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ORIGINAL ARTICLE

Cumulative Childhood Maltreatment and Non-Suicidal Self-Injury: the Mediating and Moderating Role of Perceived Social Support in a Sample of University Students

Giovanna Manna[1] · Giorgio Falgares[1] · Giulia Costanzo[1] · Maria Chiara La Sala[1] · Dorian A. Lamis[2] · Pasquale Musso[3]

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Abstract
Non-suicidal self-injury (NSSI) in young adults is recognized as a major public health concern. Some studies have identified cumulative childhood maltreatment (CCM) as a significant vulnerability factor for NSSI, although the nature of this association remains unclear. Specifically, some theorists have investigated the role of perceived social support (PSS), considered an important factor closely associated with both CCM and NSSI. The aim of the current study was to simultaneously investigate the potential mediating and moderating role of PSS from family and friends in the association between CCM and NSSI in a university student sample. Participants were 474 students (73.4% female; $M_{age} = 21.61$, $SD = 1.92$) attending a state university in southern Italy (Sicily) who completed self-report questionnaires regarding childhood trauma, non-suicidal self-harming behaviors, and PSS. The mediation model showed that CCM was significantly and positively linked to NSSI through perceived support from family, so that the higher the CCM, the lower the perceived support from family and, consequently, the higher the presence of NSSI behaviors. Moreover, the moderating model indicated that perceived support from friends buffered the relation between CCM and NSSI. These findings expand our understanding of the role of PSS in the relation between CCM and NSSI. Specifically, the perception of family support may be affected by early maltreatment experiences, increasing the risk of NSSI (mediation), whereas it seems that perceived friends support operates as a stress buffer, mitigating the deleterious effects of CCM on NSSI (moderation). Methodological limitations and clinical implications of the study are discussed.

Keywords Child maltreatment · Perceived social support · Non-suicidal self-injury · Self-Harm

Introduction

Non-suicidal self-injury (NSSI), which refers to deliberate damage to body tissue without suicidal motivation (Nock & Prinstein, 2005), is a common behavior among college students, with estimated rates between 17 and 38% (Whitlock et al., 2011). Indeed, college years mark a developmental period characterized by the transition from adolescence to adulthood, which may increase the risk for mental disorders and risky behaviors, including NSSI (Kiekens et al., 2019). In light of the concerning prevalence rates of these self-injurious behaviors among this particular population, we believe that a deeper understanding of this phenomenon is needed.

The extant literature has identified adverse childhood experiences, particularly maltreatment (Liu et al., 2018), as one of the most significant risk factors for NSSI. Indeed, early negative experiences can lead to multiple deficits, as emotion and neurophysiological dysregulation, which in turn may result in subsequent maladaptive coping behaviors, like NSSI (Brown et al., 2018). Thus, NSSI may serve as a strategy to manage with intense negative emotions which the individual is unable to regulate (Linehan, 1993), providing relief from emotional distress (Ford & Gomez, 2015).

✉ Giulia Costanzo
giulia.costanzo01@community.unipa.it

[1] Department of Psychology, Educational Sciences and Human Movement, University of Palermo, Palermo, Italy

[2] Department of Psychiatry and Behavioral Sciences, Emory School of Medicine, Atlanta, GA, USA

[3] Department of Educational, Psychological, and Communication Sciences, University of Bari, Bari, Italy

Researchers have found that the rates of NSSI are greater in people with a history of maltreatment compared to those without (Serafini et al., 2017, for review). However, the focus of most studies was limited to the effects of single types of child maltreatment on NSSI, although there is evidence that maltreatment experiences usually occur in cumulative forms (cumulative childhood maltreatment, CCM), and not in isolation (Huang et al., 2012). To the best of our knowledge, the only two studies focusing on CCM were the ones from Xu et al. (2019) and Steine et al. (2020), which found that higher CCM scores were positive predictors of the rates of NSSI.

Although research has shown that maltreatment (isolated or cumulative) is a recognized and significant vulnerability factor for NSSI, the psychological mechanisms linking these two constructs remain under investigation. We believe that useful information may be provided by referring to perceived social support (PSS), which has been hypothesized being both affected by the quality of early relational experiences and associated with different developmental outcomes (Karatekin & Ahluwalia, 2020). PSS is part of the multidimensional construct of social support that refers to the social resources that individuals perceive to be available or that are actually provided to them that may be helpful in coping with stressful experiences (Gottlieb & Bergen, 2010). Although PSS has been shown to be strongly associated with health outcomes and well-being (Steine et al., 2020), findings on the effects of actual social support on psychological adjustment seem to be inconsistent (Forster et al., 2020). Indeed, as underlined by Pepin and Banyard (2006), the feeling that significant others will be available to offer support in times of need and distress is more important for psychological well-being than the actual supportive behaviors received by these individuals. It is for this reason that we decided to focus on PSS, rather than actual social support.

Researchers have highlighted how PSS is an important factor closely associated with both single experiences of childhood maltreatment (Karatekin & Ahluwalia, 2020) and CCM (Folger & Wright, 2013; Steine et al., 2020), as well as with NSSI (Wan et al., 2019). Specifically, experiencing maltreatment in childhood may affect how individuals perceive social support, for example exhausting the credibility of support received later in life (Powers et al., 2009; Sperry & Widom, 2013). In fact, the impact of childhood adversities may damage safety and trust in interpersonal networks and the possibility to perceive their availability (Folger & Wright, 2013). In turn, the lack of PSS may lead to the development of several negative outcomes, including NSSI (Wan et al., 2019). Indeed, the inability to perceive social support may lead individuals to isolate when they encounter stressful situations, increasing the risk of engaging in NSSI behaviors (Sperry & Widom, 2013).

To our knowledge, no study has investigated the potential mediating role of PSS in the relation between CCM and NSSI. The only two studies considering the mediating role of social support focused on actual social support, both in the relation between single typologies of childhood maltreatment and NSSI (Christoffersen et al., 2015) and between CCM and NSSI (Xu et al., 2019). Christoffersen et al. (2015) found that actual social support in childhood acted as a partial mediator between a history of traumatic life-events and the occurrence of NSSI in young adulthood. Similarly, Xu et al. (2019) found that actual social support, particularly received by family members, had a mediating effect in the link between overall CCM scores and NSSI frequency. However, it is worth noting that both studies seem to discuss their results like they were obtained through moderation, and not by mediational analyses. Indeed, the authors claimed that social support plays a buffering effect on the relation between childhood adversities and NSSI, although mediational analyses do not allow to draw these conclusions.

Based on the above, exploring PSS – rather than actual social support – in the relation between CCM and NSSI, clearly differentiating the mediating effects from the moderating ones, is a worthwhile endeavor.

The moderating effects of PSS have been considered with regard to different maltreatment events (Lo et al., 2019; Oh et al., 2019) and CCM (Folger & Wright, 2013). According to Cohen and Wills (1985), PSS from family, friends and significant others can mitigate deleterious effects that adverse circumstances have on several negative outcomes. Particularly, the perception that others will be available to provide emotional and physical resources strengthens the individual's perceived ability to cope with difficulties, operating as a stress buffer (Cohen, 2004). Although several studies found that PSS buffered the effects of child abuse on multiple emotional, social, and behavioral problems (Lo et al., 2019; Sperry & Widom, 2013), only one study (Forster et al., 2020) explored PSS effects in moderating the impact of maltreatment on NSSI. Specifically, Forster and colleagues (Forster et al., 2020) found that PSS from teachers and peers led to a decrease in rates of NSSI, buffering the harmful effects of different patterns of familial adversities (i.e., parental dysfunction and familial violence) for self-injury behaviors. As underlined by the authors, these findings suggest the importance of interpersonal networks in promoting positive outcomes in spite of the existence of stressful family conditions.

In summary, no study has investigated the mediating role of PSS in the link between maltreatment and NSSI; whereas, only one study focused on the role of PSS in moderating the effects of maltreatment on NSSI (Forster et al., 2020). Therefore, it is important to advance our understanding by addressing this gap in the literature, in order to inform treatment approaches

of adverse childhood experiences and to improve interventions designed to reduce the risk of NSSI.

The Present Study

As discussed, evidence suggests that maltreatment experiences rarely occur in isolation (Huang et al., 2012). Thus, while most of the above-mentioned studies considered the effects of single forms of childhood maltreatment on NSSI, we decided to focus on cumulative forms of maltreatment (CCM), given that literature suggests that individuals experiencing different types of negative outcomes are more likely to have been the victims of multiple forms of abuse (Ajnakina et al., 2018; Marchetti et al., 2021).

Accordingly, this study was the first to simultaneously investigate the mediating and moderating role of PSS in the relation between CCM and NSSI. We aimed to evaluate whether and how specific forms of PSS (perceived family and friends social support) may mediate and/or moderate the potential negative effects of CCM on NSSI in a university student sample. As previously mentioned, a history of cumulative maltreatment could create an alteration in basic trust in others, thus creating the conditions for a distorted (more negative) perception of support even when actually received. In this sense, CCM would be directly and negatively associated with PSS, which manifesting at lower levels would be associated with a greater risk of NSSI. Here, therefore, a mediation mechanism can be seen. On the other hand, the perception of the support does not depend only on the life history of each individual, but also on the actual nature of the support itself and on the ecological conditions in which it is expressed. In this case, the mechanism will be more moderating, with a potential mitigation effect of PSS on the risky CCM and NSSI association. Both mechanisms therefore seem theoretically admissible, although different forms of perceived support could predominantly act as mediators or moderators. It is therefore theoretically and clinically relevant to study simultaneously the mediation and moderation processes of PSS in the relationship between CCM and NSSI to begin to disambiguate these aspects.

We expected (a) higher levels of CCM to be associated with lower levels of PSS, which in turn will be associated with higher levels of NSSI (mediation); and (b) higher levels of PSS to buffer the impact of cumulative trauma on NSSI (moderation).

Method

Participants

We used a convenience sampling method to recruit four hundred and seventy-four Italian students (73.4% female; $M_{age} = 21.61$, $SD = 1.92$), attending state university or other forms of higher education (i.e., higher artistic and musical education institutions) in one the biggest city of southern Italy. Approximately 70% of these students were attending psychology or social science courses. In Italy, these courses are characterized by a high female prevalence (more than 80%, see AlmaLaurea, 2017), which explains the gender distribution of the sample. A very high percentage of participants were only students (84.2%) and unmarried (97.2%), while 15.8% were studying and working at the same time. The majority came from middle class backgrounds (77.3%), had married and cohabiting parents (80.0%) who had at least a high school education (70.9% for mothers and 64.9% for fathers). No one had previous hospitalizations for psychological/psychiatric reasons, whereas 21% had some psychological counseling with a psychologist or psychiatrist, usually for anxiety problems (33%) or support during normal stress and life cycle transitions (36%) and over an average period of one year.

Procedure

The local psychology department's ethics committee approved this study and all procedures were performed in accordance with the Italian Association of Psychology (2015) ethical principles for psychological research, inspired by the Declaration of Helsinki and its revisions (World Medical Association, 2001) as well as by the American Psychological Association (APA, 2010) ethics guidelines. Data were collected during class time at the university or the higher education institution. After informing participants about the purpose of the research, the voluntary nature of participation and the anonymity of responses, students in each class were asked to participate in the study. More than 98% agreed to participate and written informed consent was obtained.

Measures

Socio-Demographics Respondents were asked to indicate their gender, age, degree course, occupation, marital status, socioeconomic status, previous hospitalization experiences, previous psychological counseling and its reason, as well as their parents' marital status, occupation and education.

Childhood Trauma Questionnaire-Short Form The Italian version of the 28-item Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein et al., 2003; Sacchi et al., 2018) was used for the retrospective assessment of childhood traumatic experiences. The CTQ-SF is the brief form of the 70-item Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994), which represents one of the most used self-report questionnaires in the assessment of a wide range of

maltreatment experiences. Of the 28 items composing the CTQ-SF, 25 were retained from the CTQ and assess experiences of five different types of childhood trauma: emotional abuse (5 items; e.g., *"People in my family said hurtful or insulting things to me"*), physical abuse (5 items; e.g., *"I was punished with a belt, a board, a cord, or some other hard object"*), sexual abuse (5 items; e.g., *"Someone tried to touch me in a sexual way, or tried to make me touch them"*), emotional neglect (5 items; e.g., *"I felt loved"* to be reversed) and physical neglect (5 items; e.g., *"I had to wear dirty clothes"*). Three additional items, not considered in this study, constitute the minimization/denial subscale, which assesses responders' tendency to minimize or deny negative childhood experiences. All items were rated on a 5-point Likert scale, ranging from 1 (*never true*) to 5 (*very often true*). Previous validation studies (Bernstein et al., 2003; Sacchi et al., 2018) demonstrated good structure/concurrent validity and reliability of both the original and Italian versions of CTQ-SF, supporting its use for the retrospective assessment of childhood traumatic experiences among nonclinical adolescents and adults. In the current study, internal reliability consistency values, as indexed by Cronbach's α, for emotional abuse (0.74), physical abuse (0.73), sexual abuse (0.77), emotional neglect (0.86), and physical neglect (0.64) were acceptable. Therefore, for each subscale, a composite variable was created by summing the item scores, with higher scores indicating higher levels of emotional, physical, sexual abuse and emotional and physical neglect. These composites were modelled to form the latent factor of Cumulative Childhood Maltreatment to be used in all subsequent analyses. This solution was supported through robust maximum likelihood confirmatory factor analysis (CFA; see the "Data Analysis Plan" section for model fit criteria), $\chi^2(5) = 13.98$, $p = 0.02$, CFI = 0.961, RMSEA = 0.062, SRMR = 0.035.

Deliberate Self-Harm Inventory Non-suicidal self-harming behaviors were assessed by using the Italian version of the Deliberate Self-Harm Inventory (DSHI; Cerutti et al., 2011; Gratz, 2001). The DSHI is a 17-item behaviorally based questionnaire, which assesses deliberate damage of body tissue (e.g., cutting, burning, severe scratching) without conscious suicidal intent. Frequency, severity, and duration were asked by follow-up questions when a self-harm behavior is positively answered. Participants were asked to indicate whether (*yes* = 1) or not (*no* = 0) they have engaged in each of the 17 self-harm behaviors "intentionally but without the intent to die". Participants who reported one or more NSSI behaviors were coded as "self-harmer" in a single, binary variable (NSSI history) whereas those that did not were coded as "not self-harmer". A continuous score of rates of NSSI was also created by summing the initial 17 dichotomous scores of the participants (see Gratz, 2006; Gratz & Chapman, 2007). The original DSHI was found to show high internal consistency, adequate test–retest reliability and adequate construct, discriminant and convergent validity (Fliege et al., 2006; Gratz, 2001). With regard to the Italian version by Cerutti et al. (2011), it was found to have adequate psychometric properties, including adequate internal consistency and good convergent and discriminant validity. In the current study, the Cronbach's α was acceptable (0.65). Considering the unidimensionality of the DSHI, we used a parceling approach (Little et al., 2002) for latent modeling. Specifically, items were parceled into four indicators comprising four or five items, with an equal distribution of factor loadings across parcels. Each parcel was computed by summing the responses across the selected items, with higher scores meaning higher rates of NSSI. A robust maximum likelihood CFA supported the one-factor structure, $\chi^2(2) = 7.97$, $p = 0.02$, CFI = 0.940, RMSEA = 0.079, SRMR = 0.032. Hence, the four parcels were modelled to form the latent factor of Rates of NSSI also in the subsequent analyses.

Multidimensional Scale of Perceived Social Support The Italian version of the Multidimensional Scale of Perceived Social Support (MSPSS; Prezza & Principato, 2002; Zimet et al., 1988) was used to measure PSS. It consists of 12 items, addressing PSS from family, friends, and significant others at the current time by assessing, for each dimension, (a) perceived availability of support and (b) function of the support. For the purposes of this study, we only considered the four items related to the perceived support from family (e.g., *"I get the emotional help and support I need from my family"*) and the four items related to the perceived support from friends (e.g., *"I can count on my friends when things go wrong*"). Participants answered on a seven-point Likert scale from 1 (*very strongly disagree*) to 7 (*very strongly agree*). The MSPSS has shown good internal and test–retest reliability, good validity and a fairly stable factorial structure across many studies (Osman et al., 2014; Zimet et al., 1988) and has already been used in previous studies with Italian samples (Efficace et al., 2016; Falgares et al., 2019). In the current study, Cronbach's α values for PSS from family (0.93) and PSS from friends (0.93) were good. To further test the factorial validity of the 8-item version of MSPSS used in this study, we conducted a CFA based on a robust maximum likelihood estimation procedure that supported a correlated two-factor structure of Perceived Support from Family and Perceived Support from Friends, $\chi^2(19) = 70.71$, $p < 0.001$, CFI = 0.967, RMSEA = 0.076, SRMR = 0.029. We used this measurement model in the subsequent analyses.

Data Analysis Plan

After computing descriptive statistics for the key study variables and examining univariate and multivariate normality of the distributions, three analytic procedures were followed. First, two structural equation models (SEMs) were estimated using *Mplus 7* (Muthén & Muthén, 2012) in order to evaluate the measurement model and estimate the correlations among the latent and control variables. We initially performed a confirmatory factor analysis including the latent variables for CCM, Rates of NSSI, Perceived Support from Family, and Perceived Support from Friends (see the Measures section for the respective indicators), as well as all their potential covariances. After introducing the control variable of gender (0 = male, 1 = female) in this model, we obtained a new model including the bivariate correlations for all the variables of interest. Both in this step and in subsequent ones, missing data (regarding 16.7% of the study variables, 0.6% of the cases, and 0.04% of the data points) were managed by the Full Information Maximum Likelihood (FIML) method, given that the *p*-value for Little's Missing Completely At Random test was not significant, $c^2(68) = 59.10$, $p = 0.77$, and because attrition analyses revealed no significant results when considering demographic variables as predictors of missingness (see Enders & Bandalos, 2001).

Second, to test the mediating role of both perceived support from family and perceived support from friends in the relationship between CCM and rates of NSSI, we initially estimated a full mediation SEM linking CCM with rates of NSSI only via perceived support from family and perceived support from friends (no direct path between CCM and rates of NSSI). All indirect paths were tested. To assess whether the mediating variables fully accounted for the indirect relations of the hypothesized model, we also estimated a partial mediation SEM including direct paths from CCM to rates of NSSI. By acknowledging the potential limitation of the chi-square test (χ^2 should be non-significant with $p > 0.05$), due to its tendency to reject the null hypothesis with large sample sizes and complex models, we relied on well-known goodness-of-fit indices and their associated cut-offs to evaluate model fit (e.g., Kline, 2015): CFI ≥ 0.90 for acceptable and ≥ 0.95 for good fit, RMSEA ≤ 0.08 for acceptable and ≤ 0.05 for good fit, and SRMR ≤ 0.10 for acceptable and ≤ 0.05 for good fit. To ascertain significant differences between nested models (the more vs. less restrictive model), at least two of these three criteria had to be satisfied (Kline, 2015): $\Delta\chi^2$ significant at $p < 0.05$, ΔCFI ≤ -0.010, and ΔRMSEA ≥ 0.015.

Third, to test the potential moderating role of both perceived support from family and perceived support from friends in the relationship between CCM and rates of NSSI, we used the latent moderated structural equations (LMS) method (Klein & Moosbrugger, 2000), as recommended by Maslowsky et al. (2014). As the simultaneous specification of more than one interaction term increases multicollinearity and its severe effects on parameter estimations (see Dakanalis et al., 2015; Kelava et al., 2011), for each moderating variable (i.e., perceived support from family and perceived support from friends) a separate LMS model was considered, and two steps were followed. Initially, we estimated a structural SEM including the measurement model of the latent variables and the structural paths from CCM and the considered moderating variable (i.e., perceived support from family or perceived support from friends) to rates of NSSI without the latent interaction term CCM*type of perceived support (henceforth be referred to as Model 0). Then, we included this latent interaction to the model (obtaining the LMS model) and estimated it (henceforth be referred to as Model 1). The output of Model 1 provided the final standardized regression coefficients (standardized beta coefficients were obtained by standardizing the data prior to analyses) and indicated whether the latent interaction was significant. If significant, the interaction was interpreted by graphing as in standard regression models (Aiken & West, 1991). Model fit indices (i.e., χ^2, CFI, RMSEA, and SRMR) and their associated cut-offs for the Model 0 were as mentioned above. However, no model fit indices have been developed for LMS models (Model 1 in this study). Alternatively, as suggested by Klein and Moosbrugger (2000) and Muthén (2012), we compared the relative fit of Model 0 (where the interaction is not estimated and therefore assumed to be zero) and Model 1 (where the interaction is estimated) by a loglikelihood ratio test, used to determine whether the more parsimonious Model 0 represented a significant loss in fit relative to the more complex Model 1 (Satorra & Bentler, 2010). The test statistic for the log-likelihood ratio test, denoted as *D*, was calculated using the following equation: $D = -2[(\text{log-likelihood for Model 0}) - (\text{log-likelihood for Model 1})]$. The values of *D* are approximately distributed as χ^2. The degrees of freedom (*df*) to determine the significance of *D* were calculated by subtracting the number of free parameters in Model 0 from the number of free parameters in Model 1.

Results

Preliminary Analyses

Tables 1 and 2 summarize the descriptive statistics. Table 1 shows how, using cut-off criteria from the international literature (Carpenter & Trull, 2015; Li et al., 2014), more than 10% of our sample reported at least one specific form of childhood maltreatment exposure with two peaks of 25.3% for emotional abuse and 39.7% for emotional neglect, 28.7% of participants reported CCM, and 26.8% of them reported NSSI behaviors. Table 2 displays that the mean values for

Table 1 Prevalence in the study sample of specific forms of childhood maltreatment exposure and non-suicidal self-injury (with score range in brackets) calculated as the percentage of participants exceeding the cut-off scores as well as of cumulative childhood maltreatment ($N = 474$)

Observed variable	Cut-off scores	Prevalence in the study sample
Low-to-moderate exposure to specific forms of childhood maltreatment		
Emotional abuse (scored 5–25)	≥ 9[a]	25.3%
Physical abuse (scored 5–25)	≥ 8[a]	11.4%
Sexual abuse (scored 5–25)	≥ 6[a]	10.3%
Emotional neglect (scored 5–25)	≥ 10[a]	39.7%
Physical neglect (scored 5–25)	≥ 8[a]	11.6%
Non-suicidal self-injury presence		
Deliberate Self-Harm (scored 0–17)	≥ 1[b]	26.8%
Cumulative childhood maltreatment (CCM)		
Two or more specific forms of childhood maltreatment exposure simultaneously exceeding the cut-off scores		28.7%

[a] See Li et al. (2014). The cut-off criteria used in this table are from a US non-clinical population and have not been confirmed in Italy

[b]See Carpenter and Trull (2015)

Table 2 Mean scores, standard deviations, skewness, and kurtosis for the key study variables ($N = 474$)

Observed variable	Mean	Standard deviation	Skewness	Kurtosis
Forms of childhood maltreatment				
Emotional abuse (scored 5–25)	7.17	2.94	1.76	3.31
Physical abuse (scored 5–25)	5.75	2.02	3.61	15.11
Sexual abuse (scored 5–25)	5.49	1.79	4.89	28.51
Emotional neglect (scored 5–25)	9.24	3.83	1.09	1.05
Physical neglect (scored 5–25)	5.82	1.51	3.93	29.43
Non-suicidal self-injury				
DSH _Parcel 1 (scored 0–4)	0.06	0.27	4.97	26.40
DSH _Parcel 2 (scored 0–4)	0.14	0.40	3.20	11.43
DSH _Parcel 3 (scored 0–4)	0.06	0.27	4.97	26.40
DSH _Parcel 4 (scored 0–5)	0.15	0.41	3.01	10.07
Perceived support from family				
Item_3 (scored 1–7)	5.50	1.50	-1.08	0.42
Item_5 (scored 1–7)	5.54	1.55	-1.14	0.55
Item_8 (scored 1–7)	5.27	1.65	-0.89	-0.11
Item_11 (scored 1–7)	5.50	1.49	-1.19	1.03
Perceived support from friends				
Item_6 (scored 1–7)	5.42	1.39	-1.22	1.34
Item_7 (scored 1–7)	5.52	1.44	-1.33	1.52
Item_9 (scored 1–7)	5.83	1.27	-1.64	3.06
Item_12 (scored 1–7)	5.66	1.35	-1.34	1.58

DSH, Deliberate self-harm

the forms of childhood maltreatment and for the indicators of non-suicidal self-injury were substantially lower than the scale mean, while the mean values for perceived support from family and friends were substantially higher than le scale mean. The combined results of Tables 1 and 2, while confirming the non-clinical nature of our sample, suggested that it was adequate to answer the research questions. However, except for a few items concerning the dimension of perceived support from family, all the items of the study variables were not normally distributed (see Table 2) with skewness and kurtosis values >|1.00| (Kline, 2015). Furthermore, both the Mahalanobis distance and the Mardia's multivariate kurtosis coefficient exceeded their critical value ($p < 0.001$) and thus evidenced multivariate non-normality. Considering this, the data were subsequently analyzed using maximum likelihood robust (MLR) estimation methods (see Muthén & Muthén, 2012).

Measurement Model and Correlations

Both the measurement model, $\chi^2(113) = 227.97$, $p < 0.001$, CFI = 0.958, RMSEA = 0.046, SRMR = 0.041, and the SEM specifying all the covariances among latent variables and gender as control variable, $\chi^2(126) = 251.06$, $p < 0.001$, CFI = 0.956, RMSEA = 0.046, SRMR = 0.040, fit the data acceptably. Bivariate correlations are reported in Table 3: (a) CCM was positively related to rates of NSSI and negatively related to both perceived support from family and perceived support from friends; (b) rates of NSSI was negatively related to both perceived support from family and perceived support from friends; (c) perceived support from family and perceived support from friends were positively related; (d) gender was not significantly associated with the other variables and, therefore, excluded from the following analyses.

Table 3 Bivariate correlations among latent and control variables of study after estimating a structural equation model specifying all covariances between them ($N = 474$)

	1	2	3	4	5
1. Cumulative childhood maltreatment	-				
2. Rates of NSSI	.40***	-			
3. Perceived support from family	-.70***	-.36***	-		
4. Perceived support from friends	-.16**	-.15*	.23***	-	
5. Gender (0 = male, 1 = female)	-.06	.04	.04	.05	-

NSSI, Non-suicidal self-injury. *$p < .05$, **$p < .01$, ***$p < .001$

Mediation Model

We estimated an initial full mediation model. This model fitted the data adequately, $\chi^2(114) = 235.79$, $p < 0.001$, CFI = 0.955, RMSEA = 0.047, SRMR = 0.047. When comparing the full mediation model with the partial mediation model, no significant differences were found: $\Delta\chi^2(1) = 9.07$, $p = 0.003$, ΔCFI = -0.002, ΔRMSEA = 0.001. Thus, the full mediation model was considered the final model (Fig. 1). The main direct effects showed that: CCM negatively predicted perceived support from family and, at a lesser extent, perceived support from friends; rates of NSSI were predicted only by perceived support from family and not by CCM or perceived support from friends. However, in terms of indirect relations, the model showed that CCM was significantly and positively linked to rates of NSSI through perceived support from family (β = 0.25, $p < 0.001$), so that the higher the CCM, the lower the perceived support from family and, consequently, the higher the rates of NSSI (but also the lower the CCM, the higher the perceived support from family and, consequently, the lower the rates of NSSI).

Moderation Models

Interaction of CCM and Perceived Support from Family Predicting Rates of NSSI First, the Model 0 including the measurement model of the latent variables and the structural paths from CCM and perceived support from family to rates of NSSI without the latent interaction term was estimated. Model 0 fit the data adequately, $\chi^2(62) = 189.82$, $p < 0.001$, CFI = 0.954, RMSEA = 0.066, SRMR = 0.044. Both CCM and perceived support from family significantly predicted rates of NSSI (β = 0.31, $p = 0.002$, 95% CI = 0.29/0.50, and β = -0.19, $p = 0.04$, 95% CI = -0.37/-0.01, respectively). The model explained 17.3% of variance in the rates of NSSI. Model 1 including the latent interaction CCM*perceived support from family (Fig. 2) was then estimated. The relative fit of Model 1 versus Model 0 was determined via a log-likelihood ratio test comparing the log-likelihood values

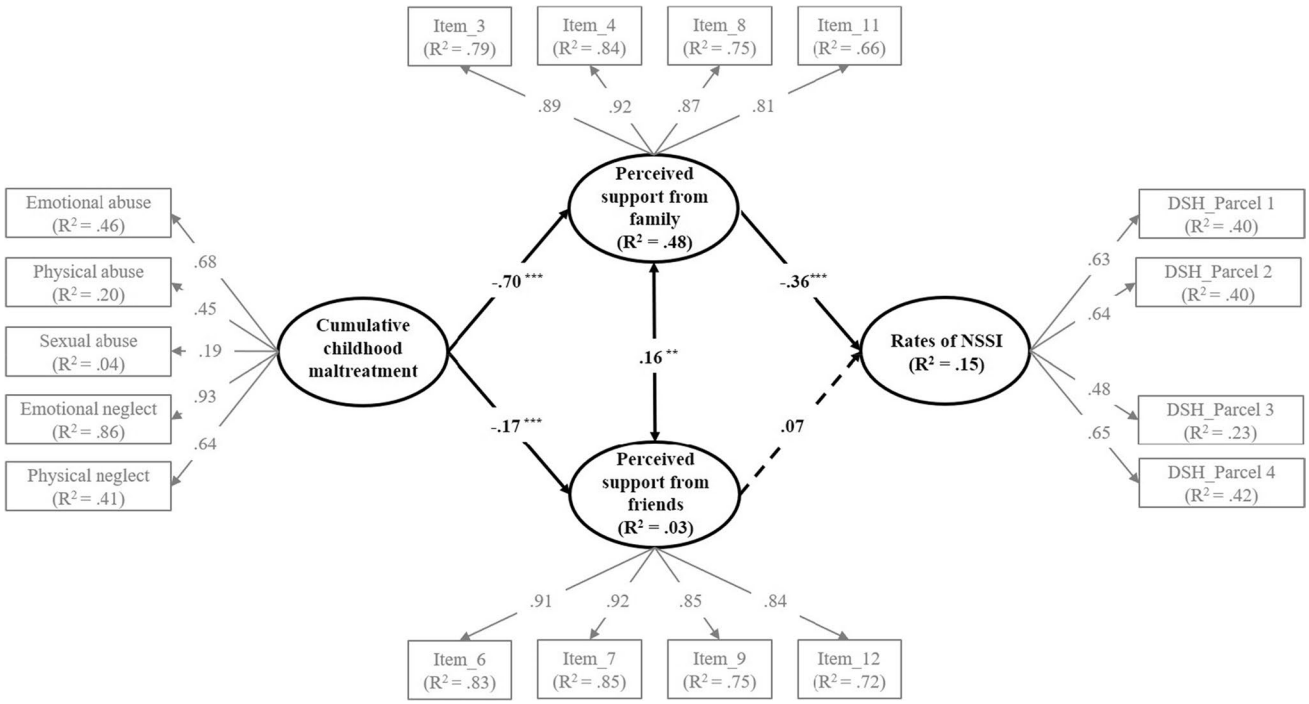

Fig. 1 Estimated structural equation model for the final full mediation model. Standardized regression coefficients are shown. Solid lines represent significant pathways, dashed lines are nonsignificant. The key study latent variables and their related paths and covariances are presented in bold black. Indicators of latent variables and their related paths are represented in grey. All the factor loadings are significant at $p < .005$. **$p < .01$, ***$p < .001$

of Model 0 and Model 1, yielding a log-likelihood difference value of $D = 3.65$. Based on the number of free parameters of Model 0 (42) and Model 1 (43), the difference in free parameters was = 1, representing the *df* value to be used for the log-likelihood ratio test. Using a chi-square distribution, this log-likelihood ratio was not significant ($p = 0.06$), indicating that Model 0 (without the interaction effect) did not represent a significant loss in fit relative to the Model 1 (with the interaction effect). Also, the CCM*perceived support from family interaction effect was not significant (β = -0.11, $SE = 0.06$, $p = 0.06$, 95% CI = -0.23/0.01). Furthermore, in terms of size of the interaction effect, Model 1 did not add any percent of variance explained by the introduction of the interaction of CCM and perceived support from family compared to Model 0. All this revealed that the relation between CCM and the rates of NSSI were not moderated by the perceived support from family and that only the main effects of both CCM and perceived support from family on the rates of NSSI were to be considered.

Interaction of CCM and Perceived Support from Friends Predicting Rates of NSSI First, the Model 0 including the measurement model of the latent variables and the structural paths from CCM and perceived support from friends to rates of NSSI without the latent interaction term was estimated. Model 0 fit the data adequately, $\chi^2(62) = 180.24$, $p < 0.001$, CFI = 0.955, RMSEA = 0.063, SRMR = 0.036. CCM significantly predicted rates of NSSI (β = 0.46, $p < 0.001$, 95% CI = 0.32/0.61), but not perceived support from friends (β = -0.09, $p = 0.15$, 95% CI = -0.21/0.03). The model explained 19.1% of variance in the rates of NSSI. Model 1 including the latent interaction CCM*perceived support from friends (Fig. 3) was then estimated. The relative fit of Model 1 versus Model 0 yielded a log-likelihood difference value of $D = 10.56$. Based on the number of free parameters of Model 0 (42) and Model 1 (43), *df* was = 1 and the log-likelihood ratio was significant ($p = 0.001$), indicating that Model 0 (without the interaction effect) represented a significant loss in fit relative to the Model 1 (with the interaction effect). Also, the CCM*perceived support from friends interaction effect was significant (β = -0.25, $SE = 0.08$, $p = 0.002$, 95% CI = -0.41/0.09). Plotting the interaction to aid in interpretation revealed that the relation between CCM and rates of NSSI becomes less positive as perceived support from friends increase (Fig. 4). In terms of size of the interaction effect, calculation of R^2 for Model 1 yielded 24.8% of variance in the rates of NSSI explained, meaning an additional 5.7% of variance in rates of NSSI was explained by the interaction of CCM and perceived support from friends.

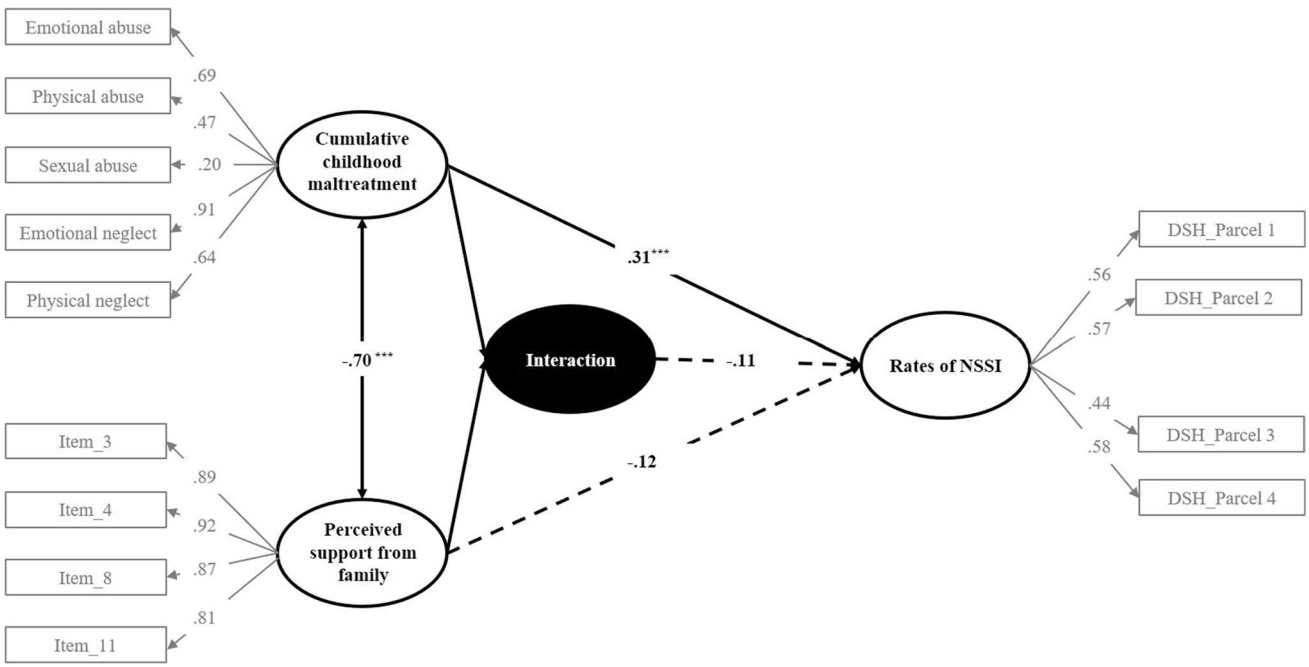

Fig. 2 Results from the latent moderated structural equation modeling analysis for the moderation of perceived support from family. Standardized regression coefficients are shown. Solid lines represent significant pathways, dashed lines are nonsignificant. The key study latent variables and their related paths and covariances are presented in bold black. Indicators of latent variables and their related paths are represented in grey. All the factor loadings are significant at $p < .001$. ***$p < .001$

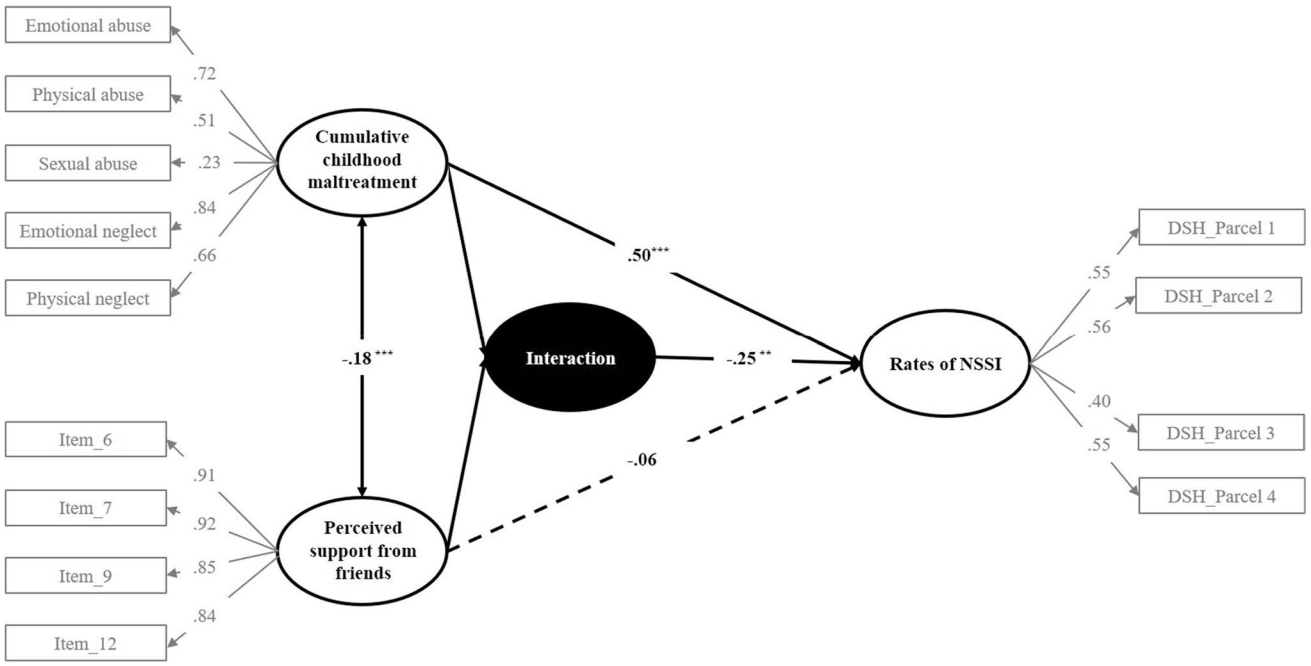

Fig. 3 Results from the latent moderated structural equation modeling analysis for the moderation of perceived support from friends. Standardized regression coefficients are shown. Solid lines represent significant pathways, dashed lines are nonsignificant. The key study latent variables and their related paths and covariances are presented in bold black. Indicators of latent variables and their related paths are represented in grey. All the factor loadings are significant at $p < .001$. $^{**}p < .01$, $^{***}p < .001$

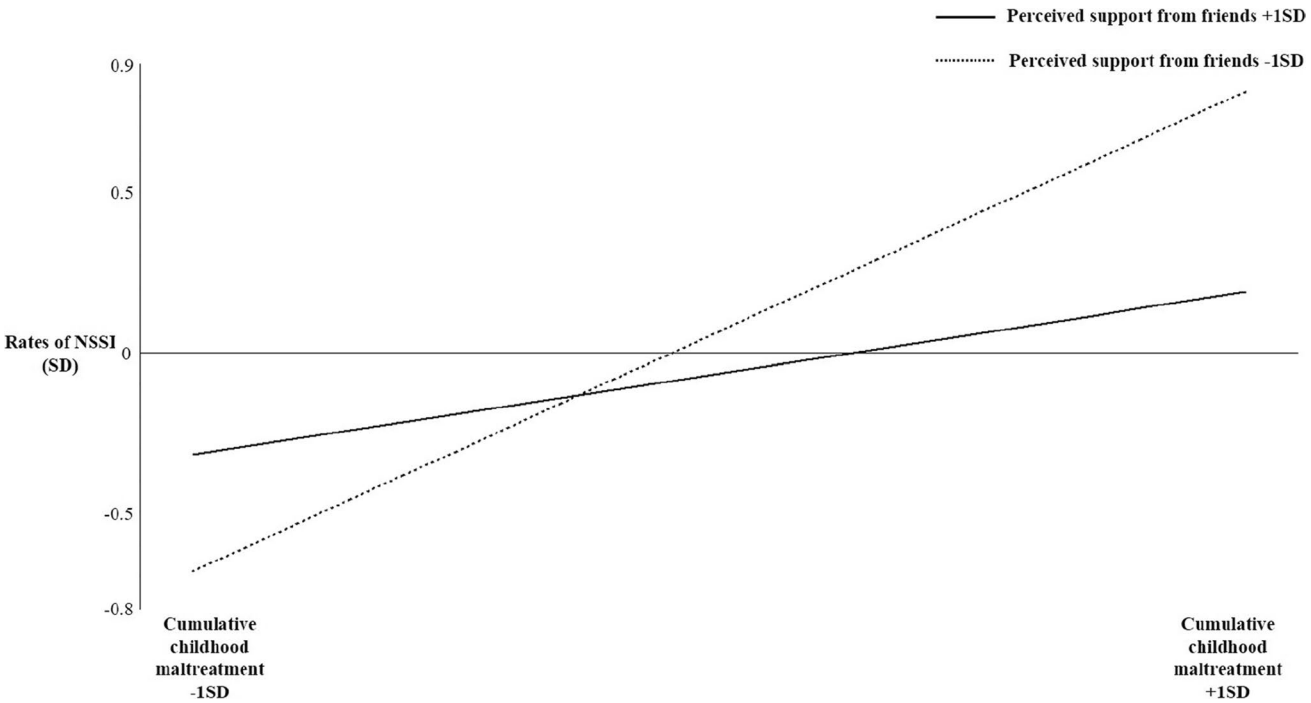

Fig. 4 Interaction of cumulative childhood maltreatment and perceived support from friends, $N = 474$

Discussion

In the present study, we investigated the mediating and moderating role of PSS from family and friends in the relation between CCM and NSSI among university students. The preliminary analyses showed that CCM was positively associated with NSSI and negatively related to both perceived family support and perceived friends' support. This is consistent with previous research showing that maltreatment experiences may expose the individual to engage in dangerous behaviors (Serafini et al., 2017; Wang et al., 2020), as well as may negatively affect perceptions of available interpersonal support (Folger & Wright, 2013; Sperry & Widom, 2013). Moreover, our results indicated that NSSI was negatively correlated to both perceived family and friends support, in accordance with other studies suggesting that poor support perceived from significant others may make the individual more vulnerable to self-injury behaviors (Tatnell et al., 2014; Wan et al., 2019).

With regard to the mediating effect of PSS in the relation between CCM and NSSI, results indicated that only perceived family support, and not support from friends, mediated the effects of CCM on NSSI behaviors. Although the cross-sectional nature of our study does not permit causal inferences, it may be possible that lower levels of perceived support from family increase the risk of NSSI behaviors among individuals who experienced maltreatment as a child. These findings are in line with studies highlighting the mediating role of low perceived family support in the relation between different forms of maltreatment and other negative outcomes (Pepin & Banyard, 2006; Thompson et al., 2007).

These results may be understood in light of the fact that maltreatment experiences are known to lead to negative representations of others and to elicit feelings of fear, isolation and mistrust that may weaken the ability of the individual to rely on his/her interpersonal networks (Steine et al., 2020). Specifically, given that CCM experiences primarily occur in the family context (Lo et al., 2019), it is plausible that perceived support from parents and relatives, in particular, might be confounded by early negative experiences (Powers et al., 2009). Indeed, family members may be perceived as a source of threat and thus be considered scarcely reliable on the supportive level (Folger & Wright, 2013). In turn, lack of perceived family support may fuel feelings of loneliness or isolation that may limit the possibility of seeking out external help when dealing with emotional stressful situations, potentially increasing the risk of the individual responding through dysfunctional self-regulation strategies, such as NSSI behaviors (Sperry & Widom, 2013). Conversely, friends' trustworthiness as a source of support may not be as affected as the family one, given that peer group represents an alternative context to the one in which the abuse is perpetrated. This may explain the non-significance of perceived friends support as a mediator in the link between CCM and NSSI.

Further analyses examined whether PSS moderated the relationship between CCM and NSSI. With the due caution that the cross-sectional nature of our study requires, the results indicated that this relation might be buffered only by perceived friends support and not by perceived family support, underlining the protective role of the peer group in the relation between CCM and NSSI. It is not surprising that perceived family support does not moderate the effects of CCM on NSSI, given that family represents the main context in which maltreatment experiences generally may occur (Lo et al., 2019). Moreover, adolescence and young adulthood are developmental periods in which the relevance of family interactions decreases while that of peer relationships increases, offering the individual the chance to experience deeper and intimate interpersonal connections outside the context of the family (Folger & Wright, 2013). This finding is consistent with the study of Forster et al. (2020) indicating that support from friends mitigated the effects of traumatic childhood experiences on suicidal behaviors and NSSI rates in adolescence. Peer relationships may thus enhance resiliency by providing new opportunities for positive experiences and validation, acting as a protective factor for well-being and psychosocial adjustment against the effects of negative events, such as NSSI (Forster et al., 2020; Wan et al., 2019). This is in accordance with Cohen and Wills' (1985) buffering hypothesis, positing that PSS (in our study, friends' support) could intercede between adverse events and the development of mental health symptomatology by providing resources or solutions to deal with stressful experiences.

Study Limitations and Clinical Implications

A number of study limitations should be noted. First, given that the data were cross-sectional, it was not possible to examine causal relations between CCM, PSS, and NSSI behaviors across time. Future researchers should employ a longitudinal design to determine how PSS may change as a result of maltreatment experiences and whether this buffers the negative consequences, such as self-injury behaviors. Second, this study may be limited by the university sample. For example, it is highly possible that university students have experienced less CCM compared to clinical sample (Banyard & LaPlant, 2002). Future research would benefit from the replication of this study in clinical samples. Third, we used a convenience sampling method and the distribution of our participants by gender was unbalanced at approximately a ratio of 2.8:1 for females to male. These are further issues that could bias results and limit generalizability.

Replication of our findings with more representative and more heterogenous (in terms of gender) samples, would therefore foster generalization of findings to broader populations. Moreover, we only administered self-report measures, which may be sensitive to social desirability bias possibility inflating some of the associations among variables. Future research should use a multiple method approach, including qualitative interviews.

Notwithstanding these limitations, results from this study underscore the importance of PSS as a central factor in the relation between CCM and NSSI among young adults, suggesting important implications for prevention and treatment. Specifically, given that our results seem to indicate that the experience of abusive and scarcely supportive family environments plays a role in NSSI engagement, it would be beneficial to promote early prevention programs aimed at altering dysfunctional relational dynamics in high-risk families. Although these dynamics are generally hard to change, effective interventions may be realized simultaneously targeting multiple family levels and mechanisms (Beauchaine et al., 2019), reinforcing parental skills and resources. Moreover, as suggested by Martin and colleagues (Martin et al., 2016), working with parents and youth to adjust dysfunctional interactions and develop healthier and more supportive relationships may strengthen the individual's ability to recur to more appropriate strategies to cope with negative emotions and distress, potentially reducing the risk of NSSI. Furthermore, given that maltreatment experiences may weaken individuals' ability to trust and to rely on their interpersonal networks and thus to perceive their support (Steine et al., 2020), young adults would benefit from interventions aimed at developing their ability to recognize support when it is actually provided, through the promotion of alternative and more positive representations of significant and non-abusive others in their lives (Pepin & Banyard, 2006). With this purpose, the reframe of the way the individual perceives and reflects upon these relationships should be considered as a target. Finally, as this study showed that PSS from friends buffered the effects of CCM on NSSI, promising preventive interventions for maltreated adolescents and young adults may focus on the expansion of their social networks outside the context of their family. Particularly, as Wan et al. (2019) suggested, interpersonal skills training in educational settings may improve youth's social and interpersonal skills, favoring the achievement of closer relationships with others and thus enhancing the quantity and the quality of available PSS. Also, schools should facilitate greater adolescents' engagement in extracurricular activities, which in turn may represent another important opportunity for the improvement of their network of support. Further empirical work is needed to delineate other potential vulnerability factors for NSSI in college students experiencing cumulative forms of maltreatment, with the purpose to improve effective prevention programs and interventions in this population.

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