaningful cross-section of the school population. This comprehensive sampling strategy was informed by the recognition that school type plays a significant role in mental health outcomes among Italian adolescents, as highlighted in previous research.<sup>48</sup>



**Figure 1** Study flowchart. ACEs, adverse childhood experiences; cPTSD, complex post-traumatic stress disorder; DEs, dissociative experiences; NSSI, non-suicidal self-injury.

The headmasters and local school council approved the participation and designated the number of courses at the eligible school level. Individual participants provided written informed consent to participate. Paper and pencil were used to collect surveys from university staff. The local ethics committee approved the study. The study was conducted according to the Declaration of Helsinki.

Recruitment and data collection took place between November 2019 and January 2020. A total of 1010 individuals participated in the study; 501 (49.60%) were male, 498 (49.31%) were female, and 11 (1.09%) preferred not to say. The mean (standard deviation (SD)) age was 18.7 (0.65). The sample characteristics and the description of the key variables are reported in table 1.

### Measures

#### Attachment style

The AS was measured using the Italian version of the Relationship Questionnaire (RQ).<sup>49</sup> In our sample, the internal validity was 0.88. The RQ comprises four short paragraphs that describe a prototypical AS (secure, preoccupied, fearful and dismissing). Participants are asked to choose which of the four ASs best describes them (categorical scoring), returning a single-item variable with four possible values. For our analysis, we used the categorical score as a grouping variable.

#### Adverse Childhood Experiences

The Risky Family Questionnaire (RFQ), a five-item retrospective self-report questionnaire on a five-point Likert scale adapted from the Adverse Childhood Experiences questionnaire (ACE-q) by Felitti *et al*, was used to measure ACEs.<sup>50</sup> Some questions include: ‘Would you say the household you grew up in was chaotic and disorganised?’ and ‘Would you say

you were neglected while you were growing up, left on your own to fend for yourself?’

Participants were instructed to recall their family surroundings as children and rate their experiences of each item on a scale of 1 (rarely or never), 2 (a little bit), 3 (quite a bit) or 4 (very much).

**Table 1** Sample characteristics

Variable	n (%) / mean (SD)
Gender	
Male	501 (49.60)
Female	498 (49.31)
Prefer not to say	11 (1.09)
School type	
Lyceum	485 (48.02)
Technical	318 (31.49)
Vocational	207 (20.50)
RFQ total	7.26 (3.08)
International trauma questionnaire: cPTSD symptomatology	11.60 (8.60)
Dissociative Experiences Scale	66.10 (92.78)
Non-suicidal self-injuries	0.61 (1.06)
Attachment style	
Secure	4.51 (1.90)
Preoccupied	2.98 (1.95)
Fearful	2.77 (1.94)

cPTSD, complex post-traumatic stress disorder; RFQ, Risky Family Questionnaire; SD, standard deviation.

4 (quite a lot). This scale's items looked at a variety of childhood events, both good and bad, like shouting, physical or verbal abuse, lack of affection, adult supervision and lack of affection. The items that showed warmth and support from the family of origin were reverse-coded to determine the scores for this measure. The scores for each item were then added to determine the overall score of dangerous family traits.

### Complex post-traumatic stress disorder symptoms

To assess the cPTSD symptomatology, we used the overall sum score of the International Trauma Questionnaire (ITQ), Italian version,<sup>51</sup> excluding the items assessing the functional outcomes. The ITQ is a self-report questionnaire tailored to the ICD-11's criteria for PTSD and cPTSD.

The ITQ first asks participants to identify and list their most upsetting traumatic experiences. Subsequently, participants are instructed to rate how annoyed they have been during the previous month by each symptom on a five-point Likert scale (0=not at all to 4=extremely). ITQ comprises six items on core PTSD symptoms and six on DSO symptoms. For these analyses, we used the sum of the 12 symptom items. ITQ is freely available at <https://www.traumameasuresglobal.com/itq>. In our sample, the internal validity was 0.88.

### Dissociative experiences

To assess dissociation, we used the taxon version of the Dissociative Experiences Scale (DES-T).<sup>52</sup> The DES-T is an eight-item self-rating instrument based on the idea of a 'dissociative continuum' ranging from mild pathological dissociation to severe normative dissociation. The DES-T, drawn from the Dissociative Experiences Scale-II (DES-II), determines whether an individual's score is related to pathological dissociation (Taxon) or more normal dissociation, which probably doesn't indicate a dissociative disorder. The taxon is based on items 3, 5, 7, 8, 12, 13, 22 and 27 of the DES-II. Subjects are instructed to draw slashes on 100-mm lines to indicate their position on the continuum.

### Non-suicidal self-injuries

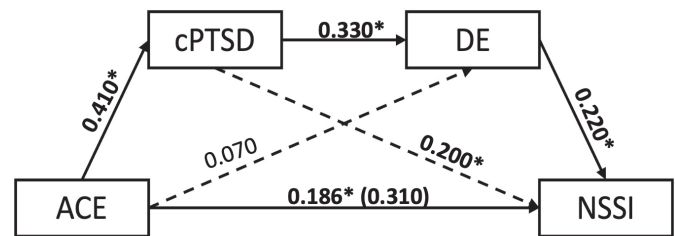
To assess NSSI, we used an abridged form of the Self Harm Inventory,<sup>53</sup> consisting of an eight-item yes/no checklist, asking about the most common circumstances where individuals deliberately hurt themselves without suicidal intent (eg, overdosing on alcohol or drugs, intentionally cutting or bruising the skin or worsening a medical condition by avoiding prescribed medication) within the past 6 months. The overall score is the sum of the 'yes', with each 'yes' assigned a score of 1. In our sample, the internal consistency was 0.81.

### Patient and public involvement in research

Patients and the public were not involved in the design, conduct, recruitment or dissemination of this study.

### Statistical analysis

Data analyses were performed using the tidyverse (version 2.0.0) and lavaan (version 0.6-19) packages for



**Figure 2** Sequential mediation model between ACEs, cPTSD symptomatology, DE and NSSI. ACEs, adverse childhood experiences; cPTSD, complex post-traumatic stress disorder; DE, dissociative experiences; NSSI, non-suicidal self-injury.

R statistical software (R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>). Before the analyses, all values of the outcome measures were tested for non-normality through the Shapiro-Wilk's test and z-transformed to account for non-normal distribution.

An initial analysis was carried out to assess the impact of ACEs on NSSI. Our analysis used a linear regression approach to model the relationship between ACEs and NSSI, where ACEs were considered independent variables and NSSI was the dependent variable.

Subsequently, we performed a step-by-step fitting of a path model that included cPTSD symptomatology and DE as sequential mediators of the relationship between ACEs and NSSI (figure 2). These analyses are largely based on Hayes's no. 6 model.<sup>54</sup> To do this, we computed four models to analyse the relationship between ACEs, cPTSD symptomatology, DE and NSSI. Model 1 examined the association between ACEs, DE and NSSI; Model 2 analysed the relationship between ACEs, cPTSD symptomatology, DE and NSSI; Model 3 focused on the association between cPTSD symptomatology and DE; and Model 4 used a global sequential mediation approach, with ACEs as the exogenous variable, cPTSD symptomatology and DE as sequential mediators and NSSI as the outcome variable.

Finally, we fitted the same mediation model using the predominant AS as a grouping variable, separately analysing the associations between secure, fearful, preoccupied and dismissing attachments.

A graphical description of the hypothesised final model is presented in figure 2. Estimates of direct, indirect and total effects and the proportion of total impact that was mediated (calculated as indirect/total effect\*100) were included in the mediation analyses. According to the syntax, mediation was evaluated by looking at the bootstrapped bias-corrected confidence intervals (CIs) of the model's indirect effects. Bootstrapping was done with 5000 replications for each indirect effect. A p value of less than 0.05 was considered statistically significant.

**Table 2** Associations between ACEs, cPTSD symptomatology, DE and NSSI in the total sample;  $R^2$ : 0.519

Associations	$\beta$	95% CI
ACEs→cPTSD	0.410*	0.347 to 0.475
ACEs→DE	0.070	0.000 to 0.010
ACEs→NSSI	0.186*	0.096 to 0.278
cPTSD→DE	0.330*	0.255 to 0.406
cPTSD→NSSI	0.200*	0.130 to 0.270
DE→NSSI	0.220*	0.130 to 0.330
Indirect effect: 1 (ACEs→cPTSD→DE→NSSI)	0.033*	0.014 to 0.041
Indirect effect : 2 (ACEs→cPTSD→NSSI)	0.083*	0.056 to 0.110
Indirect effect: 3 (ACEs→DE→NSSI)	0.012	0.000 to 0.047
Total effect	0.310*	0.232 to 0.410

\*indicates statistical significance.

ACEs, adverse childhood experiences; CI, confidence interval; cPTSD, complex post-traumatic stress disorder; DE, dissociative experiences; NSSI, non-suicidal self-injury.

## RESULTS

### Association between ACEs and NSSI

ACEs were significantly associated with NSSI ( $\beta=0.319$ , 95% CI 0.261 to 0.378) in the total sample.

### Model 1: associations between ACEs, DE and NSSI

In the total sample, ACEs significantly affected NSSI, with a direct effect of  $\beta=0.260$  (95% CI 0.177 to 0.354). Of the total effect of ACEs on NSSI ( $\beta=0.320$ , 95% CI 0.243 to 0.421), 19.1% was mediated by DE (indirect effect=0.061, 95% CI 0.031 to 0.105).

### Model 2: associations between ACEs, cPTSD symptomatology and NSSI

Among 1010 young people, the total effect of ACEs on NSSI was ( $\beta=0.318$ , 95% CI 0.232 to 0.440), whereas the indirect effect through cPTSD symptomatology was ( $\beta=0.114$ , 95% CI 0.078 to 0.142), which mediated 35.8% of the total effect.

### Model 3: association between cPTSD symptomatology and DE

Among 1010 young people, cPTSD symptomatology was significantly associated with DE ( $\beta=0.360$ , 95% CI 0.301 to 0.419).

### Model 4: a global model of ACEs, cPTSD symptomatology, dissociation and NSSI

The final model built on the whole sample from the above-mentioned partial models is proposed in figure 2 and reported in table 2. In this model, ACEs significantly affected NSSI ( $\beta=0.186$ , 95% CI 0.096 to 0.278). The total effect of ACEs on NSSI was the sum of the direct effects of cPTSD symptomatology, DE and ACEs. The total effect

mediated by cPTSD symptomatology and dissociation was 9.74%.

ACEs were also significantly associated with cPTSD symptomatology ( $\beta=0.410$ , 95% CI 0.347 to 0.475), which in turn was associated with dissociative experiences ( $\beta=0.330$ , 95% CI 0.255 to 0.406).

### The role of ASs in the relationship between ACEs, cPTSD symptomatology, DE and NSSI

We finally fitted the same global model, clustering participants according to their ASs on the RQ (secure, fearful, preoccupied and dismissing). The numerosity in the dismissing attachment group was very low ( $n=39$ , figure 1) to perform a mediation analysis<sup>55</sup>; as a small sample size would increase the odds of encountering type I errors, we decided to exclude these data from our analyses.

The sequential mediator models according to the different ASs are summarised in table 3 and online supplemental figure. In the secure attachment group, participants showed a significant total effect of ACEs on NSSI ( $\beta=0.284$ , 95% CI 0.143 to 0.456); cPTSD symptomatology and dissociation mediated 8.41% of the total effect.

In the fearful attachment, the relationship between dissociation and NSSI was significant ( $\beta=0.480$ , 95% CI 0.189 to 0.860), as opposed to the preoccupied attachment, which showed a non-significant coefficient ( $\beta=0.163$ , 95% CI -0.049 to 0.415). Similarly, in the fearful attachment, the relationship between cPTSD symptomatology and NSSI was not significant ( $\beta=0.101$ , 95% CI -0.059 to 0.253), as opposed to the preoccupied attachment, which showed a significant association between the same variables ( $\beta=0.236$ , 95% CI 0.019 to 0.456).

The relationship between ACEs and cPTSD symptomatology differed across the three groups. The fearful attachment showed the smallest association, with a  $\beta=0.231$  (95% CI 0.083 to 0.357), compared with the secure attachment, which showed a  $\beta=0.319$  (95% CI 0.244 to 0.393), and with the preoccupied attachment, which showed a  $\beta=0.613$  (95% CI 0.492 to 0.745).

## DISCUSSION

### Main findings

Our study is the first to explore a complex model of NSSI that integrates childhood adversity, dissociation and cPTSD symptoms in light of different ASs in a sample of late adolescents. The main findings of this study can be summarised as follows. The association between ACEs and NSSI is significant, with cPTSD and dissociative symptoms playing a mediating role. However, the model's outcomes differ based on the predominant AS. In individuals with a preoccupied AS, the ACEs→NSSI relationship is mediated only by cPTSD symptoms. In contrast, in those with a fearful AS, the ACEs→NSSI effect is also mediated by dissociative symptoms. Individuals with a fearful AS exhibit complete mediation compared with those with a secure AS. The findings support our initial hypothesis that ASs significantly influence the intricate

**Table 3** Associations between ACEs, cPTSD symptomatology, DEs and NSSI depending on the predominant attachment style; R<sup>2</sup>: 0.54 (secure attachment style); R<sup>2</sup>: 0.45 (fearful attachment style); and R<sup>2</sup>: 0.60 (preoccupied attachment style)

Associations	Attachment style					
	Secure		Fearful		Preoccupied	
	β	95%CI	β	95%CI	β	95%CI
ACEs→cPTSD	0.319*	0.244 to 0.393	0.231*	0.083 to 0.357	0.613*	0.492 to 0.745
ACEs→ DE	0.134*	0.034 to 0.232	0.132	-0.035 to 0.362	-0.131	-0.342 to 0.114
ACEs→NSSI	0.147*	0.011 to 0.301	0.165	-0.752 to 0.369	0.289*	0.067 to 0.495
cPTSD→DE	0.464*	0.341 to 0.603	0.325*	0.186 to 0.489	0.350*	0.170 to 0.551
cPTSD→NSSI	0.292*	0.163 to 0.424	0.101	-0.059 to 0.253	0.236*	0.019 to 0.456
DE→NSSI	0.167*	0.056 to 0.286	0.480*	0.189 to 0.860	0.163	-0.049 to 0.415
Indirect effect: 1 (ACEs→cPTSD→DE→NSSI)	0.028*	0.004 to 0.053	0.038*	0.003 to 0.084	0.038	-0.012 to 0.114
Indirect effect: 2 (ACEs→cPTSD→NSSI)	0.095*	0.055 to 0.142	0.027	-0.017 to 0.066	0.142*	0.013 to 0.297
Indirect effect: 3 (ACEs→DE→NSSI)	0.026*	0.001 to 0.542	0.062	-0.017 to 0.193	-0.029	-0.123 to 0.015
Total effect	0.284*	0.143 to 0.456	0.287*	0.072 to 0.500	0.435*	0.288 to 0.592

\*indicates statistical significance  
 ACEs, adverse childhood experiences; CI, confidence interval; cPTSD, complex post-traumatic stress disorder; DE, dissociative experiences; NSSI, non-suicidal self-injury.

connections between factors that contribute to NSSI, such as cPTSD and dissociation.

To our knowledge, this is the first study to explore a sequential mediation model that includes cPTSD and dissociative symptoms as relevant factors for NSSI and its interaction with different ASs. The association between traumatic experiences, dissociation, PTSD and NSSI is well established in the literature.<sup>6</sup> Although some evidence indicates that cPTSD is associated with higher levels of NSSI compared, for example, to PTSD,<sup>56-58</sup> no equivalent model could be found in the literature.

The following discussion could explain the difference between the three models of NSSI.

First, some evidence suggests that the main dimension driving NSSI in cPTSD is ‘alteration in self-perception’, which is correlated with the DSO dimension ‘negative self-concept’.<sup>59</sup> This construct refers to a mindset centred on self-perceived badness that patients with cPTSD are prone to experience. Such a mindset comprises a wide range of structured negative cognitions, for example, perceived loss of moral integrity, shame and guilt. In particular, shame guides self-worth as being often perceived as highly damaged, leading to the desire to withdraw and hide from others and enhancing self-destructive behaviours.<sup>60</sup> According to Nathanson’s model, self-harm is indeed considered a way of coping with shame, which involves individuals attacking themselves to deal with unpleasant and negative feelings.<sup>61</sup> To this end, Dyer and colleagues reported alterations in self-perception as mediators of the relationship between childhood maltreatment and a history of self-harm.<sup>59</sup>

Besides cPTSD, similar feelings of shame and guilt can also be found among individuals with an insecure AS. Indeed,

evidence suggests that fearful and preoccupied ASs are associated with higher levels of shame and self-perceived badness.<sup>62 63</sup> Recent findings highlight that ACEs and insecure ASs are key contributors to shame development and maladaptive shame management strategies, including self-attack and social withdrawal.<sup>64</sup> Hence, it is unsurprising to see that, compared with individuals with a secure AS, people who present fearful and preoccupied ASs show a higher association between ACEs and both cPTSD and NSSI. In particular, our results showed that the relationship between ACEs and cPTSD among individuals with a preoccupied AS was more than three times stronger compared with those with a secure AS.

Similarly, the association between ACEs and NSSI was doubled among participants with a preoccupied AS (β=0.280) compared with those with a secure AS (β=0.147). Based on our hypothesis, attachment anxiety can be advocated as a possible explanation. Individuals who present high levels of attachment anxiety (ie, fearful or preoccupied attachment) tend to be overly sensitive to interpersonal cues of rejection or abandonment.<sup>65</sup> In the context of ACEs, such sensitivity could increase their vulnerability to developing cPTSD symptoms, which, in turn, could lead to NSSI as a maladaptive coping mechanism to regulate intense negative emotions.

This pathway becomes slightly more complex when individuals with a fearful AS are taken into account. Fearful AS is a robust risk factor for a plethora of psychiatric conditions, ranging from psychosis to dissociative disorders.<sup>66</sup> In individuals with a fearful AS, high levels of avoidance can lead to a pattern of dissociation in response to emotional or interpersonal stressors.<sup>67</sup> Therefore, it is not surprising to observe individuals with a fearful AS harming themselves as a response to

ACEs through a complex pathway that involves both cPTSD symptoms and dissociation rather than in a more direct way. NSSI may indeed act as an automatic positive reinforcement in the attempt to end a distressing dissociative state.<sup>43</sup>

Lastly, the overall model might be explained in the light of possible disruptions of the Theory of Mind (ToM) construct. ToM refers to the ability to understand others' mental states, and impairments in both affective and cognitive ToM are associated with NSSI, particularly in adolescents.<sup>68–70</sup> Deficits in affective ToM, which involve recognising emotions in others, can exacerbate emotional dysregulation and interpersonal disconnection, both of which are known triggers for NSSI. Additionally, cognitive ToM impairments, related to understanding others' beliefs and intentions, can increase feelings of social isolation, reinforcing NSSI behaviours.<sup>68 71</sup>

### Implications

This study adds important information to the existing literature. First, given that the highest prevalence of NSSI occurs during adolescence,<sup>72</sup> our findings are of relevance, as they can help shed novel insights into the psychological mechanisms underlying such a severe and diffuse phenomenon. Second, our study expands on the well-established ACEs→NSSI relationship by incorporating cPTSD symptomatology. Considering cPTSD symptoms in such a relationship highlights the unique and long-lasting effects of chronic trauma on mental health, as well as the potential impact of indirect experiences of trauma, such as negative self-concept and emotional dysregulation, in addition to direct experiences of abuse.

Furthermore, we reported an important moderation effect of the AS in this complex interaction, thus confirming its key role in various mental conditions. Our results show that the relationship between ACEs and NSSI is the highest among individuals with an insecure AS. Although we did not perform any risk-assessment analysis, we may conclude, based on the existing literature, that having an insecure AS could represent a vulnerability factor for committing self-attacks in response to ACEs. Hence, our study findings emphasise the need for attachment-focused interventions in addressing NSSI. Tailoring therapeutic approaches based on individuals' ASs, such as using mentalisation-based therapy for those with insecure attachment, could be more effective.

Third, our findings suggest that clinicians should be aware of the potential associations between ACEs and NSSI, particularly considering possible comorbidities such as cPTSD and dissociation. Implementing a trauma-informed approach that addresses these foundational concerns may lead to more effective and comprehensive treatment outcomes for patients with NSSI who have experienced family abuse. This approach is especially relevant for adolescents in high schools. Schools that are informed about trauma, with teachers, counsellors and administrative staff trained to recognise and address signs of trauma, can indeed create a safe and supportive environment that mitigates the effect of life adversities and reduces the occurrence of NSSI.<sup>73</sup> Additionally, therapies like trauma-focused cognitive behavioural therapy and eye

movement desensitisation and reprocessing should be integrated to address the mediating role of cPTSD.

Furthermore, our results highlight the need for preventive measures targeting ACEs and abuse, which could ultimately reduce the incidence of NSSI in adolescents and young adults. Education and awareness campaigns for parents, teachers and healthcare professionals could improve the identification and early intervention of at-risk individuals and adolescents, potentially preventing the onset of NSSI and associated mental health issues later in life.

### Limitations

Several limitations to this study must be taken into account. First, the collected data are self-reported, which can be affected by recall bias and lead to false-positive or false-negative results. Second, the study's cross-sectional design does not allow causal inferences to be postulated in the fitted path model. Although the association between ACEs and NSSI is well established in the literature, the direction of the relationships was largely based on speculation. In the same way, the direction of the association between dissociation and cPTSD was largely based on a priori theoretical considerations<sup>74</sup> that could be disconfirmed in a longitudinal design. Further studies relying on cross-sectional design could benefit from multiple model comparisons. Furthermore, information on any psychiatric conditions currently diagnosed, psychological or psychiatric treatments, or socioeconomic status was not collected, so the results cannot be adjusted for these variables. Finally, the sample was conveniently selected from a specific population. This approach not only limits the generalisability of the results but also raises questions about the potential differential effects of the same model on adolescents and adults. For example, in comparison to their younger counterparts, adults might have enhanced cognitive abilities, potentially limiting the impact of emotional dysregulation on NSSI. Therefore, it will be important for future studies to replicate and confirm our findings or to compare them across different study populations.

### CONCLUSIONS

Our study provides valuable information on the relationship between ACEs and NSSI. By identifying specific mechanisms through which these variables interact, we can gain a better understanding of the complexity of this issue. To this end, we showed that young people may engage in different pathophysiological responses when exposed to ACEs, depending on the predominant AS.

Our findings also suggest that clinicians should consider both the role of ASs and post-traumatic symptomatology when treating individuals who have experienced ACEs and act out by means of NSSI behaviours. Tailoring interventions to address these issues may help reduce the risk of NSSI and improve overall mental health outcomes among young adults.

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