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## Childhood maltreatment and non-suicidal self-injury: A systematic review and meta-analysis

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### Abstract

**Background**—Non-suicidal self-injury (NSSI) has been increasingly recognized as a significant public health concern. Identifying early and modifiable risk factors is necessary for advancing screening and intervention efforts, particularly early detection of at-risk individuals. As a step toward addressing this need, we aimed to examine childhood maltreatment, including its specific subtypes, in relation to NSSI.

**Methods**—We conducted a comprehensive meta-analysis of childhood maltreatment (overall, sexual abuse, physical abuse and neglect, and emotional abuse and neglect) in association with NSSI. We also provided a qualitative review of mediators and moderators of this association. Relevant articles published from inception to September 25, 2017, were identified through a systematic search of Embase, MEDLINE, and PsycINFO.

**Outcomes**—We identified 71 publications meeting eligibility criteria. Overall childhood maltreatment was associated with NSSI (odds ratio [OR] 3.42, 95% CI 2.74–4.26), and effect sizes for maltreatment subtypes ranged from OR 1.84 (95% CI 1.45–2.34) for childhood emotional neglect to OR 3.03 (95% CI 2.56–3.54) for childhood emotional abuse. Except in the case of childhood emotional neglect, there was no evidence of publication bias. Across multiple maltreatment subtypes, stronger associations with NSSI were found in non-clinical samples.

**Interpretation**—With the exception of childhood emotional neglect, childhood maltreatment and its subtypes are associated with NSSI. Screening of childhood maltreatment history in NSSI risk

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#### Declaration of Interests

None.

#### Author Contributions

RTL designed the study, extracted the data, and conducted the analyses. All authors contributed to the literature search, data collection, and preparation of the manuscript. All authors approved the final version of the manuscript.

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assessments may hold particular value in community settings, and increased attention to childhood emotional abuse is warranted.

### Keywords

child abuse; child neglect; meta-analysis; non-suicidal self-injury; self-harm

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### Introduction

The clinical importance of non-suicidal self-injury (NSSI), defined as direct and deliberate destruction of one's own bodily tissue in the absence of suicidal intent,<sup>1</sup> has been increasingly acknowledged in recent years. Based on recent estimates, the lifetime prevalence of this behavior ranges from 5.5% in adults to 17.2% in adolescents.<sup>2</sup> Although most individuals who engage in repeated NSSI cease this behavior within a few years, it often follows a more chronic course, persisting for more than five years in approximately 20% of these individuals.<sup>3</sup> NSSI is a stronger predictor of suicide attempts than is a past history of suicidal behavior.<sup>4-6</sup> Clarifying potential factors underlying the etiology of this phenomenon is important insofar as it may inform the development of future prevention and intervention strategies, a pressing need given the paucity of empirically supported treatments for this behavior.<sup>7,8</sup>

Within this context, childhood maltreatment has received considerable empirical attention, particularly in the case of childhood sexual abuse<sup>9,10</sup> (for maltreatment subtype definitions, see<sup>11</sup>). Moreover, childhood sexual abuse, and to a lesser degree childhood physical abuse and neglect, feature prominently in several theoretical conceptualizations of NSSI.<sup>9,12</sup> Underlying the greater empirical and theoretical interest in these forms of childhood maltreatment is the tacit assumption that they have a more central role, relative to other maltreatment subtypes, in the etiology of NSSI. In the absence of empirical evaluation, however, such a possibility cannot be assumed. Furthermore, with the exception of an influential early meta-analysis of sexual abuse and NSSI,<sup>12</sup> the association between childhood maltreatment and NSSI has yet to be systematically and quantitatively reviewed.

The current review was intended to address several goals. First, it aimed to provide a systematic meta-analysis of childhood maltreatment and its subtypes in relation to NSSI. Second, it evaluated the strength of associations between maltreatment subtypes and NSSI after accounting for the presence of all available covariates. Third, it quantified the association between each form of childhood maltreatment and NSSI severity among individuals who engage in this behavior. Finally, a qualitative review was provided of studies on mediators and moderators of this association. Through addressing these objectives, and through including a comprehensive evaluation of all forms of childhood maltreatment, the current review builds upon the earlier meta-analysis of childhood sexual abuse and NSSI.<sup>12</sup>

## Method

### Search strategy and eligibility criteria

A systematic search of the literature was conducted in Embase, MEDLINE, and PsycINFO to identify studies relevant to the current review. The following search string was applied: (self-injur\* OR parasuicid\* OR "self-harm" OR "self-mutilation") AND ("emotional abuse" OR "emotionally abused" OR "emotional victimization" OR "emotionally victimized" OR "verbal abuse" OR "verbally abused" OR "psychological abuse" OR "psychologically abused" OR "physical abuse" OR "physically abused" OR "sexual abuse" OR "sexually abused" OR "sex abuse" OR maltreat\* OR "childhood neglect" OR "child neglect" OR "childhood abuse" OR "child abuse"). The search results were limited to: (i) English-language publications and (ii) peer-reviewed journals. This was supplemented by a search of the references of the prior meta-analysis of childhood sexual abuse and NSSI.<sup>12</sup> This search strategy yielded a total of 1,492 articles, of which 938 were unique reports. In cases where the eligibility could not be ruled out based on the title and abstract, the full text was also examined. Each search result was reviewed by two independent raters for eligibility, with discrepancies resolved by the first author.

The study inclusion criteria were: (i) any form of childhood maltreatment was assessed, distinct from other constructs (e.g., other adverse childhood experiences); (ii) assessments of childhood maltreatment observed its distinction from abuse experienced in adulthood (i.e., before versus starting at age 18); (iii) NSSI was assessed separately from other constructs (i.e., suicidality and other risky behaviors); (iv) childhood maltreatment and NSSI were assessed systematically; (v) quantitative data were presented on the association between childhood maltreatment and NSSI; and (vi) studies that only assessed childhood maltreatment subtypes in relation to NSSI distinguished between maltreatment subtypes.

### Data extraction

Several studies presented data for NSSI and/or childhood maltreatment as both continuous and categorical variables. In these cases, the continuous data were selected for use in our analyses. This decision was guided by statistical concerns regarding dichotomous relative to continuous variables.<sup>13-16</sup> Of note, in cases where both continuous and categorical data were available in a given study, the effects produced by categorical data tended to be larger, indicating that our preference for continuous data produced more conservative estimates of the association between childhood maltreatment and NSSI.

To assess potential moderators in meta-analyses, data on 10 study characteristics were extracted. These included four sample characteristics: (i) sample age group (adolescent, defined as under age 18, or adult); (ii) mean age of sample; (iii) sample type (community, clinical/at-risk, or mixed); and (iv) percentage of female participants in the sample. Data for six study design characteristics were extracted: (i) form(s) of childhood maltreatment assessed; (ii) method of measuring maltreatment (interview versus self-report); (iii) method of measuring NSSI (interview versus self-report); (iv) time-frame of maltreatment measure; (v) time-frame of NSSI measure; and (vi) cross-sectional versus longitudinal analysis.

## Data analysis

Analyses were conducted with Comprehensive Meta-Analysis Version 3.3-070.<sup>17</sup> For all analyses, random-effects models were generated, accounting for the high expected heterogeneity across studies resulting from differences in samples, measures, and design. Heterogeneity across the studies was evaluated using the  $I^2$  statistic, which indicates the percentage of the variance in an effect estimate that is a product of heterogeneity across studies rather than sampling error (i.e., chance). Low heterogeneity is indicated by  $I^2$  values of around 25%, and moderate heterogeneity by  $I^2$  values of 50%. Substantial heterogeneity across studies is indicated by an  $I^2$  value of 75%.<sup>18</sup> Whenever possible, participants with a suicide attempt history were excluded, within individual studies, from analyses so as to assess cleanly the unique association between NSSI and childhood maltreatment (e.g., in studies presenting maltreatment data separately for participants with no self-harm, NSSI only, and both NSSI and suicide attempt history, only data for the former two groups were included).

High heterogeneity indicates the need for moderator analyses to account for potential sources of this heterogeneity. Each potential moderator was first assessed separately, with an estimate of the effect size at each level of the moderator calculated. When multiple moderators were significant, a multivariate meta-regression with a random-effects model and unrestricted maximum likelihood was conducted simultaneously evaluating all significant moderators in univariate analyses.

To evaluate for publication bias inflating estimates of pooled effect size, the following indices were calculated: Orwin's fail-safe  $N$ ,<sup>19</sup> Duval and Tweedie's trim-and-fill analysis,<sup>20</sup> and Egger's regression intercept.<sup>21</sup> Orwin's fail-safe  $N$  is an index of the robustness of an overall effect size, calculating the number of studies with an effect size of 0 required to reduce the overall effect size in a meta-analysis to non-significance. Duval and Tweedie's trim-and-fill analysis yields an estimate of the number of missing studies based on asymmetry in a funnel plot of the standard error of each study in a meta-analysis against its effect size, and an effect size estimate and confidence interval, adjusting for these missing studies. It assumes homogeneity of effect sizes. Consequently, its results need to be interpreted with caution when significant heterogeneity is present. Egger's regression intercept estimates potential publication bias using a linear regression approach assessing study effect sizes relative to their standard error.

## Role of the funding source

The funding source had no role in the design or conduct of this study. The corresponding author had full access to all the data and final responsibility for the decision to submit for publication.

## Results

Of the 938 unique records identified, 368 reports were excluded based on their titles and abstracts. Following this initial screen, an additional 499 articles were excluded based on a detailed full-text review, leaving a set of 71 publications<sup>4,22-91</sup> satisfying the eligibility

criteria (Figure 1 and Table 1). Fifteen studies featured overlapping samples. Whenever it remained unclear after inspection of the full text whether two studies reported on overlapping samples, the study authors were contacted to seek clarity on this issue. In cases where two or more studies used overlapping samples but reported on different forms of maltreatment, both studies were retained for relevant analyses. In cases where multiple studies assessed the same maltreatment subtype in relation to NSSI in overlapping samples, preference was given to studies, in descending order, based on: (i) shortest time-frame used for the NSSI measure, (ii) largest sample size for relevant analyses, (iii) more common measure of maltreatment used in relevant analyses, and (iv) largest number of covariates in relevant multivariate analyses. Three studies<sup>28,34,41</sup> did not report data required for meta-analysis, but was retained after the necessary data were obtained from the study authors. With all but one study<sup>74</sup> assessing lifetime childhood maltreatment, time-frame of maltreatment measure was excluded from all moderator analyses. For only sexual abuse was there a sufficient number of studies (i.e.  $k \geq 3$ ) for a meta-analysis of prospective NSSI. Given the considerable heterogeneity among the three relevant studies of sexual abuse<sup>55,67,87</sup> in follow-up assessment of NSSI (i.e., two months to 10 years), a meta-analysis of this longitudinal association was not conducted.

### Univariate associations between overall childhood maltreatment and NSSI

Overall maltreatment was positively associated with NSSI (Table 2). Heterogeneity was high, indicating the appropriateness of moderator analyses (Table 3). Age as a categorical variable significantly moderated the strength of the relation between overall maltreatment and NSSI, with this association stronger among adolescent samples than adult samples. The time-frame of NSSI measurement was also a significant moderator, with studies of past-12-month NSSI yielding larger effects than studies of lifetime NSSI. In a multivariate meta-regression model, neither moderator remained significant.

In terms of potential publication bias (Table 2), Orwin's fail-safe-N indicated that 215 unpublished studies with an OR of 1.0 would be required to reduce the pooled effect size for the relation between overall maltreatment and NSSI to 1.1 (an *a priori* trivial effect size), suggesting that the observed weighted effect size is robust. Egger's regression test indicated that there was no significant publication bias. Additionally, the funnel plot of effect sizes was not notably asymmetrical (Figure 2a). The adjusted OR produced with the trim-and-fill method was reduced but remained medium-to-large.

### Univariate associations between childhood maltreatment subtypes and NSSI

When specific forms of childhood maltreatment were examined, all five subtypes were positively associated with NSSI. Pooled OR's ranged from small-to-medium for emotional neglect to medium-to-large for emotional abuse. When sensitivity analyses were conducted to evaluate the effect of including individuals with a suicide attempt history in the NSSI groups (i.e., with NSSI-only groups replaced by groups with NSSI, regardless of suicide attempt history), the results were largely unchanged (Appendix 1). Heterogeneity proved significant for all maltreatment subtypes. A summary of these results is presented in Table 2.

In moderator analyses (Table 3), sample type emerged most frequently as a significant moderator, with the association with NSSI stronger in community than clinical/at-risk samples for physical abuse and neglect as well as emotional abuse and neglect. However, a consistent pattern was not observed in terms of heterogeneity; heterogeneity appeared higher for community samples in the case of physical abuse, but lower in the case of emotional abuse and neglect, and relatively comparable to heterogeneity for clinical samples in the case of physical neglect (Appendix 2). Time-frame of NSSI measure was also a significant moderator for sexual abuse and physical neglect, in both cases the association being stronger for NSSI with the past year than over the lifetime. For emotional abuse, stronger associations were observed for self-report measures of maltreatment and NSSI than interview-based measures. In multivariate meta-regression analyses, both sample type and time-frame of NSSI measure remained significant moderators of the association between physical neglect and NSSI. For emotional abuse, only method of measuring NSSI remained a significant moderator. The meta-regression models accounted for a large proportion of the variance in the effect sizes for physical neglect ( $R^2 = .68$ ) and emotional abuse ( $R^2 = .77$ ), respectively.

Regarding potential publication bias for studies of maltreatment subtypes, fail-safe  $N$ 's ranged from 103 to 583. Egger's regression test indicated significant publication bias only in the case of emotional neglect. Similarly, with the exception of emotional neglect, funnel plots of the effect sizes for maltreatment subtypes were not asymmetrical, suggesting no presence of publication bias (Figures 2b to 2f). Although the trim-and-fill method produced a reduction in estimated effect sizes, significant effects remained for all maltreatment subtypes. These results are presented in Table 2.

### Multivariate associations between childhood maltreatment and NSSI

Overall maltreatment remained significantly associated with NSSI in analyses that included all available covariates (OR = 2.79 [95% CI = 2.15–3.63],  $p < .001$ ). Similarly, all maltreatment subtypes remained significantly associated with NSSI in analyses that adjusted for covariates (OR<sub>Childhood Sexual Abuse</sub> = 1.62 [95% CI = 1.38–1.90],  $p < .0001$ ; OR<sub>Childhood Physical Abuse</sub> = 1.73 [95% CI = 1.38–2.17],  $p < .0001$ ; OR<sub>Childhood Physical Neglect</sub> = 1.24 [95% CI = 1.00–1.52],  $p < .05$ ; OR<sub>Childhood Emotional Abuse</sub> = 1.86 [95% CI = 1.42–2.44],  $p < .0001$ ; OR<sub>Childhood Emotional Neglect</sub> = 1.17 [95% CI = 1.02–1.35],  $p = .03$ ). Note that in the case of physical abuse, an outlier was excluded from analysis, and the lower end of the confidence interval for physical neglect was rounded down but exceeded 1.00. To account for the high rates with which different forms of maltreatment co-occur,<sup>92–94</sup> these analyses were repeated and restricted to ones that covaried at least one maltreatment subtype (Appendix 3). With the exception of the association with emotional neglect becoming non-significant, the results remained largely unchanged.

### Childhood maltreatment and severity of NSSI

In analyses restricted to individuals who engaged in NSSI (Appendix 4), overall maltreatment and three subtypes (sexual abuse, and physical abuse and neglect) were associated with the severity of this behavior. Emotional neglect was not associated with

NSSI severity, and not enough studies investigated the association between emotional abuse and NSSI severity for meta-analysis ( $k = 2$ ).

### Qualitative review of mediators and moderators

Thirteen studies, all cross-sectional, evaluated candidate mediators of the association between childhood maltreatment subtypes and NSSI. Five found support for psychiatric morbidity as mediators, including general psychiatric comorbidity for overall maltreatment,<sup>25</sup> PTSD and dissociation for sexual abuse,<sup>83,85</sup> and personality dysfunction for emotional maltreatment and physical abuse,<sup>46</sup> and dissociation for physical abuse.<sup>46,72</sup> Four studies focusing on self-concepts reported that academic self-efficacy, self-criticism, and pessimism were mediators for emotional abuse,<sup>33,34,47</sup> and self-blame for physical abuse.<sup>72</sup> Another three found emotion dysregulation to be a mediator for overall maltreatment<sup>66</sup> and neglect,<sup>31</sup> and emotional expressivity a mediator for emotional but not physical or sexual abuse.<sup>75</sup> Three studies of impulsivity found negative urgency, but not other forms of trait or behavioral impulsivity, to be a mediator for overall maltreatment.<sup>23–25</sup>

Three studies examined potential moderators. One observed the BDNF Val66Met polymorphism to be a moderator for emotional maltreatment.<sup>28</sup> Another found an interaction between emotional expressivity, negative affect intensity, and overall maltreatment.<sup>49</sup> A third noted that overall maltreatment was not moderated by negative urgency.<sup>23</sup>

## Discussion

The current review provides the most comprehensive synthesis to date of the empirical literature on childhood maltreatment and NSSI. Collectively, these findings provide support for childhood maltreatment, and its specific subtypes, being associated with NSSI, although the current evidence is modest in the case of emotional neglect. Despite this commonality among maltreatment subtypes in being linked with NSSI, subtypes of childhood maltreatment should not be considered as a unitary construct. They might be associated with NSSI through different mediational pathways (i.e., equifinality<sup>95</sup>), as with other mental health outcomes,<sup>96,97</sup> and treating them as one construct risks obscuring these important differences and their clinical implications.

Our findings differ from that of the earlier meta-analysis of sexual abuse and NSSI.<sup>12</sup> Whereas the prior review reported a modest effect size and evidence of publication bias, we found a medium effect size and no publication bias. Furthermore, whereas the earlier review found this association was non-significant after accounting for covariates in qualitative analyses, we found a modest but significant meta-analytic association. These differences may be partly due to the inclusion of 43 new studies of sexual abuse in the present meta-analysis, lending weight to the current findings.

The results of our review are congruent with the view that screening for childhood maltreatment history may be important in assessing risk for NSSI. Moreover, the finding across multiple maltreatment subtypes that the association with NSSI is stronger in non-clinical samples, with medium to large effects, suggests that screening for history of childhood maltreatment may be of most benefit in community settings. Childhood

maltreatment is associated with multiple other clinical outcomes (e.g., depression and bipolar disorder<sup>11,98,99</sup>), and may therefore be less of a distinguishing factor for NSSI in clinical populations where such disorders are more prevalent. Age was a significant moderator only for overall maltreatment, with a stronger effect in adolescence. This suggests that although NSSI is more common in adolescence,<sup>2</sup> it is not due to a stronger association with maltreatment at this age, and that maltreatment may thus confer long-term risk for NSSI that extends into adulthood. This possibility is consistent with findings of significant long-term deleterious effects of childhood maltreatment on mental health.<sup>99–101</sup> Thus, preventing maltreatment and early intervention with maltreatment victims are very important. Although NSSI is more prevalent among females,<sup>102</sup> our moderator analyses indicated that this is unlikely to be due to potential sex differences in susceptibility to the detrimental effects of childhood maltreatment.<sup>103</sup> Rather, sex differences in the prevalence of NSSI may be better accounted for by greater exposure in females to maltreatment experiences, at least in the case of sexual abuse.<sup>104,105</sup> Given that childhood maltreatment seems to be no less deleterious in males than females with regards to NSSI as a clinical outcome, the current findings suggest that it should be accorded comparable weight in risk stratification for both sexes. Emotional abuse has received considerably less attention than childhood sexual and physical abuse in relation to NSSI. This may, in part, be due to the long-held view by clinicians and researchers alike that it is the least damaging form of abuse.<sup>106–108</sup> Contrasting with this perception, the finding in our analyses of the largest effect for this maltreatment subtype adds to the accumulating evidence that its pathogenic impact is comparable to, if not larger than, that of other abuse subtypes in relation to several mental health outcomes (e.g., depression<sup>99,101,109</sup> and bipolar disorder<sup>110</sup>). The relative neglect of emotional abuse is all the more consequential given that it is the most prevalent form of abuse.<sup>111</sup> Greater emphasis on this abuse subtype in NSSI risk assessment and research is therefore warranted.

Delineating moderators and mediational pathways through which childhood maltreatment may be associated with NSSI is of value for its potential to advance risk stratification strategies and to identify promising candidates for targeted intervention. Existing evidence is modest, with preliminary support currently strongest for negative cognitive tendencies as mediators for emotional abuse, and negative urgency for overall maltreatment. All studies in this area were cross-sectional, and should thus be interpreted with caution.<sup>112,113</sup> Future research, particularly on cognitive and biological mechanisms, is needed for the development of novel treatment approaches for individuals with maltreatment histories.

Finally, the current findings must be interpreted within the context of several important limitations. First is the paucity of primary studies employing longitudinal analyses. Establishing the temporal relation between maltreatment and NSSI is a necessary first step toward determining the potential causal role of maltreatment in this clinical outcome.<sup>114</sup> Second, with few exceptions,<sup>74,85,115</sup> most studies used retrospective recall of maltreatment. Although retrospective recall of adverse childhood experiences appears to be reasonably accurate,<sup>116,117</sup> prospective assessment of maltreatment allows for more precise estimations of its association with NSSI. Third, only one study<sup>26</sup> focused on early adolescence (ages 12–13). Future research on the transition from childhood to adolescence is important, given NSSI onset typically occurs during this period of development.<sup>118,119</sup> Fourth, only seven



studies<sup>4,26,37,48,60,73,76</sup> allowed for analyses of “pure” NSSI (i.e., unconfounded by its naturally high co-occurrence with suicide attempt history<sup>5,120</sup>) in relation to childhood maltreatment. As suicidal behavior is also associated with childhood maltreatment,<sup>121</sup> future research cleanly separating it from NSSI is required accurately to assess the latter in relation to childhood maltreatment. Finally, substantial heterogeneity often remained among studies after moderator analysis. One potential contributor to heterogeneity is the NSSI measure used. Although NSSI measurement medium was generally not a significant moderator, other aspects of NSSI measurement influence prevalence estimates (i.e., single-item versus multi-item measures of NSSI methods)<sup>2</sup> and might influence heterogeneity here. Comprehensive and standardized assessment of NSSI methods across studies would therefore be important for accurately characterizing NSSI in relation to its risk factors.

In conclusion, there was consistent evidence that childhood maltreatment in its different manifestations, with the exception of emotional neglect, was associated with engagement in NSSI. The current review also highlights the need for greater consideration of emotional abuse in evaluations of risk for NSSI, particularly in community settings. Future longitudinal research investigating moderators and mediating mechanisms has potential to guide efforts to minimize risk for NSSI in individuals with a maltreatment history.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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### Research in context

We searched Embase, MEDLINE, and PsycINFO for articles in English and published from inception to September 25, 2017, that assessed the association between childhood maltreatment and non-suicidal self-injury (NSSI), using the search terms: (self-injur\* OR parasuicid\* OR "self-harm" OR "self-mutilation") AND ("emotional abuse" OR "emotionally abused" OR "emotional victimization" OR "emotionally victimized" OR "verbal abuse" OR "verbally abused" OR "psychological abuse" OR "psychologically abused" OR "physical abuse" OR "physically abused" OR "sexual abuse" OR "sexually abused" OR "sex abuse" OR maltreat\* OR "childhood neglect" OR "child neglect" OR "childhood abuse" OR "child abuse"). This was supplemented by a search of the references of a prior meta-analysis of childhood sexual abuse and NSSI. After excluding duplicates and ineligible publications, we identified 71 relevant studies that evaluated the association between childhood maltreatment with NSSI.

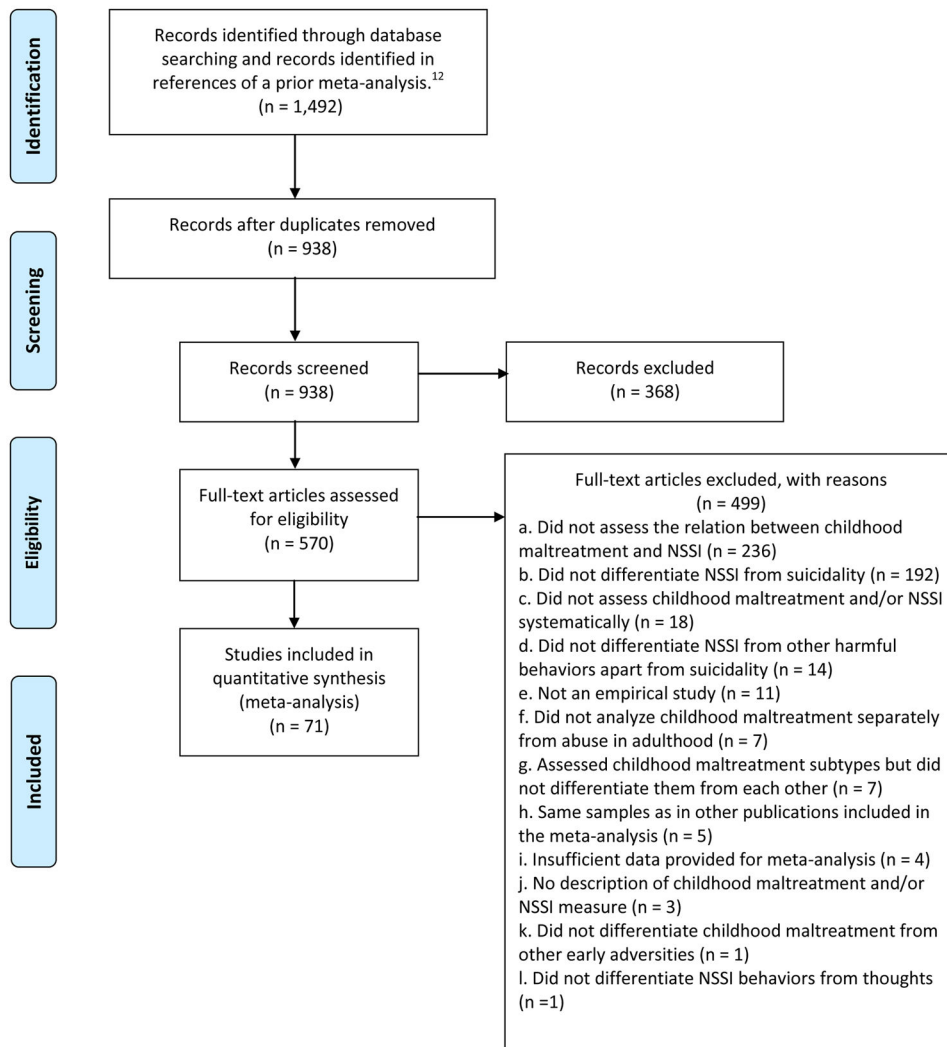
### Added value of this study

We conducted the most comprehensive review to date of the association between childhood maltreatment and NSSI, this being the first such review to expand beyond childhood sexual abuse. With 43 new studies of childhood sexual abuse in the current meta-analysis, it provides a significant update to a prior meta-analysis of childhood sexual abuse. Additionally, we quantitatively evaluated childhood maltreatment in relation to NSSI after accounting for covariates and supplemented our analyses with a systematic qualitative review of studies examining mediators and moderators of this association. With the exception of childhood emotional neglect, childhood maltreatment and its subtypes were consistently associated with NSSI, and these findings were not artifacts of publication bias or shared correlates. Across multiple maltreatment subtypes, stronger associations with NSSI were found in community samples.

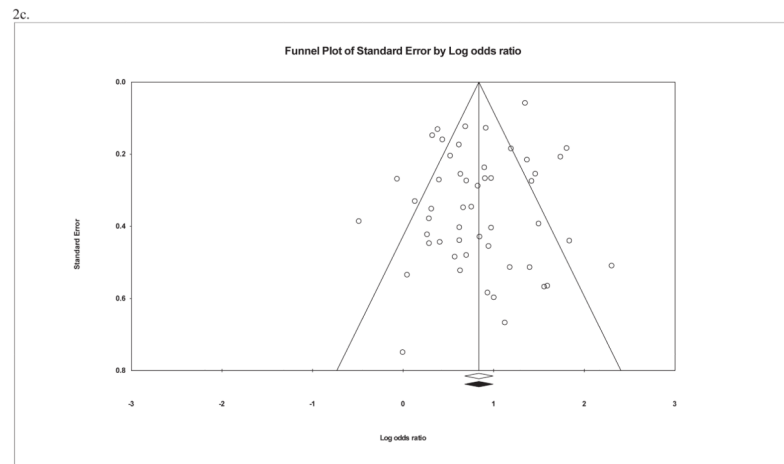
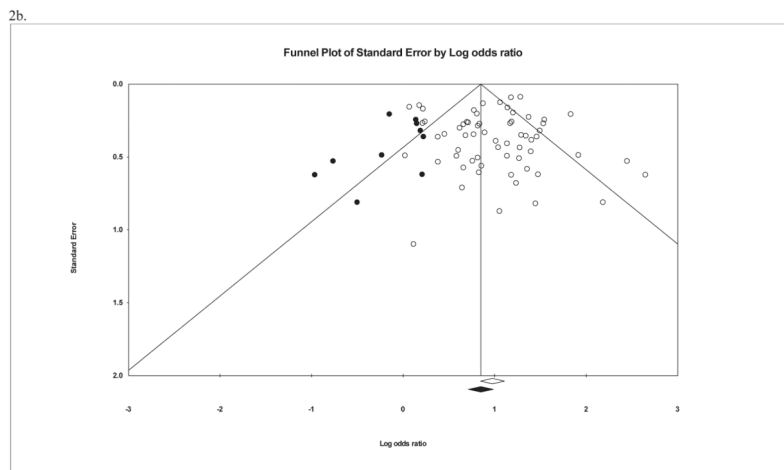
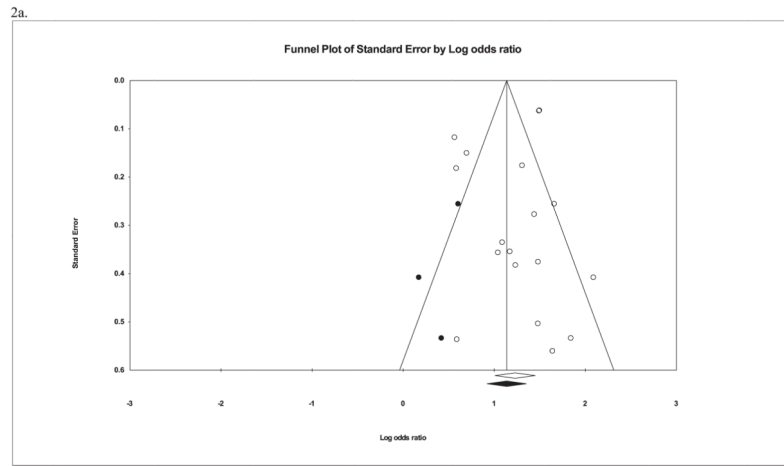
### Implications of all the available evidence

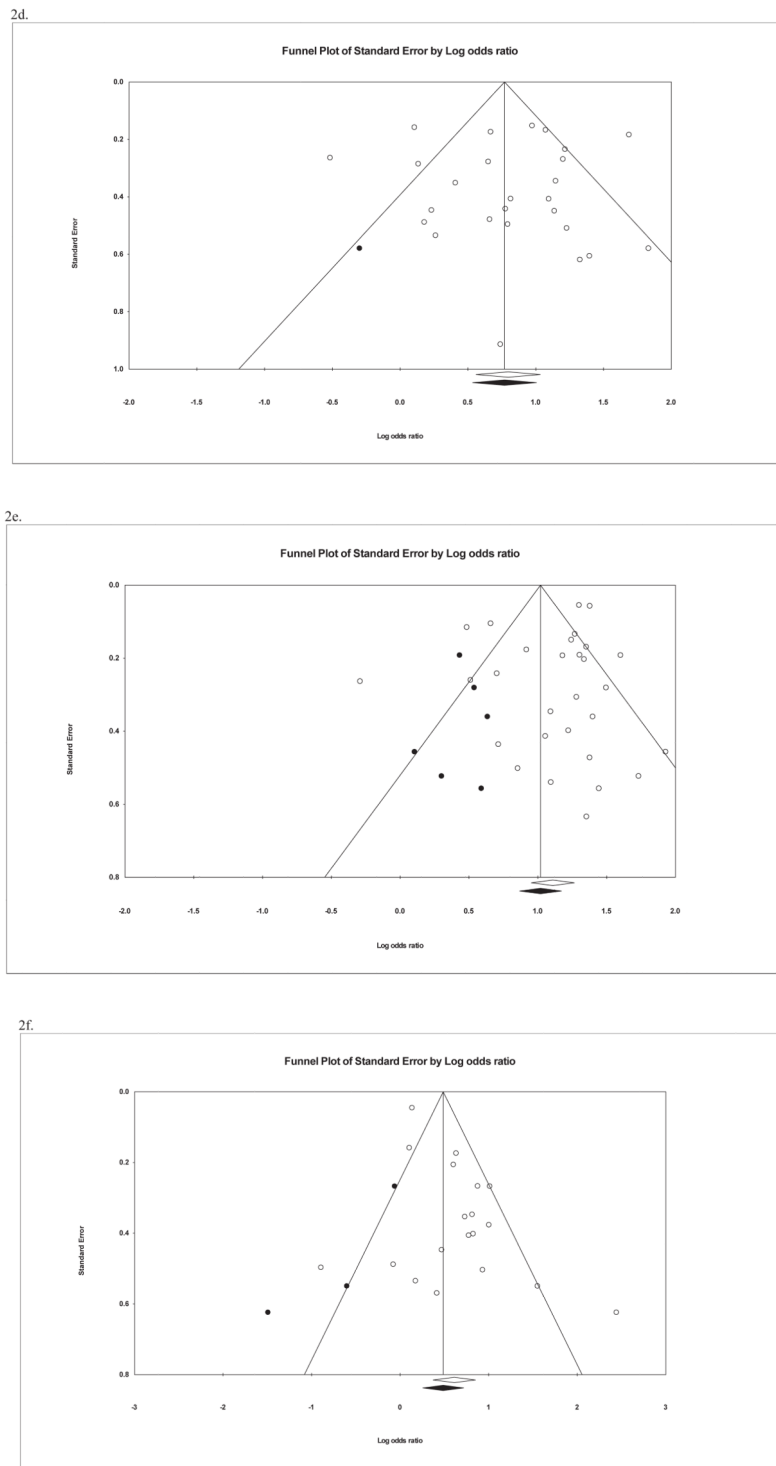
Our findings suggest that: (i) screening for childhood maltreatment history may be important in assessing risk for NSSI; (ii) such screening may be particularly valuable in community settings; (iii) a history of childhood maltreatment should be accorded comparable weight in risk stratification for both sexes rather than a greater emphasis be given with females; and (iv) countering the prevailing view in research and practice that childhood emotional abuse is less associated with NSSI than are childhood sexual and physical abuse, it may be comparably, if not more, relevant to this outcome, warranting greater attention to this maltreatment subtype, especially with it being the most prevalent form of childhood abuse. The current review also highlights the need for longitudinal research more precisely delineating the temporal nature of the relation between childhood maltreatment, NSSI, and potential mediating mechanisms underlying this association for the potential of work in this area to yield promising candidates for targeted intervention.





**Figure 1.**  
PRISMA flow chart of literature search





**Figure 2.** Funnel plot for effect sizes in the meta-analyses. The vertical line indicates the weighted mean effect. Open circles indicate observed effects for actual studies, and closed circles indicate imputed effects for studies believed to be missing due to publication bias. The clear

diamond reflects the unadjusted weighted mean effect size, whereas the black diamond reflects the weighted mean effect size after adjusting for publication bias.

- 2a. Overall childhood maltreatment and non-suicidal self-injury
- 2b. Childhood sexual abuse and non-suicidal self-injury
- 2c. Childhood physical abuse and non-suicidal self-injury
- 2d. Childhood physical neglect and non-suicidal self-injury
- 2e. Childhood emotional abuse and non-suicidal self-injury
- 2f. Childhood emotional neglect and non-suicidal self-injury

Table 1

## Study characteristics

Study Author(s) (year)	N <sup>a</sup>	% Female <sup>d</sup>	Mean Age <sup>d</sup>	Sample	Childhood Maltreatment			Non-Suicidal Self-Injury		
					Measure(s)	Format	Form(s)	Measure	Format	Time Frame
Akyuz et al. (2005)	628	100	34.8	Community	CANQ	Q	CEA, CPA, CSA	SSM	Q	Lifetime
Arens et al. (2012)	407	65.0	20.3	Community	CATS	Q	Overall	DSHI	Q	Lifetime
Arens et al. (2014)	600	73.0	19.7	Community	CATS	Q	Overall, CPA, CPN, CSA	DSHI	Q	Lifetime
Asarnow et al. (2011)	250	65.2	15.8	Clinical	K-SADS	I	CPN, CSA	K-SADS	I	Lifetime
Auerbach et al. (2014)	194	74.2	15.5	Clinical	CTQ	Q	Overall, CPA, CSA	SITBI	I	1 month
Baiden et al. (2017)	2,038	38.9	12.5	Clinical	ChYMh	I	CEA, CPA, CSA	ChYMh	I	Lifetime
Bernegger et al. (2015) <sup>b</sup>	255	56.9	-	Clinical	CTQ	Q	Overall, CEA, CEN, CPA, CPN, CSA	VI-SURIAS	Q	Lifetime
Bresin et al. (2013)	446	30.4	30.3	At-risk	CTQ	Q	CEA, CEN, CPA, CPN, CSA	LHA	I	Lifetime
Briere & Gil (1998) Study 1	927	50.0	46.0	Community	TES	Q	CSA	TSI	Q	6 months
Briere & Gil (1998) Study 2	390	77.9	36.0	Clinical	CMIS	I	CSA	TSI	Q	6 months
Brown et al. (1999)	117	98.3	24.7	Clinical	SLEI	Q	CPA, CSA	SSM	Q	Lifetime
Buckholdt et al. (2009)	117	76.3	21.0	Community	EAC	Q	CEN	DSHI	Q	Lifetime
Burke et al. (2017)	520	76.0	20.6	At-risk	CTQ	Q	CEA, CEN, CPA, CPN, CSA	FAFSI	Q	Lifetime
Buser & Hackney (2012)	390	66.0	20.3	Community	EASE-PI	Q	CEA	FASM	Q	1 year
Buser et al. (2015)	648	74.0	20.5	Community	EASE-PI	Q	CEA	FASM	Q	1 year
Cater et al. (2014) <sup>b</sup>	2,500	52.6	22.2	Community	JVQ	Q	CEA, CPA, CPN, CSA	SSM	Q	Lifetime
Cerutti et al. (2011)	234	50.4	16.5	Community	LSC-R	Q	CEA, CPA, CPN, CSA	DSHI	Q	Lifetime
Chapman et al. (2014)	104	100	31.9	At-risk	CTQ	Q	CEN, CPN, CSA	LPC-2	I	Lifetime
Claes & Vandereycken (2007)	65	100	21.7	Clinical	TEQ	Q	CPA, CSA	SIQ	Q	1 year
Croyle & Waltz (2007)	216	55.0	20.1	Community	TES	Q	CEA, CSA	SHIF	Q	3 years
Darke & Torok (2013)	300	33.0	37.1	Clinical	CTA	I	CPA	SSM	I	Lifetime
DiPietro et al. (2012)	267	70.4	17.0	Community	BCI	I	CPA, CPN, CSA	SIQ	Q	Lifetime
Evren & Evren (2005)	136	0.0	36.4	Clinical	CANQ	Q	CEA, CPA, CSA	SSM	I	Lifetime
Evren et al. (2006)	112	0.0	33.8	Clinical	CANQ	Q	CEA, CPA, CSA	SSM	I	Lifetime
Evren et al. (2008)	176	0.0	43.1	Clinical	SSM	Q	Overall	SSM	I	Lifetime

Study Author(s) (year)	N <sup>a</sup>	% Female <sup>d</sup>	Mean Age <sup>d</sup>	Sample	Childhood Maltreatment			Non-Suicidal Self-Injury		
					Measure(s)	Format	Form(s)	Measure	Format	Time Frame
Evren et al. (2012)	200	0.0	–	Clinical	CTQ	Q	CEA, CEN, CPA, CPN, CSA	SMBQ	I	Lifetime
Gladstone et al. (2004)	125	100	36.9	Clinical	SSM	I	CSA	SSM	I	Lifetime
Glassman et al. (2007) <sup>/</sup>	86	77.9	17.0	Mixed	CTQ	Q	CEA, CEN, CPA, CPN	SITBI	I	1 year
Gorodetsky et al. (2016)	614	0.0	40.3	At-risk	CTQ	Q	Overall	SSM	I	Lifetime
Gratz (2006)	200	100	23.3	Community	API, PBI	Q	Overall, CEN, CPA, CSA	DSHI	Q	Lifetime
Gratz and Chapman (2007)	97	0.0	22.7	Community	API, PBI	Q	CEN, CPA	DSHI	Q	Lifetime
Gratz et al. (2002) <sup>b</sup>	133	66.9	22.7	Community	API, DAS, PBI	Q	CEN, CPA, CPN, CSA	DSHI	Q	Lifetime
Isookookana et al. (2013) <sup>b</sup>	508	59.1	15.4	Clinical	K-SADS	I	CPA, CSA	K-SADS	I	Lifetime
Jaquier et al. (2013)	212	100	36.6	At-risk	CTQ	Q	CEA, CPA, CSA	DSHI	Q	Lifetime
Kaess et al. (2013)	125	50.4	17.1	Clinical	CECA-Q	Q	Overall, CEN, CPA, CPN, CSA	FASM	Q	1 year
Kaplan et al. (2016)	48	100	17.2	Clinical	CTQ	Q	CSA	SITBI	I	1 and 12 months
Kara et al. (2015)	295	24.4	14.3	At-risk	SSM	I	CSA	SSM	I	Lifetime
Karagöz & Da (2015)	79	0.0	41.9	Clinical	CTQ	Q	CPA, CSA	SSM	I	Lifetime
Lipschitz et al. (1999)	71	52.2	14.7	Clinical	CTQ	Q	CPN	SSM	I	Lifetime
Ludtke et al. (2016)	72	100	16.1	Clinical	CECA-Q	Q	CEN, CPA, CPN, CSA	SSM	I	Lifetime
Maloney et al. (2010)	697	44.8	35.9	Clinical	CTA	I	Overall, CEA, CEN, CPA, CSA	COGA SSAGA-II	I	Lifetime
Martin et al. (2011)	1,170	74.0	19.3	Community	PBI, PRP, SSM	Q	CEN, CSA	OSI	Q	6 months
Martin et al. (2016)	957	78.1	20.1	Community	CCMS	Q	Overall	OSI	Q	Lifetime
Muehlenkamp et al. (2010)	1,855	66.0	19.7	Community	AMQ	Q	CPA, CSA	DSHI	Q	Lifetime
Nijman et al. (1999)	47	48.0	37.5	Clinical	CTQ	Q	Overall, CEA, CEN, CPA, CPN, CSA	SSM	I	Lifetime
Parker et al. (2005) Study 1	112	60.7	36.4	Clinical	MOPS, PBI	Q	CPA, CSA	SSM	I	Lifetime
Parker et al. (2005) Study 2	98	83.7	33.7	Clinical	MOPS, PBI	Q	CPA, CSA	SSM	I	Lifetime
Parker et al. (2005) Study 3	76	80.6	33.4	Clinical	MOPS, PBI	Q	Overall, CPA, CSA	SSM	I	Lifetime
Peh et al. (2017)	108	59.3	17.0	Clinical	CTQ	Q	Overall	FASM	Q	1 year
Rabinovitch et al. (2015)	140	100	15.3	At-risk	CPS records	–	CPA, CSA	C-SSRS	I	Lifetime
Reddy et al. (2013)	71	56.0	14.7	At-risk	CTQ	Q	CSA	FASM	Q	1 year
Reichl et al. (2016)	52	92.3	16.3	Mixed	CECA	I	Overall, CEA, CEN, CPA, CPN, CSA	SITBI	I	Lifetime

Study	Author(s) (year)	N <sup>a</sup>	% Female <sup>d</sup>	Mean Age <sup>d</sup>	Sample	Childhood Maltreatment			Non-Suicidal Self-Injury		
						Measure(s)	Format	Form(s)	Measure	Format	Time Frame
	Roe-Sepowitz (2007)	256	100	35.5	At-risk	CMIS	Q	CEA, CPA, CSA	TSI	Q	Lifetime
	Stewart et al. (2014)	2,013	45.5	17.7	Clinical	ChYMh	I	CEA, CPA, CSA	ChYMh	I	1 year
	Swannell et al. (2012) <sup>b</sup>	10,719	61.7	52.1	Community	SSM	I	CPA, CPN, CSA,	SSM	I	1 year
	Taliaferro et al. (2012) <sup>b</sup>	59,276	46.6	-	Community	SSM	Q	CPA, CSA	SSM	Q	1 year
	Tatnell et al. (2016) <sup>c</sup>	2,550	68.0	13.9	Community	ALES	Q	CPA, CSA	SHBQ	Q	Lifetime
	Thomassin et al. (2016)	95	58.0	14.2	Clinical	CTQ	Q	CEA, CPA, CSA	DSHI	Q	Lifetime
	Tresno et al. (2012)	215	76	19.8	Community	CATS	Q	CPN	DSHI	Q	Lifetime
	Tresno et al. (2013)	313	50	19.0	Community	CATS	Q	CPN	DSHI	Q	Lifetime
	Tsai et al. (2011)	742	23.8	17.0	Community	SSM	Q	CSA	SSM	Q	Lifetime
	Turell & Armsworth (2000)	84	100	32.5	At-risk	SSM	Q	CEA, CPA, CSA	SSM	Q	Lifetime
	Tyler et al. (2003)	417	56.3	17.4	At-risk	PC-CTS, SSM	Q	CSA	FASM	Q	Lifetime
	Wachter et al. (2009)	58	72.4	37.1	Clinical	CTQ	Q	CEA, CEN, CPA, CPN, CSA	DSHI	Q	Lifetime
	Wan et al. (2015) <sup>b</sup>	14,211	52.8	15.1	Community	ACE Tool PC-CTS	Q	Overall, CEA, CPA, CSA	SSM	Q	1 year
	Weierich & Nock (2008) <sup>f</sup>	44	84.1	17.2	Mixed	CTQ	Q	CSA	SITBI	I	1 month
	Weismore & Esposito-Smythers (2010)	183	71.4	-	Clinical	K-SADS	I	CPA, CSA	K-SADS	I	1 year
	Yates et al. (2008) <sup>b</sup>	155	51.6	26.0	At-risk	Multiple sources	Mixed	CPA, CPN, CSA	SSM	I	Lifetime
	Zanarini et al. (2002) <sup>2</sup>	290	80.3	26.9	Clinical	CEQ-R	I	CSA	LSDS	I	Lifetime
	Zanarini et al. (2011) <sup>2</sup>	290	80.3	26.9	Clinical	CEQ-R	I	CEN	LSDS	I	10 years
	Zetterqvist et al. (2014)	816	-	-	Community	LYLES	Q	CEA, CPA, CSA	FASM	Q	1 year
	Zlotnick et al. (1996)	148	100	33.0	Clinical	SAQ	Q	CSA	SII	Q	3 months
	Zoroglu et al. (2003)	818	61.1	15.9	Community	CANQ	Q	Overall, CEA, CPA, CSA	SSM	Q	Lifetime
	Zweig-Frank et al. (1994)	150	100	29.0	Clinical	SSM <sup>d</sup>	I	CSA	DIB-R	I	2 years

Note: ACE Tool = Centers for Disease Control and Prevention Short Adverse Childhood Experiences Tool; ALES = Adolescent Life Events Scale; AMQ = About Me Questionnaire; API = Abuse and Perpetration Inventory; BCI = Boricua Child Interview; CANQ = Childhood Abuse and Neglect Questionnaire; CATS = Child Abuse and Trauma Scale; CCMS = Comprehensive Childhood Maltreatment Scale; CECA = Childhood Experiences of Care and Abuse Interview; CECA-Q = Childhood Experiences of Care and Abuse Questionnaire; CEQ-R = Revised Childhood Experiences Questionnaire; ChYMh = Child and Your Mental Health Instrument; CMIS = child protective services; COGA SSAGA-II = Collaborative Study on the Genetics of Alcoholism Semi-Structured Assessment for the Genetics of Alcoholism II; CPS = child protective services; C-SSRS = Columbia-Suicide Severity Rating Scale; CTA = Christchurch Trauma Assessment; CTQ = Childhood Trauma Questionnaire; DAS = Disruptions in Attachment Survey; DIB-R = Diagnostic Interview for Borderlines - Revised; DSHI = Deliberate Self-Harm Inventory; EAC = Emotions as a Child Scales; EASE-PI = Exposure To Abusive and Supportive Environments Parenting Inventory; FAFSI = Form and Function of Self Injury Scale; FASM = Functional Assessment of Self-Mutilation; JYQ = Juvenile Victimization

Questionnaire; K-SADS = Kiddie Schedule for Affective Disorders and Schizophrenia; LHA= Lifetime History of Aggression; LPC-2= Lifetime Parasuicide Count-2; LSC-R= Life Stressor Checklist-Revised; LSDS= Lifetime Self-Destructiveness Scale; LYLES = Linköping Youth Life Experience Scale; MOPS = Measure of Parental Style; OSI= Ottawa Self-Injury Inventory; PBI= Parental Bonding Instrument; PC-CTS= Parent-Child Conflict Tactics Scale; PRP= Personal and Relationships Profile; SAQ = Sexual Assault Questionnaire; SHBQ= Self-Harm Behavior Questionnaire; SHIF= Self-Harm Information Form; SIH = Self-Injury Inventory; SIQ= Self-Injury Questionnaire; SITBI = Self-Injurious Thoughts and Behaviors Interview; SLEI = Sexual Life Events Inventory; SMBQ= Self-mutilative Behavior Questionnaire; SSM = study-specific measure; TEQ= Traumatic Experiences Questionnaire; TES = Traumatic Events Survey; TSI = Trauma Symptom Inventory; VI-SURIAS = Viennese Suicide Risk Assessment Scale

I = Interview; Q = Questionnaire

CEA = childhood emotional abuse; CEN = childhood emotional neglect; CPA = childhood physical abuse; CFPN = childhood physical neglect; CSA = childhood sexual abuse

<sup>1, 2</sup> Studies with identical superscripts were drawn from same or overlapping samples but presented unique data included in this review.

<sup>a</sup> The sample size, mean age, and percentage female for participants included in relevant analyses, rather than of the entire study sample, are presented and were incorporated in moderator analyses whenever available. For ease of presentation, whenever the sample size varied across multiple relevant analyses within a study, the largest cumulative sample size across these analyses is presented here, and the sample size used in each analysis was retained in the relevant meta-analysis for purposes of obtaining weighted effect sizes.

<sup>b</sup> Separate effects were reported by sex. The proportion of the overall sample that was female is presented here.

<sup>c</sup> Although childhood abuse was assessed prospectively, its cross-sectional relation with NSSI was reported at each time-point. The analysis of this relation at baseline provided the largest sample size and was thus included in the current review.

<sup>d</sup> The PBI was also used to assess childhood maltreatment. This study did not include it, however, in quantitative analyses.



Table 2

Univariate associations between childhood maltreatment and non-suicidal self-injury.

	<i>k</i>	<i>N</i> <sub>Total</sub>	Mean Age (Adolescents)	Mean Age (Adults)	Effect Size Analyses			Heterogeneity Analyses		Publication Bias Analyses			
					OR	95% CI	<i>p</i>	<i>I</i> <sup>2</sup>	<i>p</i>	Orwin's fail-safe N	Egger's regression test <i>p</i>	Trim-and-fill OR	95% CI
Overall Childhood Maltreatment	18	19,537	15.17	28.00	3.42	2.74 – 4.26	<.0001	82.82%	<.0001	215	.76	3.12	2.51 – 3.87
Childhood Sexual Abuse	63	48,246	15.15	39.73	2.65	2.33 – 3.03	<.0001	68.80%	<.0001	583	.83	2.34	2.04 – 2.68
Childhood Physical Abuse	51	37,821	15.05	39.80	2.31	1.97 – 2.69	<.0001	78.22%	<.0001	397	.05	2.31	1.97 – 2.69
Childhood Physical Neglect	26	17,141	16.51	42.68	2.22	1.75 – 2.80	<.0001	73.72%	<.0001	192	.97	2.16	1.71 – 2.73
Childhood Emotional Abuse	29	27,768	15.16	26.52	3.03	2.59 – 3.54	<.0001	79.18%	<.0001	309	.37	2.77	2.38 – 3.23
Childhood Emotional Neglect	19	3,468	16.51	28.26	1.84	1.45 – 2.34	<.0001	72.68%	<.0001	103	<.01	1.63	1.29 – 2.05

Note: *k* = number of unique effects; OR = pooled odds ratio; CI = confidence interval

An outlier was excluded from analyses for childhood physical abuse and sexual abuse, respectively.

Participants < age 18 are classified here as adolescents, and those 18 are classified as adults.

**Table 3**

Univariate and multivariate moderator analyses.

	Univariate Moderator Analyses											Multivariate					
	Effect Size Analyses				Heterogeneity Analyses				Meta-Regression Analyses			p	R <sup>2</sup>				
	k	N	b	OR	95% CI	p	I <sup>2</sup>	p	b	p							
<i>Overall Childhood Maltreatment</i>																	
Age (Categorical)	17	19,412				<.01											
Adolescent	6		4.44	4.07–4.84		<.0001	1.71%	.41		-.43		.13					
Adult <sup>c</sup>	11		2.86	2.16–3.78		<.0001	67.76%	<.01									
Age (Continuous)	16	19,282	<.01			.53											
Percentage Female	18	19,537	<.01			.62											
Sample Type	17	19,485				.15											
Childhood Maltreatment Measure <sup>a</sup>	–	–	–	–	–	–											
NSSI Measure	18	19,537				.11											
NSSI Timeframe	17	19,343				<.01											
12-Month	4		4.50	4.12–4.90		<.0001	0%	.46		-.15		.62					
Lifetime <sup>c</sup>	13		3.06	2.34–3.99		<.0001	70.10%	<.0001									
<i>Childhood Sexual Abuse</i>																	
Age (Categorical)	62	48,121				.44											
Age (Continuous)	58	46,792	<.01			.54											
Percentage Female	62	48,246	<.01			.49											
Sample Type	61	48,150				.09											
Childhood Maltreatment Measure	61	48,091				.66											
NSSI Measure	63	48,246				.10											
NSSI Timeframe	62	48,094				<.01											
12-Month	15		3.52	2.84–4.37		<.0001	67.10%	<.01									
Lifetime	47		2.38	2.05–2.76		<.0001	60.48%	<.0001									
<i>Childhood Physical Abuse</i>																	
Age (Categorical)	50	37,696				.26											
Age (Continuous)	46	36,367	.02			.07											
Percentage Female	50	37,821	<.01			.29											

	Univariate Moderator Analyses										Multivariate		
	Effect Size Analyses					Heterogeneity Analyses					Meta-Regression Analyses		
	<i>k</i>	<i>N</i>	<i>b</i>	OR	95% CI	<i>p</i>	<i>I</i> <sup>2</sup>	<i>p</i>	<i>b</i>	<i>p</i>	<i>R</i> <sup>2</sup>	<i>p</i>	<i>R</i> <sup>2</sup>
Sample Type	49	37,683				<.0001							
Clinical	32		1.78	1.56–2.04	<.0001	34.30%	.03						
Community	17		3.29	2.64–4.11	<.0001	78.80%	<.0001						
Childhood Maltreatment Measure	48	37,526				.52							
NSSI Measure	51	37,821				.13							
NSSI Timeframe	50	37,627				.14							
<i>Childhood Physical Neglect</i>													.68
Age (Categorical)	25	17,016				.81							
Age (Continuous)	23	16,686	.02			.09							
Percentage Female	26	17,141	<.01			.28							
Sample Type	24	17,003				<.01							
Clinical <sup>c</sup>	13		1.60	1.19–2.15	<.01	55.76%	<.01						
Community	11		2.87	2.22–3.71	<.0001	60.77%	<.01	.50			<.01		
Childhood Maltreatment Measure	24	16,986				.26							
NSSI Measure	26	17,141				.66							
NSSI Timeframe	26	17,141				<.01							
12–Month	4		3.87	2.59–5.77	<.0001	39.45%	.18	.61			.02		
Lifetime <sup>c</sup>	22		2.01	1.58–2.54	<.0001	67.61%	<.0001						
<i>Childhood Emotional Abuse</i>													.77
Age (Categorical)	29	27,768				.83							
Age (Continuous)	25	26,497	<.01			.59							
Percentage Female	28	27,768	<.01			.10							
Sample Type	27	27,630				.03							
Clinical <sup>c</sup>	16		2.69	2.08–3.47	<.0001	75.28%	<.0001						
Community	11		3.66	3.31–4.04	<.0001	29.43%	.17	<.01			.77		
Childhood Maltreatment Measure	29	27,768				<.0001							
Interview <sup>c</sup>	4		1.85	1.55–2.21	<.0001	19.88%	.29						
Questionnaire	25		3.32	2.91–3.79	<.0001	60.67%	<.0001	.16			.44		

	Univariate Moderator Analyses										Multivariate		
	Effect Size Analyses					Heterogeneity Analyses					Meta-Regression Analyses		
	<i>k</i>	<i>N</i>	<i>b</i>	OR	95% CI	<i>p</i>	<i>I</i> <sup>2</sup>	<i>p</i>	<i>b</i>	<i>p</i>	<i>R</i> <sup>2</sup>		
NSSI Measure	29	27,768				<.01							
Interview <sup>c</sup>	10		2.19	1.64-2.92	<.0001	<.0001	71.92%	<.01					
Questionnaire	19		3.74	3.50-3.99	<.0001	<.0001	0%	.61	.56		<.01		
NSSI Timeframe	29	27,768				.51							
<i>Childhood Emotional Neglect</i>													
Age (Categorical)	18	3,343				.24							
Age (Continuous)	16	3,013	<.01			.09							
Percentage Female	19	3,468	<.01			.59							
Sample Type	17	3,330				.02							
Clinical	12		1.53	1.19-1.97	<.01	<.01	67.98%	<.01					
Community	5		2.45	1.78-3.36	<.0001	<.0001	0%	.90					
Childhood Maltreatment Measure	19	3,468				.68							
NSSI Measure	19	3,468				.82							
NSSI Timeframe <sup>b</sup>	-	-	-	-	-	-	-	-	-	-	-	-	

Note: *k* = number of unique effects; OR = pooled odds ratio; CI = confidence interval

In analyses of sample type, at-risk and clinical samples were combined and compared to community samples.

<sup>a</sup>Not enough observations from studies employing interview measures of childhood maltreatment (*k* = 2) were available for moderator analysis.

<sup>b</sup>All but two studies analyzed lifetime history of NSSI in relation to childhood maltreatment, and thus moderator analysis was not conducted.

<sup>c</sup>The category with the smallest effect size in univariate moderator analysis served as the reference group in the corresponding meta-regression analysis.