BMC Psychology

RESEARCH

Open Access

Adult attachment insecurity and uncertain reflective functioning as mediators between traumatic experiences and alexithymia in young adults: a structural equation modeling approach

Lucia Sideli[1], Alessandro Alberto Rossi[2,3*], Stefania Mannarini[2,3], Christian Franceschini[5], Alessio Gori[4], Adriano Schimmenti[6†] and Alessandro Musetti[7†]

Abstract

Background Alexithymia concerns a difficulty identifying, describing, and valuing feelings, and is regarded as a transdiagnostic dimensional construct, expressed at different levels in both non-clinical and clinical populations. Despite evidence supporting the relationship between traumatic experiences, adult attachment insecurity, uncertain reflective functioning, and alexithymia, there is a need to model their relationships to inform research, preventative actions, and clinical practice. Accordingly, this study aimed to investigate the mediating effect of adult attachment insecurity (M1) and uncertain reflective functioning (M2), on the relationship between traumatic experiences (X) and alexithymia (Y) in a community sample of young adults.

Methods $N = 1,510$ community members (78% female, age range 18–30) were assessed for traumatic experiences, adult attachment insecurity, uncertain reflective functioning, and alexithymia using self-report questionnaires. A sequential multiple mediation model was tested using structural equation modeling.

Results There was no evidence of a direct effect of traumatic experiences on alexithymia. Traumatic experiences showed an indirect effect on alexithymia through adult attachment insecurity and uncertain reflective functioning. The total effect was statistically significant and the total explained variance of the model was $R^2 = 0.737$.

Conclusions Alexithymia implies difficulties in understanding, processing and verbalizing emotions, which may be associated with difficulties in mentalizing and adult attachment insecurities that may in turn be linked to traumatic experiences. These considerations may serve to promote effective, process-based clinical intervention aimed to improve reflective functioning and alexithymia.

†Adriano Schimmenti and Alessandro Musetti contributed equally to this work.

*Correspondence:
Alessandro Alberto Rossi
a.rossi@unipd.it

Full list of author information is available at the end of the article

Keywords Attachment, Trauma, Alexithymia, Reflective functioning, Mentalization

Introduction

Alexithymia and its impact on mental health

Alexithymia is a condition characterized by a difficulty identifying and describing feelings, combined with a difficulty in use feelings as a guide for one's own behaviors. This condition can lead to an impairment in emotion regulation abilities (i.e., in difficulties to manage negative emotions with appropriate coping strategies) [1]. Alexithymia consists in three interconnected domains: (a) a poor ability to identify feelings and distinguish them from bodily sensations; (b) a reduced capacity to describe and communicate feelings; and (c) an 'operatory thinking', focused on external aspects of the experience and lacking of imaginative processes [2].

Alexithymia has been conceptualized as a transdiagnostic and dimensional construct, expressed at different levels in non-clinical and clinical populations, suggesting that it may play a role both in the onset and the course of somatic and psychological conditions [3, 4]. Meta-analyses and systematic reviews documented high levels of alexithymia amongst individuals affected by cardiovascular [5, 6], gastrointestinal [7], oncologic [8], neurological [9, 10], infectious [11], and cutaneous diseases [12, 13]. Furthermore, higher levels of alexithymia have been associated with severity of depressive symptoms [14], psychological distress [15–18], addictive behaviors [19–24], disordered eating [25–29], personality disorders [30], and autism spectrum disorders [31, 32]. Given the impact of alexithymia on several somatic and mental health conditions, it is important to elucidate psychological factors and processes underlying alexithymia, in order to identify vulnerable populations and to design appropriate interventions.

The relationship between traumatic experiences and alexithymia

Accumulating research has suggested that alexithymia is associated with exposure to traumatic experiences, defined as interpersonal (e.g., physical or sexual violence) or impersonal events (e.g., natural disaster), which may directly cause or threaten harm to individuals [33, 34].

Empirical research has highlighted the association between alexithymia and childhood traumatic experiences [24, 35, 36]. In fact, interpersonal traumatic experiences may affect the capacity to identify feelings and to use them as a guide behavior, thus fostering alexithymia and emotion dysregulation [17, 37]. Meta-analytic evidence has suggested that alexithymia is associated, with a small but significant effect size, with having a history of childhood maltreatment [38]. Consistent with these findings, another meta-analysis found that childhood maltreatment is associated with greater emotion dysregulation, with moderate effect size [39]. Alexithymia demonstrates a stronger association with childhood neglect compared to childhood abuse, which may reflect differences in opportunities for children to meet their physical and emotional needs and to develop emotional skills with parental [38].

In addition to childhood traumatic experiences, alexithymia has been also construed as a response to overwhelming emotions related to recent adverse events, such as war, natural disaster, chronic illnesses, and intimate partner violence [15–18, 40, 41]. Higher levels of alexithymia have been associated with greater post-traumatic consequences, depressive, and dissociative symptoms, and poor quality of life in response to adverse life events [15, 36, 42–48].

The mediating role of attachment

Alexithymia has been found to be associated with insecure adult attachment [49–52]. Adult attachment is a motivational system which promotes security and safety by seeking proximity to the caregiver or close others [53]. Attachment was initially conceptualized by Bowlby [54, 55] as a motivational system that leads to stable bonds between infants and their primary caregivers, providing a secure base for environmental exploration. Subsequently, research in this area has expanded to include adult attachment, defined as the individuals' views of the self and others in intimate relationships during adulthood [56]. Bartholomew and Horowitz (1991) developed a model based on four adult attachment styles: (a) secure attachment is characterized by a positive view of the self and a positive view of others, (b) insecure-dismissing attachment is characterized by a positive view of the self and a negative view of others, (c) insecure-preoccupied attachment is characterized by a negative view of the self and a positive view of others, and (d) insecure-fearful attachment is characterized by a negative view of the self and a negative view of others and In this model, insecure attachment encompasses both attachment anxiety (i.e., fear of abandonment and overwhelming desire for closeness) and attachment avoidance (i.e., mistrust of others and discomfort with closeness) [57].

Children who can rely on their caregiver as a 'secure base' and a 'safe haven' tend to form cognitive-affective representations of the self and the others (i.e., internal working models) characterized by self-confidence and trust in the others, and to develop adaptive emotion regulation strategies based on search for proximity to

the caregiver [55, 58, 59].However, children exposed to abusive or neglecting parenting and with insecure adult attachment to the caregiver tend to use maladaptive strategies to regulate distressing emotions, e.g., excessive dependence on caregivers for affective support or, alternative, extreme self-reliance and difficulty in seeking or accepting from the others [17, 59]. Specifically, parental abuse (e.g., verbal, physical, or sexual violence acted by parents or the primary caregivers), parental over-protection (e.g., overcontrolling and intrusive behaviours), and adverse experiences while children have been separated by parents, might foster overestimation of environmental threats, amplification of negative emotions, and over-dependence on caregivers' support (i.e., attachment hyperactivation). On the other hand, parental neglect (i.e., failure by the parents or the primary caregivers to meet children's physical or emotional needs) or rejection might encourage minimization of emotional needs, excessive self-reliance, and avoidance of closeness to significant others (i.e., attachment deactivation) [53, 59, 60]. In adulthood, individuals with insecure adult attachment may encounter in recognizing negative emotions, expressing them appropriately, and managing their emotional needsthroughadaptive strategies, such as seeking emotional and practical support from significant others andemploying constructive problem solving approaches tomanage sources of distress [59, 61]. Accordingly, a recent meta-analysis found a positive significant correlation between alexithymia and attachment insecurity in adulthood [49]. The findings indicate thatindividuals with higherlevels of attachment insecurity experience increases difficulty recognizing negative emotions and regulating them effectively, oftenresorting to maladaptivestrategies such as minimizing or amplifyingtheir emotional needs [49].

Attachment insecurity in adulthood has also been related with traumatic experiences in adult life, such as physical illness [62, 63], war exposure [64, 65], family loss [66, 67], and domestic violence [68]. According to the life stress model, attachment insecurity in adolescence and adulthood might be partially explained as a response to interpersonal stressors or traumatic experiences, such as parental loss, physical and sexual violence, life-threatening illness, parental divorce and family dysfunction [69–71]. Furthermore, systematic evidence and meta-analysis suggest that adult attachment insecurity correlated with increased severity of post-traumatic stress symptoms, suggesting that adult attachment insecurity might affect response to traumatic experiences [72, 73]. Overall, available evidence suggests that adult attachment can provide a pathway mediating the association between interpersonal traumatic experiences and alexithymia. However, this pathway has not been tested yet.

The mediating role of reflective functioning

Fonagy's mentalization model posits that attachment disruption negatively affects the development of the reflective functioning, which underlines emotion regulation processes [74–76]. A secure attachment relationship with caregivers supports children in understanding and interpreting their own and the others' behaviors as results of internal mental states (e.g., feelings, intentions, or thoughts), a capacity defined as reflective functioning or mentalization ability [77, 78]. By contrast, inadequate parenting, frequently resulting in insecure or even disorganized attachment, are associated with parental difficulties in treating the child as a psychological agent, that is, in representing the child's feelings, intentions, and thoughts, and mirroring them accurately [78, 79]. Accordingly, a recent meta-analysis found that emotionally maltreating parents experienced greater difficulties in emotion regulation and more frequent negative emotions [80], which might affect dyadic attunement and might result in their children's emotion dysregulation [17]. Repeated failures in parental mirroring hinder the development of adequate mentalization capacities in the child, thereby increasing the likelihood of mentalization difficulties such as uncertain reflective functioning. Uncertain reflective functioning marked by challenges in interpreting experiences through the lens of mental states and in differentiating one's own mental states from external reality [81, 82].

As regard to the impairment in understanding one's own mental states, hypo-mentalization might be considered an antecedent of alexithymia [83, 84]. Furthermore, since hypo-mentalization makes the individual easily overwhelmed by negative mental states, perceived as concrete as the external world [74, 76], it has been related with impaired emotion regulation and dysfunctional coping strategies (such as problematic internet use, disordered eating behaviors, and non-suicidal self-injuries) in lieu of more adaptive ones [60, 85–95]. In light of these findings, adult attachment and uncertain reflective functioning may mediate the association between interpersonal traumatic experiences and alexithymia, both independently and in sequence. Insecure adult attachment is linked with deficiencies in reflective functioning, which may, in turn, be associated with higher levels of alexithymia. However, this potential pathway is still unexplored and warrants further attention.

The present study

Despite evidence supporting the relationship between traumatic experiences, adult attachment insecurity, uncertain reflective functioning, and alexithymia, to our knowledge a comprehensive model that molds the relationships among them has not been statistically tested. This study aimed to investigate the mediating effect

of adult attachment insecurity and impaired reflective functioning on the relationship between traumatic experiences and alexithymia in a community sample. We hypothesized that the effect of traumatic experiences on alexithymia would be partially mediated by adult attachment insecurity and uncertain reflective functioning.

Methods

Procedure

We used the snowball sampling method to enroll participants from the general population through social media platforms, such as Facebook and Twitter/X [96]. In line with recent recommendations in the literature [97], and to ensure data integrity while minimizing the inclusion of unreliable responses, we implemented multiple quality-control procedures commonly used in health research with participants recruited via social media. For example, we used dedicated data collection platforms that prevent automated bots from completing the survey. Additional checks included examining survey completion time and screening response patterns for indications of straight-lining, defined as providing identical answers to all closed-ended items on a given survey page. Cases presenting one or more suspicious indicators were deemed unreliable and excluded from the final dataset. This multi-criteria post-hoc screening approach was applied after survey completion to safeguard sample validity and enhance the overall reliability of data collected through online surveys disseminated via social media.

The inclusion criteria were: (A) being aged between 18 and 30 years old, (B) being a native Italian speaker, (C) do not have any inability to complete the assessment procedure due to illiteracy, cognitive and/or vision impairments and (D) do not provide incomplete responses. Each participant agreed to participate in the study voluntarily. Digital informed consent was obtained from all participants. The Research Ethics Board of the University of Parma approved this study (prot. N. 184304). The study has been carried out in accordance with the Declaration of Helsinki.

Sample size determination

The sample size was planned by using the "*n: q* criterion" [98] – the ratio between the number of participants (*n*) to the number of model parameters to be estimated (*q*). In detail, considering the main analyses of the study (see the dedicated section), the number of free parameters was equal to 51 and a ratio of at least ten subjects per parameter was guaranteed. Consequently, the minimum sample size was equal to 510 participants.

Participants

The final sample was composed of 1510 participants: 333 men (aged from 18 to 30 years; *mean* = 24.61, *SD* = 3.13) and 1,177 women (aged from 18 to 30 years; *mean* = 23.65, *SD* = 2.81). The majority of the sample was composed of university students (777, 51.5%), followed by full-time employees (319, 21.1%), and university students/part-time employees (288, 19.1%). The remaining part of the sample were entrepreneurs (75, 5.0%) and unemployed (51, 3.4%).

Measures

A socio-demographics schedule and the following self-report questionnaires were administered via an online anonymous form.

Traumatic experiences checklist (TEC)

The TEC [99] was used to assess traumatic experiences. The TEC evaluates four main types of traumatic experiences: (A) emotional abuse and emotional neglect, (B) threat from a person to the integrity of the body such as physical abuse and/or threat to life, pain, and bizarre punishment, (C) sexual harassment and abuse, and (D) other potentially negative events. These four features compose the overall dimension of traumatic experience [24, 99–102] and reflect the fact that, even in non clinical samples, exposure to multiple traumas is very common [17, 103, 104]. The TEC is composed of 29 items with a binary response scale (yes/no, coded as 1/0) – for each item, respondents were asked to state whether they had ever experienced (or not) that traumatic experience in their lifetime. Higher scores indicate a greater number of reported traumatic experiences. The Italian version of the TEC [103] was used in this study and provided good internal consistency: McDonald's ω = 0.92.

Relationship questionnaire (RQ)

The RQ [57] was used to measure the adult attachment. The RQ measures the four main different (one secure and three insecure) attachment prototypes: (A) secure, (B) dismissing, (C) preoccupied, and (D) fearful. The RQ is composed of two separate sections. In the first one, four different short paragraphs were depicted – each describing one of the four aforementioned adult attachment styles. In the second section, respondents were asked to evaluate – on a 7-point Likert-type scale (from 1 = strongly disagree to 7 = strongly agree) – how well each aforementioned paragraph describes them. In this study, we calculated the overall measure of attachment insecurity by combining the three dimensional score of insecure attachment (i.e., B, C, and D) and the reversed dimensional score of secure attachment (i.e., A). Consequently, higher scores reflect higher levels of adult attachment insecurity. Considering the nature of the questionnaire, which is composed of different attachment styles, the calculation of an overall internal consistency (e.g.,

McDonald's omega) is not appropriate [91]. The Italian version of the RQ [105] was used in this study.

Reflective functioning questionnaire 8 (RFQ-8)

The RFQ-8 [82] was used to measure the ability to understand mental states of the self and others (namely, reflective functioning). The RFQ-8 measures two diametrically opposite poles of reflective functioning: the certainty and the uncertainty about mental states, each represented by 6 items. The RFQ-8 is composed of 8 items with a 7-point Likert-type scale ranging from "completely disagree" (1) to "completely agree" (7). Respondents are asked to express their agreement on 8 statements related to mentalizing abilities and processes. Higher scores reflect higher levels of the measured domains of reflective functioning (i.e., certainty or uncertainty about mental states). In the present study, the Italian version of the RFQ-8 was used [106]. Considering the need for testing the role of lack of mentalization in alexithymic conditions, and according to the main statistical analysis (see designed section), only the RFQ-8 uncertainty scale (namely, RFQ-8u) was used in this study and provided good internal consistency: McDonald's ω = 0.86.

Toronto alexithymia scale 20 (TAS-20)

The TAS-20 [107] was used to assess alexithymia. The TAS-20 measures the three main domains of alexithymia: (A) difficulties identifying feelings, (B) difficulties describing and communicating feelings to others, and (C) externally oriented thinking. These three domains compose the overall hierarchical dimension of alexithymia [107, 108]. The TAS-20 is composed of 20 items with a 5-point Likert-type scale ranging from "strongly disagree" (1) to "strongly agree" (5). Respondents are asked to express their agreement (or disagreement) on statements related to the main domains of alexithymia. Higher scores reflect higher levels of measured domain of alexithymia. In this study, the Italian version of the TAS-20 [108] was used and provided good internal consistency: McDonald's ω = 0.91.

Statistical analysis

Statistical analyses were performed using R software with the following packages: lavaan [109], psych [110], and tidyverse [111]. Graphical diagrams were performed with GraphViz via DiagrammeR [112].

In accordance with the inclusion/exclusion criteria, none of the observations had missing data. Before carrying out the main analyses of the study, classical preliminary analyses were performed (e.g., correlation analysis) to assess the relationships between the observed variables [113]. Moreover, in line with previous studies [114], a multivariate multiple regression analysis was performed to exclude the potential confounding effects of covariates (external variables) on model variables: (A) gender, (B) age, and (C) occupational status. Thus, these external variables were simultaneously regressed on all the psychological constructs. Standardized regression coefficients (B*) were considered to represent null (B* from 0.0 to 0.1), negligible (B* from 0.1 to 0.2), small (B* from 0.2 to 0.3), medium (B* from 0.3 to 0.5), and large (B* higher than 0.5) effect sizes (ES), respectively [115]. These preliminary analyses were specifically conducted to identify any variables that might need to be included as covariates, with the aim of avoiding overly complex models overloaded with covariates.

In addition, also as a preliminary process, a five-step procedure was carried out – as shown below [98, 116, 117]. Lastly, since SEM should be considered as a linear model [98], its assumptions were tested and no violations were detected.

Step 1. The structural validity of each questionnaire was independently tested using a confirmatory factor analysis (CFA). Considering the response scale of each questionnaire, the diagonally weighted least square (DWLS) estimator was used [98, 118]. Model fit of each CFA was assessed with classical fit indices and their recommended cutoff values: (A) the Chi-square statistics (χ^2), preferably non-statistically significant ($p > .05$); (B) the Root-Mean-Square Error of Approximation (RMSEA), values below 0.08 indicating 'acceptable' model fit and values below 0.05 indicating 'good' model fit; (C) the Comparative Fit Index (CFI), values between 0.90 and 0.95 for an 'acceptable' fit and higher than 0.95 to indicate a 'good' fit, and (D) the Standard Root Mean square Residual (SRMR), with values lower than 0.08 considered good [119, 120].

Step 2. Potential 'common method bias' was checked by means of Harman's single-factor test [121]. More in detail, a nine (correlated) factors model was specified corresponding to the measurement model of each scale (TEC: four factors, RQ: single factor, RFQ-8u: single factor, and TAS-20: three factors). Then, a single factor model was specified in which all the items loaded onto a single latent dimension. Consequently, the two models were compared using the test differences in goodness-of-fit indices suggesting the absence of the bias: a statistically significant chi-square difference ($\Delta\chi^2$; $p < .050$), a ΔRMSEA greater than 0.015, and a ΔCFI greater than 0.010 [118, 122, 123].

Step 3. Latent factors were defined by using a partially disaggregated item-parcel – namely, parcels were used as indicators [115, 116]. On one hand, the 'item-to-construct balance strategy' [124] was used to create parcels of unidimensional scales (i.e., RQ and RFQ-8u) – by examining factor loadings resulting from the aforementioned measurement models [124, 125]. On the other hand, the 'domain-representative strategy' [124, 125] was

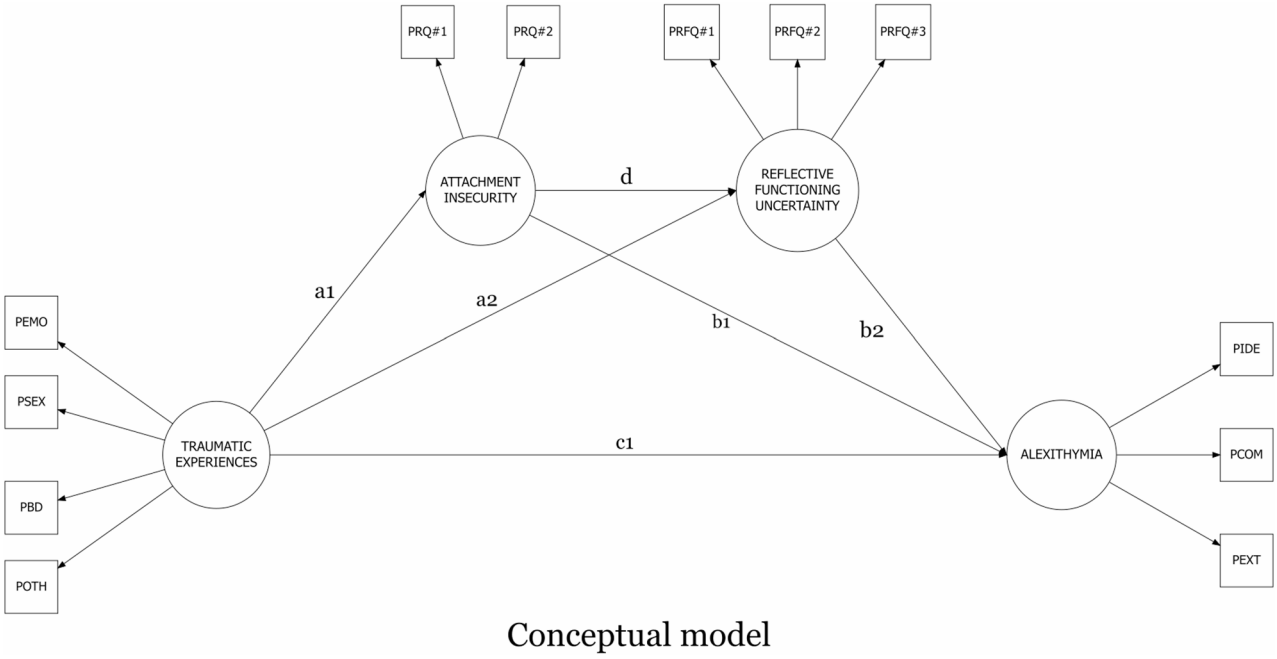

Fig. 1 *Conceptual model diagram*

Table 1 *Descriptive statistics and correlation analysis among variables*

	Descriptive statistics				Correlations			
	Mean	SD	SK	K	TEC	RQ	RFQ-8u	TAS-20
TEC	4.121	3.128	1.173	1.636	-			
RQ	15.975	4.806	-0.172	-0.625	0.234	-		
RFQ-8u	3.863	3.670	1.064	0.751	0.176	0.263	-	
TAS-20	46.566	12.851	0.272	-0.572	0.127	0.431	0.494	-

All correlations are statistically significant with $p < .001$; SD = standard deviation; SK = skewness; K = Kurtosis; TEC = Traumatic Experiences Checklist; RQ = Relationship Questionnaire; RFQ-8u = Reflective Functioning Questionnaire-8 uncertainty scale; TAS-20 = Toronto Alexithymia Scale 20

used to create parcels of the hierarchical structures (i.e., TEC and TAS-20) – by aggregating items within each dimension.

Step 4. Normal distribution was found for the large majority of item parcels. Consequently, the maximum likelihood (ML) estimator was used to test the hypothesized model with latent variables [98, 118]. Moreover, a 10,000 bootstrap resampling procedure with the Bollen–Stine method was used to deal with non-perfect normality of indicators [98, 126].

Step 5. The sequential multiple mediation model with latent variables was specified: traumatic experiences (X) predict alexithymia (Y) through adult attachment insecurity (M1) and uncertain reflective functioning (uncertainty) (M2) (see Fig. 1). This model was evaluated by using the aforementioned indices of good model fit (χ^2, RMSEA, CFI, SRMR) and their cutoff values. All regression coefficients (B) reported into the dedicated section (i.e., structural equation model) are unstandardized.

Results

Preliminary analysis

The distribution of observed variables was inspected as well as the relationships between the observed variables. As reported in Table 1, variables showed an almost univariate normal distribution. Moreover, small-to-moderate associations among variables included in the mediation model were found.

The multivariate multiple regression analysis showed no substantial effects (i.e., B*) of gender, age, or occupational status on psychological variables. More in detail, controlling for the other covariates, no statistically significant effect of (A) gender was found on alexithymia [B* = −0.016, p = .515]. However, a negligible effect of gender was found on traumatic experience(s) [B* = 0.076, p = .003], adult attachment insecurity [B* = 0.080, p = .002], and uncertain reflective functioning [B* = 0.060, p = .014]. Also, controlling for other covariates, negligible effects of (B) age were found on traumatic experiences [B* = 0.076, p = .008], adult attachment insecurity [B* = −0.153, $p < .001$], uncertain reflective functioning

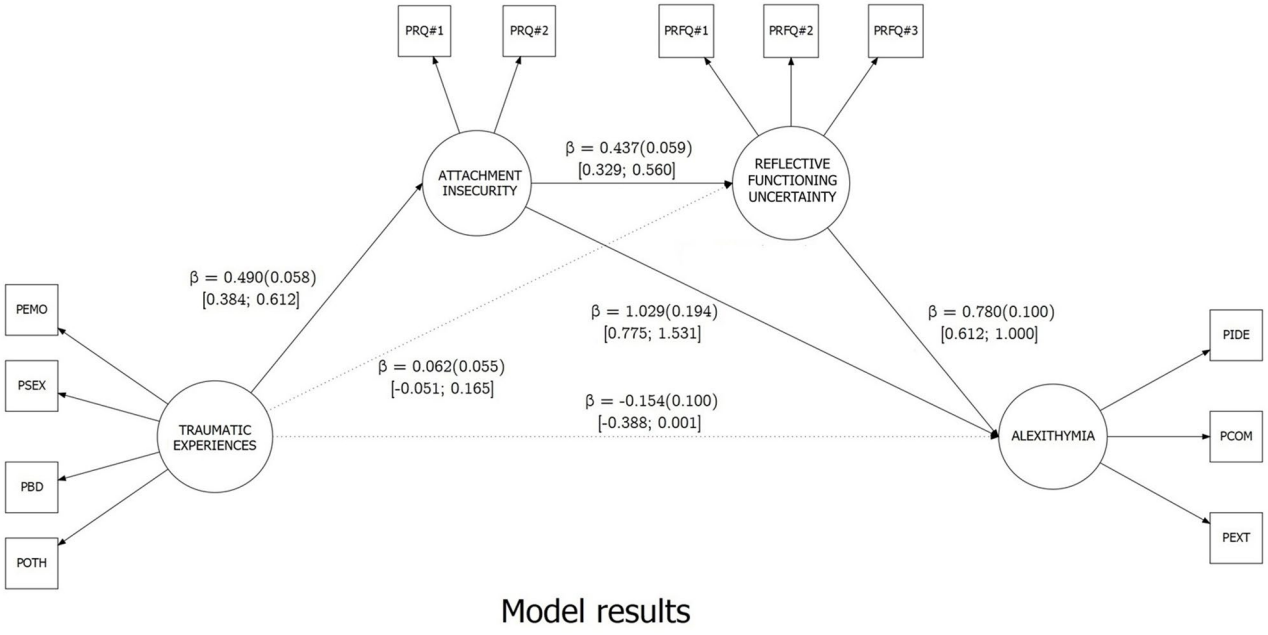

Fig. 2 *Sequential mediation model results*

[B* = – 0.111, p < .001], and alexithymia [B* = – 0.180, p < .001]. Finally, no statistical significant effects of (C) occupational status were found on traumatic experience(s) [B* = 0.046, p = .107], adult attachment insecurity [B* = – 0.011, p = .688], uncertain reflective functioning [B* = – 0.050, p = .071], and alexithymia [B* = – 0.050, p = .071].

Structural models

The TEC revealed adequate fit indices: χ^2 (373) = 1011.255; p < .001; RMSEA = 0.035; 90%CI[0.032, 0.037]; p(RMSEA < 0.05) = 1, CFI = 0.907, SRMR = 0.131. Also, the RQ revealed good fit indices: χ^2 (1) = 4.802; p = .028; RMSEA = 0.050; 90%CI[0.013, 0.099]; p(RMSEA < 0.05) = 0.402, CFI = 0.997, SRMR = 0.018. Also the RFQ-8u showed good fit indices: χ^2 (8) = 36.203; p < .001; RMSEA = 0.048; 90%CI[0.033, 0.065]; p(RMSEA < 0.05) = 0.535, CFI = 0.993, SRMR = 0.044. Lastly, the TAS-20 revealed adequate fit indices: χ^2 (167) = 1780.891; p < .001; RMSEA = 0.080; 90%CI[0.077, 0.083]; p(RMSEA < 0.05) < 0.001, CFI = 0.970, SRMR = 0.072.

Harman's single-factor test

The CFA with nine correlated factors provided adequate fit indices: χ^2 (1615) = 5846.081; p < .001; RMSEA = 0.042; 90%CI:0.041, 0.043]; p(RMSEA < 0.05) = 1, CFI = 0.955, SRMR = 0.093. In contrast, the CFA with a single latent factor provided poor fit indices: χ^2 (1651) = 15060.755; p < .001; RMSEA = 0.073; 90%CI [0.072, 0.74]; p(RMSEA < 0.05) < 0.001, CFI = 0.858, SRMR = 0.148. Model comparison suggested the absence of the 'common method bias': $\Delta\chi^2$ (36) = 9214.7, p < .001; |ΔRMSEA| = 0.032, and |ΔCFI| = 0.097.

Table 2 *Item-parcels' descriptive statistics*

	Descriptive statistics				Factor loading
	Mean	SD	SK	K	λ
PTEC#1	0.286	0.256	0.765	-0.115	0.753
PTEC#2	0.102	0.147	1.809	4.170	0.575
PTEC#3	0.042	0.096	2.631	7.746	0.411
PTEC#4	0.140	0.120	0.955	0.770	0.516
PRQ#1	4.006	1.456	-0.074	-0.712	0.502
PRQ#2	3.982	1.533	0.011	-0.890	0.583
PRFQu#1	0.661	0.699	0.912	0.222	0.720
PRFQu#2	0.702	0.771	0.994	0.295	0.750
PRFQu#3	0.569	0.743	1.325	1.156	0.716
PTAS#1	2.135	0.893	0.762	-0.185	0.846
PTAS#2	2.756	1.009	0.228	-0.761	0.722
PTAS#3	2.230	0.623	0.157	-0.508	0.379

each item-parcel factor loading (λ) is statistically significant at p < .001; P(…) = item parcel; TEC = Traumatic Experiences Checklist; RQ = Relationship Questionnaire; RFQu = Reflective Functioning Questionnaire 8 – uncertainty scale; TAS-20 = Toronto Alexithymia Scale 20

Structural equation model

The structural model (Fig. 2) provided good fit indices: χ^2 (48) = 469.431; p < .001; RMSEA = 0.076; 90%CI[0.070, 0.083]; p(RMSEA < 0.05) < 0.001, CFI = 0.905, SRMR = 0.051. All of the item-parcels were significantly related to their latent construct (Table 2). In line with the hypothesized model, traumatic experience(s) (X) positively predicted adult attachment insecurity (M_1), *path a1*: B = 0.497 (SE = 0.058), [95%CI: 0.392; 0.616], z = 8.645, p < .001, and adult attachment insecurity – in turn – positively predicted uncertain reflective functioning, i.e. uncertain reflective functioning (M_2), *path d*: B = 0.436 (SE = 0.059) [95%CI: 0.327, 0.560], z = 7.336, p < .001.

Table 3 *Structural equation model coefficients*

Traumatic experiences (X) → Attachment insecurity (M_1)	**Path**	**B***	**B (SE)**	**95% CI [L-U]**	**z-value**	***p*-value**	R^2
	a1	**0.445**	**0.497 (0.058)**	**[0.392; 0.616]**	**8.645**	***p* < .001**	**0.194**
Attachment insecurity (M_1) → Uncertain reflective functioning (M_2)	d	0.432	0.436 (0.059)	[0.327; 0.560]	7.336	$p < .001$	0.211
Uncertain reflective functioning (M_2) Alexithymia (Y)	b2	0.451	0.781 (0.100)	[0.611; 1.004]	7.810	$p < .001$	0.737
Traumatic experiences (X) → Uncertain reflective functioning (M_2)	a2	0.053	0.060 (0.056)	[-0.054; 0.167]	1.062	$p = .288$	
Attachment insecurity (M_1) → Alexithymia (Y)	b1	0.588	1.026 (0.195)	[0.771; 1.524]	5.251	$p < .001$	
Traumatic experiences (X) → Alexithymia (Y)	c1	-0.079	-0.155 (0.102)	[-0.397; 0.002]	-1.516	$p = .130$	
Effect of X on Y via M_1	a1*b1	0.262	0.510 (0.127)	[0.345; 0.834]	4.004	$p < .001$	
Effect of X on Y via M_2	a2*b2	0.024	0.047 (0.046)	[-0.040; 0.143]	1.008	$p = .313$	
Effect of X on Y via M_1 and M_2	a1*d*b2	0.087	0.169 (0.032)	[0.120; 0.243]	5.324	$p < .001$	
Total effect X on Y		0.293	0.571 (0.093)	[0.422; 0.788]	6.144	$p < .001$	

B* = standardized beta; B = unstandardized beta; 95%CI = 95% confidence intervals (lower and upper bound) for the unstandardized beta; R^2 = explained variance. Traumatic experiences (X): measured by the TEC; attachment insecurity (M_1): measured by the RQ; Uncertain reflective functioning (M_2): measured by the RFQ-8u – uncertainty scale; alexithymia (Y): measured by the TAS20

Lastly, uncertain reflective functioning (M_2) positively predicted alexithymia (Y) *path b2*: B = 0.781 (SE = 0.100) [95%CI: 0.611, 1.004], $z = 7.810$, $p < .001$ (Table 3).

In addition, adult attachment insecurity (M_1) positively predicted alexithymia (Y) *path b1*: B = 1.026 (SE = 0.195) [95%CI: 0.771, 1.524], $z = 5.251$, $p < .001$. The relationships between traumatic experience(s) (X) and uncertain reflective functioning (M_2) were not statistically significant [*path a2*: B = 0.060 (SE = 0.056) [95%CI: -0.054; 0.167], $z = 1.062$, $p = .288$]. Also, the relationships between traumatic experience(s) (X) and alexithymia (Y) were not statistically significant [*path c1*: B = -0.155 (SE = 0.102) [95%CI: -0.397; 0.002], $z = -1.516$, $p = .132$]. However, the total indirect effect [traumatic experience(s) → adult attachment insecurity → uncertain reflective functioning → alexithymia] was statistically significant: B = 0.169 (SE = 0.032) [95%CI: 0.120; 0.243], $z = 5.324$, $p < .001$]. Also, the total model effect was statistically significant: B = 0.571 (SE = 0.093) [95%CI: 0.422; 0.788], $z = 6.144$, $p < .001$], indicating a fully mediated model that highlighted the mediating role of both adult attachment insecurity and uncertain reflective functioning in the relationship between traumatic experiences and alexithymia. The total explained variance (R^2) of alexithymia in the model was 0.737.

Discussion

This study investigated the relationship between traumatic experiences, adult attachment insecurity, uncertain reflective functioning, and alexithymia in a community sample of young adults. The study found that the relationship between traumatic experiences and alexithymia was fully accounted for by adult attachment insecurity and sequentially by uncertain reflective functioning, a pattern consistent with the proposed theoretical model. These three factors jointly explained about three-quarters of the observed variance in alexithymia. By contrast, no evidence was found of a direct effect of traumatic experiences on alexithymia: B = -0.155 [95%CI: -0.397; 0.002].

The study found that the severity of traumatic experiences predicted higher levels of adult attachment insecurity (B = 0.497, [95%CI: 0.392; 0.616]). This is consistent with previous studies suggesting that interpersonal traumatic experiences, not only related with severe physical or sexual violence but also with emotional maltreatment or poor parental involvement [37, 83, 103, 127, 128], might be associated with lower levels of secure adult attachment and with insecure internal working models [55, 58, 129–132]. Furthermore, research has suggested that, when exposed to interpersonal traumatic experiences, individuals with insecure adult attachment tend to be less resilient and more at risk for psychopathological symptoms, compared to those with secure adult attachment [36, 128, 133, 134]. This might depend on the fact that they could not benefit from the possibility to elaborate distressing emotions and memories within a supportive meaningful relationship [36, 103, 127]. Furthermore, individuals with adult attachment insecurity might have difficulties in seeking and receiving interpersonal support when exposed to lifetime traumatic experiences, either because of excessive self-reliance or because of over-dependence on others [53, 59].

Furthermore, in line with previous research [36, 60, 85, 87, 89, 106, 135], higher adult attachment insecurity predicted greater impairment in reflective functioning (B = 0.436 [95%CI: 0.327, 0.560]), which in turn predicted higher levels of alexithymia (B = 0.781 [95%CI: 0.611, 1.004]). Notably, adult attachment insecurity also showed a significant independent indirect effect on alexithymia (B = 0.510 [95%CI: 0.345; 0.834]), suggesting that, beyond its sequential role through uncertain reflective functioning, attachment insecurity may constitute a pathway to alexithymia in its own right. This finding is consistent with theoretical accounts positing that insecure attachment directly undermines the capacity to identify, differentiate, and regulate emotional states [49, 59]. These

findings suggest that the reduction in the ability to identify, express, and manage negative emotions which constitutes alexithymia following traumatic experiences may be contingent upon insecure internal working models and diminished mentalization capacity.

In summary, the present findings are consistent with theoretical frameworks suggesting that the association between traumatic experiences and alexithymia may be shaped by the quality of adult attachment relationships and mentalization abilities [17, 37]. Secure adult attachment relationships have been theoretically linked to greater capacity for exploration, identification, differentiation, and management of internal mental states, which in turn may be associated with lower levels of alexithymia and more adaptive emotion regulation skills [78].

As a methodological note, it should be noted that, before estimating the SEM, preliminary analyses were conducted to identify demographic variables that might warrant inclusion as covariates, with the aim of preserving model parsimony and avoiding an overly complex structure. These analyses showed that all significant effects of demographic variables fell below or around the negligible threshold (B* ranging from 0.060 to 0.180) and were therefore not included in the SEM. Notably, the effect of age on alexithymia (B* = −0.180) and adult attachment insecurity (B* = −0.153) approached the small-effect cutoff and could be considered in future studies. Overall, these results support focusing the SEM on theoretically meaningful constructs while maintaining a parsimonious model.

Some limitations should be acknowledged. First, due to the observational/correlational nature of the research design, it was not possible to establish a causal relationship among variables, and hypotheses on putative mediating mechanisms were based on theory. Although mediation models are preferably tested within longitudinal perspective studies [136], the effort and cost required by this type of study tend to limit its use in clinical psychology research. Also, although only validated self-reported measures were used in this study, interview-based measures represent the gold standard, allowing for a more accurate recall and reduce the risk for recall bias. Moreover, another potential limitation lies in the limited set of sociodemographic variables collected for the description of the sample (such as, for example, educational level). Although the available sociodemographic variables suggest a relative independence from the constructs used in the SEM (see the preliminary analyses section), it cannot be ruled out that other variables might exert an effect. Consequently, future studies could consider assessing the role of additional sociodemographic variables in the proposed model. Although it is known that men and older people are less easily involved in online research [137, 138], literature suggests that the effect of sampling bias on observed associations might significantly vary [139]. Although preliminary analyses showed no associated effects, the disproportions in sample size between males and females did not allow to conduct a comparison across gender (i.e., multi-group SEM). Thus, future studies may overcome this gap by enrolling a more gender-balanced sample. Furthermore, the relationship between adult attachment insecurity, traumatic experiences, reflective functioning, and alexithymia might have been affected by other variables, not assessed in this study. These includes genetic and neurobiological characteristics which might affect temperament, as well as pre-existing mental health conditions. Furthermore, although Harman's single-factor test confirmed the absence of significant common method bias, the high proportion of explained variance (R^2 = 0.737) may partly reflect the degree of conceptual proximity among the assessed constructs – in particular between uncertain reflective functioning and alexithymia, both of which involve difficulties in understanding and processing internal mental states, and between attachment insecurity and alexithymia, as documented in the existing literature [49]. This should be taken into account when interpreting the magnitude of the explained variance.

Overall, the present findings are consistent with theoretical models suggesting that the association between traumatic experiences and alexithymia may be shaped by the quality of adult attachment relationships and mentalization abilities [17, 37]. Secure adult attachment relationships have been theoretically linked to greater capacity for exploring, identifying, distinguishing, and managing internal mental states, which in turn may be associated with lower levels of alexithymia and more adaptive emotion regulation abilities [78].

Moreover, from a clinical perspective, this study findings indicate that following traumatic experiences, high levels of adult attachment insecurity and failures in reflective functioning may affect the degree of alexithymia reported. Support and interventions could focus on enhancing reflective functioning abilities and provide a "secure base"/safe haven for their clients with a history of traumatic experiences to deal more effectively with dysregulated emotional states associated with traumatic memories. Since alexithymic conditions imply difficulties in emotional understanding and processing that might generate both mental and somatic symptoms, it is critical to understand that these symptoms may be associated with difficulties in mentalizing and relational insecurities, which in turn may be linked to traumatic experiences. In fact, this knowledge may serve to promote process-based effective interventions designed to enhance mentalizing abilities and promote adult attachment security, thereby mitigating risks to both mental and physical health associated with alexithymia. Examples of interventions

include emotion focused parenting interventions for children [140–143].

Conclusions

Its limitations notwithstanding, the current study provides empirical support for a theoretical model of the relationships among traumatic experiences, adult attachment insecurity, failures in mentalization, and alexithymia. The observed pattern of findings is consistent with the proposed sequential mediation model, though it should be interpreted as reflecting theoretical coherence rather than evidence of causal or developmental mechanisms, given the cross-sectional design and exclusive reliance on self-report measures. Since alexithymic conditions imply difficulties in emotional understanding and processing that might generate both mental and somatic symptoms, it is important to acknowledge that these symptoms may be associated with difficulties in mentalizing and attachment insecurities that may in turn be linked to traumatic experiences. These findings may inform the development of process-based interventions aimed at enhancing mentalizing abilities and fostering adult attachment security, with potential benefits for both mental and physical health.

Abbreviations

TEC	Traumatic Experiences Checklist
RQ	Relationship Questionnaire
RFQ-8	Reflective Functioning Questionnaire-8
RFQ-8u	Reflective Functioning Questionnaire-8, uncertainty scale
TAS-20	Toronto Alexithymia Scale-20
SEM	Structural Equation Modeling
CFA	Confirmatory Factor Analysis
ML	Maximum Likelihood
DWLS	Diagonally Weighted Least Squares
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation
SRMR	Standardized Root Mean Square Residual
CI	Confidence Interval
SE	Standard Error
B	Unstandardized regression coefficient
B*	Standardized regression coefficient
R^2	Explained variance

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40359-026-04411-x.

Supplementary Material 1.

Acknowledgements

Not applicable.

Authors' contributions

AM and AS Conceptualization, Methodology, and Supervision; LS and AAR: Methodology and Writing—original draft; AAR: Formal analysis, AAR, CF, SM, and AG Investigation and Data curation; all the authors: Writing—review & editing of the final draft.

Funding

None.

Data availability

The datasets generated and/or analysed during the current study are not publicly available due to privacy restrictions but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The Research Ethics Board of University of Parma approved this study (prot. N. 184304). Digital informed consent was obtained from all participants, and it was deemed equivalent to written consent. All procedures adhered to the relevant guidelines and regulations. The study described has been carried out in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Human Science, LUMSA University, Rome, Italy
[2]Department of Philosophy, Sociology, Education, and Applied Psychology, Section of Applied Psychology, University of Padova, Padova, Italy
[3]Center for intervention and Research on Family studies – CIRF – Department of Philosophy, Sociology, Education, and Applied Psychology, Section of Applied Psychology, University of Padova, Padova, Italy
[4]Department of Health Sciences, University of Florence, Florence, Italy
[5]Department of Medicine and Surgery, University of Parma, Parma, Italy
[6]Faculty of Human and Social Sciences, UKE – Kore University of Enna, Enna, Italy
[7]Department of Humanities, Social Sciences and Cultural Industries, University of Parma, Parma, Italy

Received: 27 December 2024 / Accepted: 18 March 2026
Published online: 25 April 2026

References

1. Bagby RM, Parker JDA, Taylor GJ. Twenty-five years with the 20-item Toronto Alexithymia Scale. J Psychosom Res. 2020;131:109940. https://doi.org/10.1016/j.jpsychores.2020.109940.
2. Nemiah JC. Alexithymia: a view of the psychosomatic process. Mod Trends Psychosom Med. 1976;3:430–9. https://doi.org/10.15064/JJPM.51.5_376.
3. Luminet O, Bagby RM, Taylor GJ. Alexithymia: Advances in Research, Theory, and Clinical Practice. In: Alexithymia: Advances in Research, Theory, and Clinical Practice. 2018;1–352. https://doi.org/10.1017/9781108241595.
4. Taylor GJ, Bagby RM, Parker JD. Disorders of affect regulation: Alexithymia in medical and psychiatric illness. Cambridge University Press; 1997. https://doi.org/10.1017/CBO9780511526831.
5. Sancassiani F, Montisci R, Preti A, Paribello P, Meloni L, Romano F, et al. Surviving to acute myocardial infarction: The role of psychological factors and alexithymia in delayed time to searching care: A systematic review. J Clin Med. 2021;10. https://doi.org/10.3390/jcm10173813.
6. Di Tella M, Benfante A, Airale L, Castelli L, Milan A. Alexithymia and Hypertension: Does Personality Matter? A Systematic Review and Meta-analysis. Curr Cardiol Rep. 2023;25:711–24. https://doi.org/10.1007/s11886-023-01894-7.
7. Porcelli P, Todarello O. Psychological Factors Affecting Functional Gastrointestinal Disorders. Psychol Factors Affect Med Cond. 2007;28:34–56. https://doi.org/10.1159/000106796.
8. Yang Y, Lin Y, Sikapokoo GO, Min SH, Caviness-Ashe N, Zhang J, et al. Social relationships and their associations with affective symptoms of women with breast cancer: A scoping review. PLoS ONE. 2022;17:e0272649. https://doi.org/10.1371/journal.pone.0272649.
9. Assogna F, Cravello L, Orfei MD, Cellupica N, Caltagirone C, Spalletta G. Alexithymia in Parkinson's disease: A systematic review of the literature. Parkinsonism Relat Disord. 2016;28:1–11. https://doi.org/10.1016/j.parkreldis.2016.03.021.

10. Ricciardi L, Demartini B, Fotopoulou A, Edwards MJ. Alexithymia in neurological disease: A review. J Neuropsychiatry Clin Neurosci. 2015;27:179–87. https://doi.org/10.1176/appi.neuropsych.14070169.
11. Benfante A, Romeo A. Alexithymia Among People Living with HIV: A Scoping Review. AIDS Behav. 2023;27:1926–41. https://doi.org/10.1007/s10461-022-03926-9.
12. Holmes A, Marella P, Rodriguez C, Glass D, Goerlich KS. Alexithymia and Cutaneous Disease Morbidity: A Systematic Review. Dermatology. 2022. https://doi.org/10.1159/000524736.
13. Tang F-Y, Xiong Q, Gan T, Yuan L, Liao Q, Yu Y-F. The prevalence of alexithymia in psoriasis: A systematic review and meta-analysis. J Psychosom Res. 2022;161:111017. https://doi.org/10.1016/j.jpsychores.2022.111017.
14. Sagar R, Talwar S, Desai G, Chaturvedi S. Relationship between alexithymia and depression: A narrative review. Indian J Psychiatry. 2021;63:127–33. https://doi.org/10.4103/psychiatry.IndianJPsychiatry_738_19.
15. Mannarini S, Taccini F, Rossi AA. Women and violence: alexithymia, relational competence and styles, and satisfaction with life: A comparative profile analysis. Behav Sci. 2021;11. https://doi.org/10.3390/bs11110147.
16. Putica A, Van Dam NT, Steward T, Agathos J, Felmingham K, O'Donnell M. Alexithymia in post-traumatic stress disorder is not just emotion numbing: Systematic review of neural evidence and clinical implications. J Affect Disord. 2021;278:519–27. https://doi.org/10.1016/j.jad.2020.09.100.
17. Schimmenti A, Caretti V. Attachment, Trauma, and Alexithymia. In: Alexithymia: Advances in Research, Theory, and Clinical Practice. 2018;127–41. https://doi.org/10.1017/9781108241595.010.
18. Mannarini S, Taccini F, Rossi AA. The Role of Alexithymia and Impulsivity in Male Victims and Perpetrators of Intimate Partner Violence. Behav Sci. 2023;13. https://doi.org/10.3390/bs13050402.
19. Honkalampi K, Jokela M, Lehto SM, Kivimäki M, Virtanen M. Association between alexithymia and substance use: A systematic review and meta-analysis. Scand J Psychol. 2022;63:427–38. https://doi.org/10.1111/sjop.12821.
20. Mahapatra A, Sharma P. Association of Internet addiction and alexithymia – A scoping review. Addict Behav. 2018;81:175–82. https://doi.org/10.1016/j.addbeh.2018.02.004.
21. Marchetti D, Verrocchio MC, Porcelli P. Gambling problems and alexithymia: A systematic review. Brain Sci. 2019;9. https://doi.org/10.3390/brainsci9080191.
22. Musetti A, Mancini T, Corsano P, Santoro G, Cavallini MC, Schimmenti A. Maladaptive personality functioning and psychopathological symptoms in problematic video game players: A person-centered approach. Front Psychol. 2019;10:2559.
23. Musetti A, Starcevic V, Boursier V, Corsano P, Billieux J, Schimmenti A. Childhood emotional abuse and problematic social networking sites use in a sample of Italian adolescents: The mediating role of deficiencies in self-other differentiation and uncertain reflective functioning. J Clin Psychol. 2021;77:1666–84. https://doi.org/10.1002/jclp.23138.
24. Schimmenti A, Passanisi A, Caretti V, La Marca L, Granieri A, Iacolino C, et al. Traumatic experiences, alexithymia, and Internet addiction symptoms among late adolescents: A moderated mediation analysis. Addict Behav. 2017;64:314–20. https://doi.org/10.1016/j.addbeh.2015.11.002.
25. Balottin L, Nacinovich R, Bomba M, Mannarini S. Alexithymia in parents and adolescent anorexic daughters: Comparing the responses to TSIA and TAS-20 scales. Neuropsychiatr Dis Treat. 2014;10:1941–51. https://doi.org/10.2147/NDT.S67642.
26. Bonfanti RC, Sideli L, Teti A, Musetti A, Cella S, Barberis N, et al. The Impact of the First and Second Wave of the COVID-19 Pandemic on Eating Symptoms and Dysfunctional Eating Behaviours in the General Population: A Systematic Review and Meta-Analysis. Nutrients. 2023;15:3607. https://doi.org/10.3390/nu15163607.
27. Mannarini S, Kleinbub JR. Parental-Bonding and Alexithymia in Adolescents with Anorexia Nervosa, Their Parents, and Siblings. Behav Sci. 2022;12. https://doi.org/10.3390/bs12050123.
28. Nowakowski ME, McFarlane T, Cassin S. Alexithymia and eating disorders: a critical review of the literature. J Eat Disord. 2013;1:21. https://doi.org/10.1186/2050-2974-1-21.
29. Westwood H, Kerr-Gaffney J, Stahl D, Tchanturia K. Alexithymia in eating disorders: Systematic review and meta-analyses of studies using the Toronto Alexithymia Scale. J Psychosom Res. 2017;99:66–81. https://doi.org/10.1016/j.jpsychores.2017.06.007.
30. Sloan E, Hall K, Moulding R, Bryce S, Mildred H, Staiger PK. Emotion regulation as a transdiagnostic treatment construct across anxiety, depression, substance, eating and borderline personality disorders: A systematic review. Clin Psychol Rev. 2017;57:141–63. https://doi.org/10.1016/j.cpr.2017.09.002.
31. Cai RY, Richdale AL, Uljarević M, Dissanayake C, Samson AC. Emotion regulation in autism spectrum disorder: Where we are and where we need to go. Autism Res. 2018;11:962–78. https://doi.org/10.1002/aur.1968.
32. Kinnaird E, Stewart C, Tchanturia K. Investigating alexithymia in autism: A systematic review and meta-analysis. Eur Psychiatry. 2019;55:80–9. https://doi.org/10.1016/j.eurpsy.2018.09.004.
33. Cardeña E, Butler LD, Spiegel D. Stress Disorders. In: Weiner B, editor. Handbook of Psychology. John Wiley & Sons, Ltd; 2003;229–49. https://doi.org/10.1002/0471264385.WEI0809.
34. Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Burden and consequences of child maltreatment in high-income countries. Lancet. 2009;373:68–81. https://doi.org/10.1016/S0140-6736(08)61706-7.
35. Aust S, Bajbouj M. The role of early emotional neglect in alexithymia. Neuropsychotherapist. 2014;4:96–7. https://doi.org/10.12744/tnpt(4)096-097.
36. Schimmenti A. The developmental roots of dissociation: A multiple mediation analysis. Psychoanal Psychol. 2017;34:96–105. https://doi.org/10.1037/pap0000084.
37. Schimmenti A, Caretti V. Linking the overwhelming with the unbearable: Developmental trauma, dissociation, and the disconnected self. Psychoanal Psychol. 2016;33:106–28. https://doi.org/10.1037/a0038019.
38. Khan AN, Jaffee SR. Alexithymia in individuals maltreated as children and adolescents: a meta-analysis. J Child Psychol Psychiatry. 2022;63:963–72. https://doi.org/10.1111/jcpp.13616.
39. Lavi I, Katz LF, Ozer EJ, Gross JJ. Emotion Reactivity and Regulation in Maltreated Children: A Meta-Analysis. Child Dev. 2019;90:1503–24. https://doi.org/10.1111/cdev.13272.
40. Frewen PA, Dozois DJA, Neufeld RWJ, Lanius RA. Meta-analysis of alexithymia in posttraumatic stress disorder. J Trauma Stress. 2008;21:243–6. https://doi.org/10.1002/jts.20320.
41. Wise TN, Mann LS, Mitchell JD, Hryvniak M, Hill B. Secondary alexithymia: An empirical validation. Compr Psychiatry. 1990;31:284–8. https://doi.org/10.1016/0010-440X(90)90035-Q.
42. Butow PN, Hiller JE, Price MA, Thackway SV, Kricker A, Tennant CC. Epidemiological evidence for a relationship between life events, coping style, and personality factors in the development of breast cancer. J Psychosom Res. 2000;49:169–81. https://doi.org/10.1016/s0022-3999(00)00156-2.
43. Craparo G, Gori A, Mazzola E, Petruccelli I, Pellerone M, Rotondo G. Posttraumatic stress symptoms, dissociation, and alexithymia in an Italian sample of flood victims. Neuropsychiatr Dis Treat. 2014;10:2281–4. https://doi.org/10.2147/NDT.S74317.
44. Craparo G, Gori A, Petruccelli I, Cannella V, Simonelli C. Intimate Partner Violence: Relationships Between Alexithymia, Depression, Attachment Styles, and Coping Strategies of Battered Women. J Sex Med. 2014;11:1484–94. https://doi.org/10.1111/jsm.12505.
45. Giacinto A, Lai C, Cieri F, Cinosi E, Massaro G, Angelini V, et al. Difficulty describing feelings and post-traumatic symptoms after a collective trauma in survivors of L'Aquila earthquake. J Ment Health. 2015;24:150–4. https://doi.org/10.3109/09638237.2015.1019055.
46. Gao W, Zhao J, Li Y, Cao FL. Post-traumatic stress disorder symptoms in first-time myocardial infarction patients: Roles of attachment and alexithymia. J Adv Nurs. 2015;71:2575–84. https://doi.org/10.1111/jan.12726.
47. Söndergaard HP, Theorell T. Alexithymia, emotions and PTSD; findings from a longitudinal study of refugees. Nord J Psychiatry. 2004;58:185–91. https://doi.org/10.1080/08039480410006214.
48. Marrazzo G, Sideli L, Rizzo R, Marinaro AM, Mulè A, Marrazzo A et al. Quality of life, alexithymia, and defense mechanisms in patients affected by breast cancer across different stages of illness. J Psychopathol. 2016;22.
49. Zhang J, Zhang Y, Mao Y, Wang Y. The relationship between insecure attachment and alexithymia: A meta-analysis. Current Psychology; 2023. https://doi.org/10.1007/s12144-023-04749-0.
50. Montebarocci O, Codispoti M, Baldaro B, Rossi N. Adult attachment style and alexithymia. Personal Individ Differ. 2004;36:499–507. https://doi.org/10.1016/S0191-8869(03)00110-7.
51. Pellerone M, Formica I, Lopez MH, Migliorisi S, Granà R. Relationship between parenting, alexithymia and adult attachment styles: a cross-national study in Sicilian and Andalusian young adults. Mediterr J Clin Psychol. 2017;5. https://doi.org/10.6092/2282-1619/2017.5.1557.
52. Pellerone M, Tomasello G, Migliorisi S. Relationship between parenting, alexithymia and adult attachment styles: A cross-sectional study on a group of adolescents and young adults. Clin Neuropsychiatry. 2017;14:125–34.
53. Bowlby J, London. UK: The Hogarth Press and the Institute of Psycho-Analysis; 1973.

54. Bowlby J. Attachment and Loss. Basic Books; 1969.
55. Bowlby J. A secure base: clinical applications of attachment theory. Psychother Theory Res Pract Train. 1988;27.
56. Hazan C, Shaver P. Romantic love conceptualized as an attachment process. J Pers Soc Psychol. 1987;52:511–24. https://doi.org/10.1037//0022-3514.52.3.511.
57. Bartholomew K, Horowitz LM. Attachment styles among young adults: A test of a four-category model. J Pers Soc Psychol. 1991;61:226–44. https://doi.org/10.1037/0022-3514.61.2.226.
58. Bretherton I. Updating the 'internal working model'construct: Some reflections. Attach Hum Dev. 1999;1:343–57.
59. Mikulincer M, Shaver PR, Pereg D. Attachment Theory and Affect Regulation: The Dynamics, Development, and Cognitive Consequences of Attachment-Related Strategies. Motiv Emot. 2003;27:77–102. https://doi.org/10.1023/A:1024515519160.
60. Santoro G, Midolo LR, Costanzo A, Schimmenti A. The vulnerability of insecure minds: The mediating role of mentalization in the relationship between attachment styles and psychopathology. Bull Menninger Clin. 2021;85:358–84. https://doi.org/10.1521/bumc.2021.85.4.358.
61. Mikulincer M, Shaver PR. The attachment behavioral system in adulthood: Activation, psychodynamics, and interpersonal processes. In: Zanna M, editor. Advances in experimental social psychology. Academic; 2003.
62. Pietromonaco PR, Beck LA. Adult attachment and physical health. Curr Opin Psychol. 2019;25:115–20. https://doi.org/10.1016/j.copsyc.2018.04.004.
63. Pearse E, Bucci S, Raphael J, Berry K. The relationship between attachment and functioning for people with serious mental illness: a systematic review. Nord J Psychiatry. 2020;74:545–57. https://doi.org/10.1080/08039488.2020.1767687.
64. Harari D, Bakermans-Kranenburg MJ, Kloet CS, Geuze E, Vermetten E, Westenberg HG, et al. Attachment representations in Dutch veterans with and without deployment-related PTSD. Attach Hum Dev. 2009;11:515–36. https://doi.org/10.1080/14616730903282480.
65. Fraley RC, Fazzari DA, Bonanno GA, Dekel S. Attachment and psychological adaptation in high exposure survivors of the September 11th attack on the World Trade Center. Pers Soc Psychol Bull. 2006;32:538–51. https://doi.org/10.1177/0146167205282741.
66. Mikulincer M, Shaver PR. An attachment perspective on loss and grief. Curr Opin Psychol. 2022;45:101283. https://doi.org/10.1016/j.copsyc.2021.11.003.
67. Shevlin M, Boyda D, Elklit A, Murphy S. Adult attachment styles and the psychological response to infant bereavement. Eur J Psychotraumatology. 2014;5:10 3402 5 23295. https://doi.org/10.3402/ejpt.v5.23295.
68. Knox L, Karantzas G, Ferguson E. The Role of Attachment, Insecurity, and Stress in Partner Maltreatment: A Meta-Analysis. Trauma Violence Abuse. 2024;25:721–37. https://doi.org/10.1177/15248380231161012.
69. Davila J, Cobb RJ. Predicting change in self-reported and interviewer-assessed adult attachment: tests of the individual difference and life stress models of attachment change. Pers Soc Psychol Bull. 2003;29:859–70. https://doi.org/10.1177/0146167203029007005.
70. Waters E, Merrick S, Treboux D, Crowell J, Albersheim L. Attachment Security in Infancy and Early Adulthood: A Twenty-Year Longitudinal Study. Child Dev. 2000;71:684–9. https://doi.org/10.1111/1467-8624.00176.
71. Weinfield NS, Sroufe LA, Egeland B. Attachment from Infancy to Early Adulthood in a High-Risk Sample: Continuity, Discontinuity, and Their Correlates. Child Dev. 2000;71:695–702. https://doi.org/10.1111/1467-8624.00178.
72. Barazzone N, Santos I, McGowan J, Donaghay-Spire E. The links between adult attachment and post-traumatic stress: A systematic review. Psychol Psychother Theory Res Pract. 2019;92:131–47. https://doi.org/10.1111/papt.12181.
73. Woodhouse S, Ayers S, Field AP. The relationship between adult attachment style and post-traumatic stress symptoms: A meta-analysis. J Anxiety Disord. 2015;35:103–17. https://doi.org/10.1016/j.janxdis.2015.07.002.
74. Fonagy P, Target M. Playing with reality: I. Theory of mind and the normal development of psychic reality. Int J Psychoanal. 1996;77:217–33.
75. Fonagy P, Target M. Playing with reality: III. The persistence of dual psychic reality in borderline patients. Int J Psychoanal. 2000;81:853–73. https://doi.org/10.1516/0020757001600165.
76. Target M, Fonagy P. Playing with reality: II. The development of psychic reality from a theoretical perspective. Int J Psychoanal. 1996;77:459–79.
77. Cooke JE, Kochendorfer LB, Stuart-Parrigon KL, Koehn AJ, Kerns KA. Parent-child attachment and children's experience and regulation of emotion: A meta-analytic review. Emotion. 2019;19:1103–26. https://doi.org/10.1037/EMO0000504.
78. Fonagy P, Gergely G, Jurist E, Target M. Affect. Regulation, Mentalization, and the Development of the Self. London, UK: Other; 2002.
79. Sharp C, Fonagy P. The parent's capacity to treat the child as a psychological agent: Constructs, measures and implications for developmental psychopathology: Topic review. Soc Dev. 2008;17:737–54. https://doi.org/10.1111/j.1467-9507.2007.00457.x.
80. Lavi I, Manor-Binyamini I, Seibert E, Katz LF, Ozer EJ, Gross JJ. Broken bonds: A meta-analysis of emotion reactivity and regulation in emotionally maltreating parents. Child Abuse Negl. 2019;88:376–88. https://doi.org/10.1016/J.CHIABU.2018.11.016.
81. Bateman A, Fonagy P. Borderline Personality Disorder and Mood Disorders: Mentalizing as a Framework for Integrated Treatment. J Clin Psychol. 2015;71:792–804. https://doi.org/10.1002/JCLP.22206.
82. Fonagy P, Luyten P, Moulton-Perkins A, Lee YW, Warren F, Howard S, et al. Development and validation of a self-report measure of mentalizing: The reflective functioning questionnaire. PLoS ONE. 2016;11:0158678. https://doi.org/10.1371/journal.pone.0158678.
83. Fonagy P, Luyten P. A developmental, mentalization-based approach to the understanding and treatment of borderline personality disorder. Dev Psychopathol. 2009;21:1355–81. https://doi.org/10.1017/S0954579409990198.
84. Taylor GJ, Bagby RM. Psychoanalysis and Empirical Research: The Example of Alexithymia. J Am Psychoanal Assoc. 2013;61:99–133. https://doi.org/10.1177/0003065112474066.
85. Badoud D, Luyten P, Fonseca-Pedrero E, Eliez S, Fonagy P, Debbané M. The French version of the reflective functioning questionnaire: Validity data for adolescents and adults and its association with non-suicidal self-injury. PLoS ONE. 2015;10:0145892. https://doi.org/10.1371/journal.pone.0145892.
86. Borghesi F, Cipresso P, Franceschini C, Guglielmucci F, Musetti A. Understanding the relationship between Traumatic experiences and Compulsive Internet use through the lens of mentalization: A mediation analysis. Annu Rev CyberTherapy Telemed. 2022;20:121–6.
87. Cucchi A, Hampton JA, Moulton-Perkins A. Using the validated Reflective Functioning Questionnaire to investigate mentalizing in individuals presenting with eating disorders with and without self-harm. PeerJ. 2018;6:5756. https://doi.org/10.7717/peerj.5756.
88. Quattropani MC, Geraci A, Lenzo V, Sardella A, Schimmenti A. Failures in Reflective Functioning, Dissociative Experiences, and Eating Disorder: a Study On a Sample of Italian Adolescents. J Child Adolesc Trauma. 2022;15:365–74. https://doi.org/10.1007/s40653-022-00450-9.
89. Musetti A, Pingani L, Zagaria A, Uberti D, Meli S, Lenzo V, et al. Insecure adult attachment and reflective functioning as mechanisms of the relationship between traumatic life events and suicidal ideation: A path analysis. Front Psychol. 2022;13. https://doi.org/10.3389/FPSYG.2022.985148.
90. Musetti A, Gagliardini G, Lenzo V, Cella S. From childhood emotional maltreatment to disordered eating: A path analysis. Psychoanal Psychol. 2023. https://doi.org/10.1037/pap0000438. :No Pagination Specified-No Pagination Specified.
91. Rossi AA, Mannarini S. Childhood traumatic experiences and addiction-like eating behaviors: the mediating roles of attachment, mentalization, and emotional eating. J Eat Disord. 2025;13:288. https://doi.org/10.1186/s40337-025-01473-x.
92. Rossi AA, Tagliagambe A, Scuderi A, Dalla Ragione L, Mannarini S. The Path from Childhood Emotional Maltreatment to Disordered Eating Behaviors: The Role of Reflective Functioning and Food Addiction. Nutrients. 2025. https://doi.org/10.3390/nu17111863.
93. Santoro G, Cannavò M, Schimmenti A, Barberis N. Childhood trauma and eating disorder risk among young adult females: The mediating role of mentalization. Dev Psychopathol. 2025;1–8. https://doi.org/10.1017/S0954579425100205.
94. Rossi AA, Tagliagambe A, Scuderi A, Dalla Ragione L, Mannarini S. Uncontrolled Eating Through the Lens of Mentalization and Emotional Eating: The Moderating Role of Food Addiction. Nutrients. 2025;17:3233. https://doi.org/10.3390/nu17203233.
95. Rossi AA, Tagliagambe A, Mannarini S, Dalla Ragione L. Insecure attachment and impaired reflective functioning mediate the association between childhood trauma and grazing behavior. Front Psychol. 2025;16. https://doi.org/10.3389/fpsyg.2025.1703521.
96. Fricker RD, London England EC1Y 1SP United Kingdom. Sampling Methods for Web and E-mail Surveys. The SAGE Handbook of Online Research Methods. 1 Oliver's Yard, 55 City Road. SAGE Publications, Ltd; 2008. pp. 195–216. https://doi.org/10.4135/9780857020055.n11.
97. Pozzar R, Hammer MJ, Underhill-Blazey M, Wright AA, Tulsky JA, Hong F, et al. Threats of Bots and Other Bad Actors to Data Quality Following Research Participant Recruitment Through Social Media: Cross-Sectional Questionnaire. J Med Internet Res. 2020;22:e23021. https://doi.org/10.2196/23021.

98. Kline RB. Principles and Practice of Structural Equation Modeling. Guilford.; 2016.
99. Nijenhuis ERS, Van Der Hart O, Kruger K. The psychometric characteristics of the traumatic experiences checklist (TEC): first findings among psychiatric outpatients. Clin Psychol Psychother. 2002;9:200–10. https://doi.org/10.1002/cpp.332.
100. Craparo G, Schimmenti A, Caretti V. Traumatic experiences in childhood and psychopathy: a study on a sample of violent offenders from Italy. Eur J Psychotraumatology. 2013;4:21471. https://doi.org/10.3402/ejpt.v4i0.21471.
101. Schimmenti A, Passanisi A, Gervasi AM, Manzella S, Famà FI. Insecure Attachment Attitudes in the Onset of Problematic Internet Use Among Late Adolescents. Child Psychiatry Hum Dev. 2014;45:588–95. https://doi.org/10.1007/s10578-013-0428-0.
102. van Duijl M, Nijenhuis E, Komproe IH, Gernaat HBPE, de Jong JT. Dissociative Symptoms and Reported Trauma Among Patients with Spirit Possession and Matched Healthy Controls in Uganda. Cult Med Psychiatry. 2010;34:380–400. https://doi.org/10.1007/s11013-010-9171-1.
103. Schimmenti A. The trauma factor: Examining the relationships among different types of trauma, dissociation, and psychopathology. J Trauma Dissociation. 2018;19:552–71. https://doi.org/10.1080/15299732.2017.1402400.
104. Cronholm PF, Forke CM, Wade R, Bair-Merritt MH, Davis M, Harkins-Schwarz M, et al. Adverse Childhood Experiences. Am J Prev Med. 2015;49:354–61. https://doi.org/10.1016/j.amepre.2015.02.001.
105. Carli L. Attaccamento e rapporto di coppia [Attachment and couple relationships]. Milano, IT: Raffaello Cortina; 1995.
106. Morandotti N, Brondino N, Merelli A, Boldrini A, Vidovich GZ, Ricciardo S, et al. The Italian version of the Reflective Functioning Questionnaire: Validity data for adults and its association with severity of borderline personality disorder. PLoS ONE. 2018;13:0206433. https://doi.org/10.1371/journal.pone.0206433.
107. Bagby RM, Parker JDA, Taylor GJ. The twenty-item Toronto Alexithymia scale—I. Item selection and cross-validation of the factor structure. J Psychosom Res. 1994;38:23–32. https://doi.org/10.1016/0022-3999(94)90005-1.
108. Bressi C, Taylor G, Parker J, Bressi S, Brambilla V, Aguglia E, et al. Cross validation of the factor structure of the 20-item Toronto Alexithymia Scale: An Italian multicenter study. J Psychosom Res. 1996;41:551–9. https://doi.org/10.1016/S0022-3999(96)00228-0.
109. Rosseel Y. lavaan: An R Package for Structural Equation Modeling. J Stat Softw. 2012;48:1–36. https://doi.org/10.18637/jss.v048.i02.
110. Revelle W. Package psych - Procedures for Psychological, Psychometric and Personality Research. R Package. 2015;:1–358.
111. Wickham H, Averick M, Bryan J, Chang W, McGowan L, François R, et al. Welcome to the Tidyverse. J Open Source Softw. 2019;4:1686. https://doi.org/10.21105/joss.01686.
112. Iannone R. DiagrammeR: Graph/Network Visualization. 2023.
113. Tabachnick BG, Fidell LS. Using Multivariate Statistics: Pearson new international edition. Pearson; 2014.
114. Rossi AA, Panzeri A, Taccini F, Parola A, Mannarini S. The Rising of the Shield hero. Development of the Post-Traumatic Symptom Questionnaire (PTSQ) and Assessment of the Protective Effect of self-esteem from trauma-related Anxiety and Depression. J Child Adolesc Trauma. 2024;17:83–101. https://doi.org/10.1007/s40653-022-00503-z.
115. Cohen J. Statistical Power Analysis for the Behavioral Sciences. Hilsdale: Lawrence Earlbaum Associates; 1988.
116. Weston R, Gore PA. A Brief Guide to Structural Equation Modeling. Couns Psychol. 2006;34:719–51. https://doi.org/10.1177/0011000006286345.
117. Rossi AA, Mannarini S, Donini LM, Castelnuovo G, Simpson S, Pietrabissa G. Dieting, obsessive-compulsive thoughts, and orthorexia nervosa: Assessing the mediating role of worries about food through a structural equation model approach. Appetite. 2024;193:107164. https://doi.org/10.1016/j.appet.2023.107164.
118. Brown TA. Confirmatory factor analysis for applied research. 2nd ed. New York, NY, US: The Guilford Press; 2015.
119. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model Multidiscip J. 1999;6:1–55. https://doi.org/10.1080/10705519909540118.
120. van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. Eur J Dev Psychol. 2012;9:486–92. https://doi.org/10.1080/17405629.2012.686740.
121. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. J Appl Psychol. 2003;88:879–903. https://doi.org/10.1037/0021-9010.88.5.879.
122. Cheung GW, Rensvold RB. Evaluating Goodness-of-Fit Indexes for Testing Measurement Invariance. Struct Equ Model Multidiscip J. 2002;9:233–55. https://doi.org/10.1207/S15328007SEM0902_5.
123. Millsap RE. Statistical Approaches to Measurement Invariance. New York, NY, US: Routledge; 2012.
124. Little TD, Rhemtulla M, Gibson K, Schoemann AM. Why the items versus parcels controversy needn't be one. Psychol Methods. 2013;18:285–300. https://doi.org/10.1037/a0033266.
125. Coffman DL, MacCallum RC. Using Parcels to Convert Path Analysis Models Into Latent Variable Models. Multivar Behav Res. 2005;40:235–59. https://doi.org/10.1207/s15327906mbr4002_4.
126. MacKinnon DP. Introduction to statistical mediation analysis. Routledge; 2012. https://doi.org/10.4324/9780203809556.
127. Bifulco A, Schimmenti A. Assessing child abuse: We need to talk! Child Abuse Negl. 2019;98:104236. https://doi.org/10.1016/j.chiabu.2019.104236.
128. Schimmenti A, Bifulco A. Linking lack of care in childhood to anxiety disorders in emerging adulthood: The role of attachment styles. Child Adolesc Ment Health. 2015;20:41–8. https://doi.org/10.1111/camh.12051.
129. Griffin DW, Bartholomew K. The metaphysics of measurement: The case of adult attachment. Attachment processes in adulthood. London, England: Jessica Kingsley; 1994;17–52.
130. Griffin DW, Bartholomew K. Models of the self and other: Fundamental dimensions underlying measures of adult attachment. J Pers Soc Psychol. 1994;67:430–45. https://doi.org/10.1037/0022-3514.67.3.430.
131. Mannarini S, Boffo M. The relevance of security: A latent domain of attachment relationships. Scand J Psychol. 2014;55:53–9. https://doi.org/10.1111/sjop.12091.
132. Taccini F, Rossi AA, Mannarini S, Rossi AA. Intergenerational Transmission of Relational Styles: Current Considerations. Front Psychol. 2021;12:1–6. https://doi.org/10.3389/fpsyg.2021.672961.
133. Midolo LR, Santoro G, Ferrante E, Pellegriti P, Russo S, Costanzo A, et al. Childhood trauma, attachment and psychopathology: A correlation network approach. Mediterr J Clin Psychol. 2020;8:1–25. https://doi.org/10.6092/2282-1619/mjcp-2418.
134. Sideli L, Murray RM, Schimmenti A, Corso M, Barbera D, Trotta A, et al. Childhood adversity and psychosis: A systematic review of bio-psycho-social mediators and moderators. Psychol Med. 2020;50:1761–82. https://doi.org/10.1017/S0033291720002172.
135. Musetti A, Brazzi F, Folli MC, Plazzi G, Franceschini C. Childhood Trauma, Reflective Functioning, and Problematic Mobile Phone Use Among Male and Female Adolescents. Open Psychol J. 2020;13:242–52. https://doi.org/10.2174/1874350102013010242.
136. Maxwell SE, Cole DA. Bias in cross-sectional analyses of longitudinal mediation. Psychol Methods. 2007;12:23–44. https://doi.org/10.1037/1082-989X.12.1.23.
137. Kwak N, Radler B. A comparison between mail and web surveys: Response pattern, respondent profile, and data quality. J Off Stat. 2002;18:257–73.
138. Steinmetz S, Tijdens K, De Pedraza P. Comparing different weighting procedures for volunteer web surveys: Lessons to be learned from German and Dutch WageIndicator data. 2009.
139. Haddad C, Sacre H, Zeenny RM, Hajj A, Akel M, Iskandar K, et al. Should samples be weighted to decrease selection bias in online surveys during the COVID-19 pandemic? Data from seven datasets. BMC Med Res Methodol. 2022;22:63. https://doi.org/10.1186/s12874-022-01547-3.
140. Luyten P, Campbell C, Moser M, Fonagy P. The role of mentalizing in psychological interventions in adults: Systematic review and recommendations for future research. Clin Psychol Rev. 2024;108:102380. https://doi.org/10.1016/j.cpr.2024.102380.
141. Havighurst SS, Radovini A, Hao B, Kehoe CE. Emotion-focused parenting interventions for prevention and treatment of child and adolescent mental health problems: a review of recent literature. Curr Opin Psychiatry. 2020;33:586–601. https://doi.org/10.1097/YCO.0000000000000647.
142. Salles BM, De Maturana W, Dos Santos VA, Mograbi DC. Effects of DBT-based interventions on alexithymia: a systematic review. Cogn Behav Ther. 2023;52:110–31. https://doi.org/10.1080/16506073.2022.2117734.
143. Norman H, Marzano L, Coulson M, Oskis A. Effects of mindfulness-based interventions on alexithymia: a systematic review. Evid Based Ment Health. 2019;22:36–43. https://doi.org/10.1136/ebmental-2018-300029.

Publisher's Note