Running head: Predictors for DSM-5 NSSI disorder

Predictors for DSM-5 nonsuicidal self-injury in female adolescent inpatients: the role of
childhood maltreatment, alexithymia, and dissociation

Janine Lüdtke, M.Sc.^a, Tina In-Albon, PhD^b, Chantal Michel, PhD^c and Marc Schmid, PhD^{a*}

^a Department of Child and Adolescent Psychiatry, Psychiatric Clinics of the University Basel,
Basel, Switzerland

^b Clinical Child and Adolescent Psychology, Department of Psychology, University of
Koblenz-Landau, Germany

^c University Hospital of Child and Adolescent Psychiatry and Psychotherapy, University of
Bern, Bern, Switzerland

Correspondence to Marc Schmid, Department of Child and Adolescent Psychiatry,
Psychiatric Clinics of the University Basel, Schanzenstrasse 13, 4056 Basel, Switzerland
E-Mail: Marc.Schmid@upkbs.ch

Tel. +41 61 265 89 74

Fax +41 61 265 89 61

Abstract

The purpose of this study was to examine the relationship between various adverse childhood experiences, alexithymia, and dissociation in predicting nonsuicidal self-injury (NSSI) in an inpatient sample of female adolescents. Seventy-two adolescents (aged 14-18 years) with NSSI disorder ($n = 46$) or mental disorders without NSSI ($n = 26$) completed diagnostic interviews and self-report measures to assess NSSI disorder according to the DSM-5 criteria, childhood maltreatment, alexithymia, and dissociation. Alexithymia and dissociation were highly prevalent in both study groups. Multivariate logistic regression analyses indicated that only alexithymia was a significant predictor for NSSI, whereas childhood maltreatment and dissociation had no predictive influence. The association between alexithymia and NSSI emphasizes the significance of emotion regulation training for female adolescents with NSSI. Efforts to reduce NSSI behavior should therefore foster skills to heighten the perception and recognition of one's own emotions.

Keywords: Nonsuicidal self-injury, childhood maltreatment, alexithymia, dissociation, emotion regulation

1. Introduction

Nonsuicidal self-injury (NSSI) is defined as the repetitive, deliberate, direct, and socially unacceptable destruction or alteration of one's own body tissue without the intent to die (American Psychiatric Association, 2013). NSSI behavior is highly prevalent among adolescents, with lifetime prevalence rates (including single occurrence of NSSI) ranging from 13% to 45% in adolescent community samples (Jacobson and Gould 2007; Lloyd-Richardson et al. 2007). Of these, 6.7% of adolescents report repetitive NSSI according to the *DSM-5* criteria (NSSI disorder = NSSI-D; *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed., APA, 2013; Zetterqvist et al., 2013). In inpatient settings, over 40% of patients suffer from NSSI-D (Glenn and Klonsky 2013; Kaess et al., 2013). NSSI is accompanied by various mental diagnoses (Glenn and Klonsky, 2013; In-Albon et al., 2013) and is known to be a risk factor for suicidality (Klonsky et al., 2013; Tuisku et al., 2014). Given its high relevance and potentially hazardous nature, NSSI has been included in the *DSM-5* as a condition for further study, indicating that additional research is necessary before NSSI becomes an official diagnosis. With a consistent and stringent definition of NSSI along with adequate measures, the recognition of risk factors and development of specific treatment strategies can be advanced, since evidence-based treatment is still lacking (Glenn et al., 2015).

Multiple developmental and psychosocial risk factors for the engagement in NSSI have been identified (Nock, 2010), among them childhood maltreatment, alexithymia, and dissociation (for a review see Fliege et al., 2009). However, little is known about how these risk factors might interact and eventually lead to NSSI. Adolescents with NSSI-D show high rates of emotional abuse (77.4%), physical abuse (38.7%), and sexual abuse (36.6%) (Zetterqvist et al., 2014). There is an intense debate about the role of sexual abuse in the etiology of NSSI, however a meta-analysis concluded that sexual abuse in childhood is a

statistically significant but modest risk factor for NSSI, while other confounding factors might partly or directly account for this relationship (Maniglio, 2011). This holds true for the influence of childhood maltreatment on NSSI in general although little is known about the underlying mechanisms leading from childhood maltreatment to NSSI (Auerbach et al., 2014).

One factor involved in the developmental trajectory of NSSI is alexithymia. Alexithymia is defined as the inability to describe and identify emotional experiences, the inability to distinguish between emotions and bodily sensations, and externally oriented thinking (Taylor et al., 1997). Prevalence estimates of clinically significant alexithymia range between 10-15% in adolescent community samples and are higher among young adolescents (12-13 years of age: 21%; Säkkinen et al., 2007). This indicates that the occurrence of alexithymic features in childhood is to some extent in the normal developmental range, as the consciousness for emotional states improves considerably during the transition from childhood to adolescence (Karukivi and Saarijärvi, 2014). Although there is a depth of research on different pathways leading to alexithymic features, little progress has been made in establishing a comprehensive understanding (for a review see Karukivi and Saarijärvi, 2014). According to one line of research, alexithymia is assumed to arise in periods of emotional development in an invalidating or abusive family environment where children learn that the expression and communication of emotions are inappropriate, ineffective, or dangerous (Paivio and McCulloch, 2004). A significant association between physical and emotional abuse and alexithymia has frequently been reported, with emotional neglect having an especially eminent role (Aust et al., 2013; Gülec et al., 2013; Paivio and McCulloch, 2004). However, not all individuals with alexithymia show a history of childhood maltreatment, and the etiological role of childhood maltreatment in alexithymia remains questionable (Karukivi and Saarijärvi, 2014).

Alexithymia is hypothesized to contribute to a broad range of mental disorders that are characterized by disordered affect regulation (Taylor et al., 1997), such as depression, anxiety disorders, somatic complaints, and NSSI (Borrill et al., 2009; Gulpek et al., 2014; Karukivi et al., 2010; Li et al., 2015). Poor emotion regulation is the primary cause of engaging in NSSI (Klonsky, 2009). The most widely used questionnaire to assess alexithymia (TAS-20) includes three subscales measuring “difficulties identifying feelings”, “difficulties describing feelings”, and “externally oriented thinking” (Taylor et al., 1992). Strong associations between NSSI and the subscales “difficulties identifying feelings” and “difficulties describing feelings” were found across studies (Borrill et al., 2009; Gratz and Roemer, 2008; Polk and Liss, 2007). Previous work focused on the role of alexithymia as a mediator between childhood maltreatment and NSSI, with mixed findings (Paivio and McCulloch, 2004; Swannell et al., 2012). Paivio and McCulloch (2004) found that alexithymia fully mediated the relationship between child maltreatment and self-injurious behavior, indicating that experiences of abuse give rise to alexithymia, which in turn leads to NSSI. Another study confirmed alexithymia as a mediator, but the effect was only partial and small (Swannell et al., 2012). Research on the role of alexithymia in NSSI behavior has so far only been conducted using adult samples, making it difficult to draw conclusions with regard to the role in adolescents. Since NSSI is highly prevalent in adolescence and decreases with age, it is important to identify factors that contribute to NSSI in this age group.

When studying the relationship between NSSI, child maltreatment, and alexithymia, it is important to control for the confounding influence of dissociation. Dissociation is a well established predictor of self-injury (Zetterqvist et al., 2014; Zlotnick et al., 1996) and known to mediate the relationship between childhood maltreatment and NSSI (Swannell et al., 2012; Yates et al., 2008). In addition, alexithymia and dissociation have been found to be

overlapping phenomena (Tolmunen et al., 2010), hence dissociation should be controlled for when studying alexithymia.

To our knowledge, this is the first cross-sectional study investigating childhood maltreatment, alexithymia, and dissociation as predictors for NSSI-D according to DSM-5 in female adolescents in an inpatient setting. The objectives of our study were twofold. On the one hand, we aimed to examine the association between childhood maltreatment and alexithymia. On the other hand, we focused on the characteristics of alexithymia in NSSI-D and assessed the predictive power of childhood maltreatment, alexithymia, and dissociation on NSSI-D. Based on previous research the following hypotheses were formulated. First, parental emotional abuse (i.e., antipathy and neglect) and physical abuse will show the strongest associations with alexithymia. Second, adolescents with NSSI-D will display a higher overall alexithymia level than adolescents without NSSI-D. Third, dissociation and alexithymia will predict NSSI-D.

2. Methods

2.1 Recruitment, study sample and study procedure

Participants in the current study were consecutively recruited from various psychiatric inpatient units for children and adolescents in the German-speaking part of Switzerland and Germany. Our population included 72 female patients aged 14 – 18 years ($M = 16.08$, $SD = 1.29$). The sample included 46 adolescents who fulfilled the *DSM-5* criteria for NSSI disorder (NSSI-D group; APA, 2013) and 26 adolescents with a *DSM-IV* (APA, 2000) diagnosis other than NSSI-D (clinical control sample, CC group). Table 1 shows the sociodemographic and psychosocial variables for all patients. The NSSI-D and CC groups did not differ significantly with respect to age ($U = 585.50$, $p = 0.88$; NSSI-D: $M = 16.06$, $SD = 1.23$; CC: $M = 16.11$, $SD = 1.42$) and years of education ($U = 442.50$, $p = 0.38$; NSSI-D: $M = 8.86$, $SD = 1.59$; CC: $M = 9.37$, $SD = 1.46$).

When examining mental diagnoses among adolescents with NSSI-D the most frequent disorders were depressive disorders (73.9%), anxiety disorders (65.2%), eating disorders (10.9%), and disruptive behavior disorders (6.5%). The CC group most frequently reported anxiety disorders (65.4%), followed by depressive disorders (46.2%), eating disorders (15.4%), and disruptive behavior disorders (11.5%). The NSSI-D group reported an average of 3.45 ($SD = 1.44$) diagnoses, which was significantly higher compared to the CC group reporting 2.03 ($SD = 0.99$) diagnoses ($U = 264.50, p < 0.01$). In addition, the groups differed significantly in the prevalence of major depressive disorder ($\chi^2(1) = 3.83, p = 0.04$), with this diagnosis being more frequent in the NSSI-D group, and in the prevalence of obsessive compulsive disorder (OCD; $p = 0.01$, Fisher's exact test), which was more common among non-injurers. Given the significant differences in the prevalence of major depression and OCD between the groups, we included the variables “major depression” and “OCD” and defined them as dichotomous covariates (0 = not present, 1 = present) in order to control for a possibly confounding effect. The inpatient clinics were responsible for the recruitment of the study groups. Therefore, we have no access to the demographic and clinical characteristics of patients excluded by the clinics. Predefined exclusion criteria were current or past psychosis, schizophrenic symptoms, and acute substance abuse. Furthermore, adolescents with borderline personality disorder (BPD; $n = 13$) were excluded from the analyses because we aimed to draw specific conclusions for NSSI-D. Previous research has shown that NSSI and BPD are distinct disorders, with some overlap (Bracken-Minor and McDevitt-Murphy 2014; Glenn and Klonsky, 2013). Individuals with BPD report significantly more traumatic experiences and higher levels of emotion dysregulation than self-injuring individuals without BPD (Selby et al., 2012; Bracken-Minor and McDevitt-Murphy, 2014). In addition, the overlap between NSSI disorder and BPD was no greater than that between BPD and other Axis-I disorders (e.g., anxiety and mood disorders) and NSSI disorder demonstrated unique

associations with clinical impairment (Glenn and Klonsky, 2013). Since we studied these very factors and aimed to make specific conclusions on NSSI-D, including individuals with BPD may have distorted the results. The local ethics committee approved the study. The patients and their parents gave written informed consent in accordance with the Declaration of Helsinki. Patients were paid 40 Swiss francs upon completion of the tasks.

2.2 Measures

2.2.1 Diagnostic assessments

To assess current or past *DSM-IV-TR* (APA, 2000) diagnoses in both study groups, we conducted a structured interview (Diagnostisches Interview psychischer Störungen im Kindes- und Jugendalter (Kinder-DIPS); Schneider et al., 2009) for axis-I disorders. The Kinder-DIPS assesses the most frequent mental disorders in childhood and adolescence (all anxiety disorders, major depression, dysthymia, eating disorders, sleeping disorders, attention deficit hyperactivity disorder, and conduct disorder, as well as substance use disorders taken from the adult DIPS). The Kinder-DIPS has good validity and reliability for axis I disorders (child version, kappa = 0.48 to 0.88; Neuschwander et al., 2013). NSSI-D was assessed using the proposed *DSM-5* criteria (Shaffer and Jacobson, 2009) and with the publication of the *DSM-5* all NSSI diagnoses were reevaluated. The criteria were reformulated as questions and added to the interview. Inter-rater reliability estimates for the diagnosis of NSSI were very high (kappa = 0.90). In addition, we conducted a structured interview for personality disorders (SKID-II; Wittchen et al., 1997). Before conducting the interviews, all interviewers received an intensive standardized training. A history of suicide attempts was assessed at the end of the interview.

2.2.2 Childhood experiences of Care and Abuse Questionnaire (CECA.Q; Kaess et al., 2011)

The CECA.Q was used to assess a number of lifetime adverse childhood experiences including poor care (neglect and antipathy) and physical abuse for each parent as well as sexual abuse from any perpetrator before the age of 17. In the current study, internal consistency was excellent (maternal antipathy: $\alpha = 0.90$, paternal antipathy: $\alpha = 0.88$, maternal neglect: $\alpha = 0.90$, paternal neglect: $\alpha = 0.90$) confirming previous results on reliability and validity (Kaess et al., 2011).

2.2.3 Toronto Alexithymia Scale (TAS-26; Taylor et al. 1992; German version, Kupfer et al., 2001)

The TAS-26 is a standardized self-report questionnaire used to assess the presence and severity of trait alexithymia. The questionnaire included 26 items rated on a 5-point Likert scale assessing alexithymia according to three factors, i.e., difficulty identifying feelings, difficulty describing feelings, and externally oriented. The present sample showed adequate alpha coefficients (difficulty identifying feelings: $\alpha = 0.84$, difficulty describing feelings: $\alpha = 0.67$, externally oriented thinking: $\alpha = 0.67$, total score: $\alpha = 0.81$). The choice of the TAS-26 was based on better reliability and consistency compared to the TAS-20 version (Bach et al., 1996; Kupfer et al., 2000). The TAS-26 can be administered to adolescents aged 14 and older, and the validation study showed that the scales are independent of age (Kupfer et al., 2001). In order to report how many adolescents achieved total scores in the clinically significant range for alexithymia, we used the recommended cut-off score of 54.

2.2.4 Short version of the German Dissociative Experience Scale (FDS-20; Spitzer et al., 2004)

FDS-20 is the short version of the FDS (Freyberger et al., 1998), which is the German adaptation of the Dissociative Experience Scale (DES, Bernstein and Putnam, 1986). This 20-

item screening instrument is designed to assess a number of self-reported dissociative phenomena in the past two weeks and has been shown to have very good internal consistency ($\alpha = 0.93$) (Spitzer et al., 2004). Internal consistency within our sample was excellent ($\alpha = 0.91$).

2.3 Data analysis

Statistical analyses were performed using SPSS for Windows, version 22. Descriptive statistics and group differences were calculated for adolescents with NSSI-D and the CC group. Categorical variables were analyzed using Pearson's Chi-square or Fisher's exact test, and continuous variables with Student's t-test or Mann-Whitney U test. Spearman correlations were computed to test the relationship between dichotomous (NSSI-D, childhood sexual abuse) and continuous (parental antipathy, neglect, physical abuse, alexithymia total score, dissociation) study variables. In instances where alexithymia correlated with childhood maltreatment variables and NSSI-D, we tested mediation models. Effect sizes (Cohen's d) were used to assess differences in alexithymia (TAS-26) and dissociation (FDS-20). Logistic regression analyses were performed in three steps to explore significant predictors of NSSI-D and to derive a parsimonious model (Hosmer and Lemeshow, 1999). First, variables from univariate analysis were preselected for further analyses when changes of the $-2 \log$ -likelihood and Wald statistic became significant reaching a liberal p -value-cut-off point of 0.15. In a second step, forward multivariate regression analyses were performed within each subgroup of predictors (childhood maltreatment, alexithymia, depression, and dissociation) at a significance level of $p < 0.10$ for further selection of predictors. The remaining predictors were analyzed together forward and backward to exclude effects of blocking at a significance level of $p < 0.05$. Associations between the NSSI-D group as the dependent variable and childhood maltreatment, alexithymia, dissociation, OCD and major depressive disorder as the

explanatory variables were based on odds ratios (OR) with 95% confidence intervals (CIs).

Significance levels for all analyses were set at $\alpha = 0.05$.

3. Results

3.1 Frequencies of childhood maltreatment, alexithymia, and dissociation

Table 1 shows the frequencies of childhood maltreatment, alexithymia, and dissociation. Adolescents with NSSI-D had significantly more often been exposed to sexual abuse in childhood compared to the CC group (37% vs. 15.4%; $\chi^2(1) = 3.74, p = 0.04$). There were significant differences between the NSSI-D and CC groups with respect to the prevalence of dissociation (78.3% vs. 53.8%; $\chi^2(1) = 4.66, p = 0.03$) and alexithymia (69.6% vs. 34.6%; $\chi^2(1) = 8.27, p < 0.01$), with the NSSI-D group showing higher levels in each case. No significant differences between the groups were found with respect to the remaining childhood maltreatment variables (Table 1). Compared to the CC group, the NSSI-D group scored significantly higher on the TAS-26 total scale, $t(70) = -3.52, p < 0.01$, and on the subscales ‘difficulties identifying feelings’, $t(70) = -3.05, p < 0.01$, Cohen’s $d = 0.76$, and ‘difficulties describing feelings’, $t(70) = -3.36, p < 0.01$, Cohen’s $d = 0.84$. There was no significant difference between groups in terms of the subscale ‘externally oriented thinking’, $t(70) = -0.93, p = 0.35$, Cohen’s $d = 0.23$, and the FDS-20 score, $t(70) = -1.62, p = 0.10$, Cohen’s $d = 0.40$ (Table 3).

3.2 Correlations of childhood maltreatment, alexithymia, dissociation, and NSSI-D

Table 2 shows the correlations between childhood maltreatment, alexithymia, dissociation, and NSSI-D. Alexithymia was significantly associated with NSSI-D, maternal antipathy, maternal neglect, and dissociation. Dissociation was significantly associated with maternal antipathy, paternal antipathy, maternal neglect, and paternal neglect but not with paternal physical abuse. Sexual abuse was significantly associated with maternal neglect and

dissociation. Results failed to satisfy the requirements for testing mediational effects, as the independent variable (childhood maltreatment types) must be significantly correlated with the mediator (alexithymia) and the dependent variable (NSSI-D), and the potential mediator must be correlated with the dependent variable (Baron and Kenny, 1986).

3.3 Logistic regression

Three logistic regression models were conducted to examine the relationship between predictor variables and NSSI-D in univariate and multivariate analyses (see Table 4). The first logistic regression was performed with all childhood maltreatment variables, dissociation, alexithymia, OCD, and major depression as predictor variables. The following variables reached a p-value cut-off point of 0.15 and were therefore included in further analyses: maternal antipathy, maternal neglect, sexual abuse, alexithymia, dissociation, and major depression. Of these, maternal antipathy, sexual abuse, alexithymia and major depression were selected in a second step for inclusion in the final model. The variable ‘maternal neglect’ was removed from the model due to the high collinearity with maternal antipathy. The final model was significant ($\chi^2(1) = 11.52, p < 0.01$) and accounted for 14.8% (Cox and Snell R^2) to 20.3% (Nagelkerke R^2) of the variance. Higher alexithymia levels significantly predicted NSSI-D (OR = 1.08, 95% CI = 1.03-1.14, $p = .01$), whereas maternal antipathy and sexual abuse were nonsignificant. Since the NSSI-D and the CC group differed significantly with respect to the mean number of diagnoses, we repeated the regression analyses including the number of diagnoses to control for a confounding effect. As no alterations of the main results were found, the variable was removed again.

4. Discussion

The present study investigated the predictive role of childhood maltreatment, alexithymia, and dissociation in female adolescents with NSSI-D and studied the manner by which these domains interact with each other. Alexithymia was a significant predictor for

NSSI-D. This finding is in line with studies in subjects with NSSI (Polk and Liss, 2007; Zlotnick et al., 1996) but our study is the first to confirm this phenomenon in an adolescent sample meeting the criteria for NSSI-D. Adolescents with NSSI-D scored significantly higher on the subscales of the TAS-26 “difficulties identifying feelings” and “difficulties describing feelings” than adolescents without NSSI-D, which is consistent with previous findings (Borrill et al., 2009; Gratz and Roemer, 2008; Polk and Liss, 2007).

Individuals with alexithymia lack the ability to appropriately identify and communicate emotions, an ability that is crucial for proper emotion regulation (Gross, 1999). Limited tolerance and perception of emotions might reduce the affected person’s ability to apply adequate coping strategies when handling intense negative feelings. In the absence of effective emotion regulation skills, such individuals may resort to extreme behaviors to reduce their emotional arousal (Wupperman et al., 2013). This is a possible explanation for the high percentage of adolescents with NSSI-D who obtained scores above the cut-off level for alexithymia (69.6%). This rate is considerably higher than the rate of 44% in a sample of female college students engaging in NSSI reported by Paivio and McCulloch (2004). The discrepancy may partly be explained by the different study samples and the variable levels of severity of self-injury in the studies. Another reason might be methodological problems that emerge when assessing alexithymia in adolescents. As outlined above, the consciousness for emotional states improves significantly from childhood to adolescence, leading to higher prevalence rates of alexithymia in younger compared to older adolescents (Säkkinen et al., 2007). Considering these rapid and continuing changes, the reliable assessment of alexithymia in adolescents is somewhat problematic and might distort results. Further, in light of the high alexithymia prevalence we found in our sample and the absence of emotional introspection abilities of individuals with alexithymic traits, applying self-report measures to

these individuals might be questionable and lead to limited reliability of the results (Lane et al., 1996).

Logistic regression analyses revealed that none of the childhood maltreatment variables were significant predictors for NSSI-D. This was an unexpected finding given the association between childhood maltreatment and NSSI shown in other studies (for a review see Lang and Sharma-Patel, 2011). One reason might be the low maltreatment prevalence among adolescents with NSSI-D in our sample. Our sample endorsed a considerably lower prevalence of emotional abuse and physical abuse compared to other studies (Kaess et al., 2013; Swannell et al., 2012; Zetterqvist et al., 2014). One explanation for this discrepancy could be our exclusion of adolescents with BPD from the present analyses. Individuals with BPD endure more traumatic experiences than self-injuring individuals without BPD (Selby et al., 2012). The adolescents with NSSI-D in our sample exhibited high levels of sexual abuse and lower levels of emotional and physical abuse, which is consistent with the findings of a recent latent cluster analysis in NSSI based on childhood adversity (Vaughn et al., 2014). Vaughn et al. (2014) suggested that a “sexual abuse class” accounted for the majority of individuals with NSSI (43.0%), most of whom were females (98.4%). The characteristics of this class were an increase in sexual abuse in tandem with lower levels of physical abuse, parental neglect, and family violence.

Contrary to our hypothesis, dissociation was no significant predictor for NSSI-D disorder. This finding deviates from previous literature where dissociative symptoms have shown to predict NSSI (Zetterqvist et al., 2014; Zlotnick et al., 1996). Interestingly, the two groups did not differ significantly with respect to scores on the FDS-20, but adolescents with NSSI-D showed slightly higher scores compared to the CC group.

Alexithymia was significantly associated with maternal antipathy and neglect. This result is in line with Aust et al. (2013) and Gülec et al. (2013), emphasizing the role of

emotional abuse in the development of alexithymia. However, since we found high levels of alexithymia but low levels of childhood maltreatment, our results do not support the notion of an etiological role of childhood maltreatment in alexithymia. Although there is a link between these two factors, the association appears to be more complex (Karukivi et al., 2011).

Childhood maltreatment and inadequate parenting represent only a small proportion of factors that are assumed to be involved in the development of alexithymia, and causality is hard to establish due to the retrospective and cross-sectional design of most studies (Karukivi and Saarijärvi, 2014).

Our results indicate that alexithymia is an important predictor of NSSI-D and that a high percentage of adolescents with NSSI-D have difficulties identifying and describing their feelings in self-report measures. High levels of alexithymia are also present in other mental disorders, yet no treatment exists that specifically targets the problems associated with alexithymia (Samur et al., 2013). Patients with alexithymia have been shown to benefit from psychotherapeutic treatment and to be able to improve their emotional processing (Ogrodniczuk et al., 2011). Our results emphasize the importance of targeting emotion regulation by improving the perception of emotions in the treatment of NSSI-D.

Improvement of emotion regulation is a central feature of dialectical behavioral therapy (DBT) (Bohus et al., 2004; Fleischhaker et al., 2011). A recent review on psychosocial treatment for self-injurious thoughts and behavior by Glenn et al. (2015) concluded that an essential part of effective treatment is the training of skills to regulate emotion. They concluded that treatment modalities excluding a skill- training component did not lead to a significant reduction in NSSI. In DBT, the first step of fostering emotion regulation skills is learning to recognize one's own emotions and eventually cope with the reactions to the emotions in a constructive way (McKay et al., 2008). Focused training of emotion regulation skills might be a reason for the effectiveness of DBT in reducing NSSI.

Several limitations of the current study have to be considered. We examined adolescent female inpatients, and our results may thus not be applicable to other samples or to male adolescents. Swannell et al. (2012) reported gender-specific differences with regard to the influence of alexithymia on the relationship between childhood maltreatment and NSSI, with female patients exhibiting a larger influence. Furthermore, the cross-sectional design of the present study does not allow drawing conclusions about the chronological or causal sequence between the predictor variables and NSSI-D. It is unclear whether maltreatment experiences occurred before the onset of NSSI, but the proposed sequence is based on and supported by theoretical models of NSSI (Nock, 2010). The same applies to alexithymia and dissociation that are both assumed to arise in the aftermath of child maltreatment that usually precedes NSSI. The number of patients in the CC group was small because it was difficult to find suitable individuals as the main requirement was to have never, at no point in time, engaged in self-injury.

In addition, given the limited ability of individuals with alexithymic traits to identify and describe their feelings, it is questionable whether self-report measures are reliable instruments for these individuals (Lane et al., 1996). Although the German version of the TAS-26 can be administered to adolescents aged 14 and older (Kupfer et al., 2001), it has previously been shown that age-adequate measures that have been validated in adolescent samples are needed to reliably assess adolescent alexithymia (Parker et al., 2010). Further, the comparability of our alexithymia scores with other studies are limited, as the most widely used questionnaire to assess alexithymia is the TAS-20 scale, while we applied the TAS-26. A further limitation regarding generalization is that we were unable to report data of adolescents excluded by the clinics. Future research may investigate which factors might contribute to the development of alexithymia in individuals with and without a history of neglect and maltreatment. This may allow for a more comprehensive understanding of the

development of alexithymia. Longitudinal studies are needed to clarify the temporal relationship between childhood maltreatment types, emotion dysregulation including alexithymia, and NSSI-D.

5. Conclusions

The findings of the present study suggest that alexithymia is an important predictor for NSSI-D in female adolescents. Although NSSI-D was initially linked to a higher frequency of sexual abuse and maternal antipathy, these factors did not turn out to be significant predictors for NSSI-D in multivariate analyses. This was also the case for dissociation. Strengthening emotion awareness might enable adolescents with alexithymia and NSSI-D to improve their emotion regulation skills in order to alter negative states instead of injuring themselves.

Acknowledgements

The study has received financial support from the Swiss National Science Foundation (grant project 100014_135205) awarded to Tina In-Albon in collaboration with Marc Schmid. The authors want to thank the following clinics for patient recruitment: Zentrum für Kinder- und Jugendpsychiatrie und –psychotherapie, Clenia Littenheid AG; Kinder- und Jugendpsychiatrischer Dienst Koenigsfelden, Kinder- und Jugendpsychiatrie Kriens, St. Elisabethen-Krankenhaus Kinder- und Jugendpsychiatrie Loerrach, Kinder- und Jugendpsychiatrie Chur, Universitaere Psychiatrische Kliniken Kinder- und Jugendpsychiatrie Basel, Universitaetsklinik fuer Kinder- und Jugendpsychiatrie und Psychotherapie Bern, Kinder- und Jugendpsychiatrische Klinik Solothurn, and Klinik Sonnenhof Kinder- und Jugendpsychiatrisches Zentrum Ganterschwil.

Conflict of interest

The authors declare that we have nonfinancial competing interests.

References

- American Psychiatric Association, 2000. Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (text rev.) American Psychiatric Association, Arlington, VA.
- American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, 5th ed. American Psychiatric Association, Arlington, VA.
- Auerbach, R. P., Kim, J. C., Chango, J. M., Spiro, W. J., Cha, C., Gold, J., . . . Nock, M. K., 2014. Adolescent nonsuicidal self-injury: examining the role of child abuse, comorbidity, and disinhibition. *Psychiatry Res*, 220, 579-584.
- Aust, S., Hartwig, E. A., Heuser, I., Bajbouj, M., 2013. The role of early emotional neglect in alexithymia. *Psychol Trauma*. 5, 225-232.
- Bach, M., Bach, D., deZwaan, M., Serim, M., Böhmer, F., 1996. Validierung der deutschen Version der 20-Item Toronto-Alexithymie-Skala bei Normalpersonen und psychiatrischen Patienten. *Psychother Psychosom Med Psychol*. 46, 23–28.
- Baron, R. M., Kenny, D. A., 1986. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*. 51, 1173-1182.
- Bernstein, E. M., Putnam, F. W., 1986. Development, reliability, and validity of a dissociation scale. *J Nerv Ment Dis*. 174, 727-735.
- Bohus, M., Haaf, B., Simms, T., Limberger, M. F., Schmahl, C., Unckel, C., Linehan, M. M., 2004. Effectiveness of inpatient dialectical behavioral therapy for borderline personality disorder: a controlled trial. *Behav Res Ther*. 42, 487-499.

- Borrill, J., Fox, P., Flynn, M., & Roger, D., 2009. Students who self-harm: Coping style, rumination and alexithymia. *Couns Psychol Q.* 22, 361-372.
- Bracken-Minor, K. L., & McDevitt-Murphy, M. E. (2014). Differences in features of non-suicidal self-injury according to borderline personality disorder screening status. *Arch Suicide Res.* 18, 88-103.
- Fleischhaker, C., Böhme, R., Sixt, B., Brück, C., Schneider, C., Schulz, E., 2011. Dialectical Behavioral Therapy for Adolescents (DBT-A): A clinical trial for patients with suicidal and self-injurious behavior and borderline symptoms with a one-year follow-up. *Child Adolesc Psychiatry Mental Health.* 5,3.
- Fliege, H., Lee, J. R., Grimm, A., Klapp, B. F., 2009. Risk factors and correlates of deliberate self-harm behavior: a systematic review. *J Psychosom Res.* 66, 477-493.
- Freyberger, H. J., Spitzer, C., Stieglitz, R.-D., Kuhn, G., Magdeburg, N., Bernstein-Carlson, E., 1998. Fragebogen zu dissoziativen Symptomen (FDS; German adaptation of Dissociative Experience Scale; DES): Reliability and validity. *Psychother Psych Med.* 48, 223-229.
- Glenn, C. R., Franklin, J. C., Nock, M. K., 2015. Evidence-based psychosocial treatments for self-injurious thoughts and behaviors in youth. *J Clin Child Adolesc Psychol.* 44, 1-29.
- Glenn, C. R., Klonsky, E., 2013. Nonsuicidal self-injury disorder: An empirical investigation in adolescent psychiatric patients. *J Clin Child and Adolesc Psychol.* 42, 496-507.
- Gratz, K. L., Roemer, L., 2008. The relationship between emotion dysregulation and deliberate self-harm among female undergraduate students at an urban commuter university. *Cogn Behav Ther.* 37, 14-25.
- Gross, J. J., 1999. Emotion regulation: Past, present, future. *Cogn Emot.* 13, 551-573.

- Gülec, M. Y., Altintas, M., Inanc, L., Bezgin, C. H., Koca, E. K., Gulec, H., 2013. Effects of childhood trauma on somatization in major depressive disorder: The role of alexithymia. *J Affect Disord.* 146, 137-141.
- Gulpek, D., Kelemence Kaplan, F., Kesebir, S., Bora, O., 2014. Alexithymia in patients with conversion disorder. *Nord J Psychiatry.* 68, 300-305.
- Hosmer, D. W., & Lemeshow, S., 1999. *Applied Survival Analysis: Regression Modelling of Time to Event Data.* John Wiley & Sons, Hoboken, NJ, USA.
- In-Albon, T., Ruf, C., Schmid, M., 2013. Proposed diagnostic criteria for the DSM-5 of nonsuicidal self-injury in female adolescents: diagnostic and clinical correlates. *Psychiatry Journal*, 2013, 159208.
- Jacobson, C. M., Gould, M., 2007. The epidemiology and phenomenology of non-suicidal self-injurious behavior among adolescents: a critical review of the literature. *Arch Suicide Res.* 11, 129-147.
- Kaess, M., Parzer, P., Mattern, M., Plener, P. L., Bifulco, A., Resch, F., Brunner, R., 2013. Adverse childhood experiences and their impact on frequency, severity, and the individual function of nonsuicidal self-injury in youth. *Psychiatry Res.* 206, 265-272.
- Kaess, M., Parzer, P., Mattern, M., Resch, F., Bifulco, A., Brunner, R., 2011. Childhood Experiences of Care and Abuse (CECA). Validierung der deutschen Version von Fragebogen und korrespondierendem Interview sowie Ergebnisse einer Untersuchung von Zusammenhängen belastender Kindheitserlebnisse mit suizidalen Verhaltensweisen. *Z Kinder Jugendpsychiatrie Psychother.* 39, 243-252.
- Karukivi, M., Hautala, L., Kaleva, O., Haapasalo-Pesu, K. M., Liuksila, P. R., Joukamaa, M., Saarijärvi, S., 2010. Alexithymia is associated with anxiety among adolescents. *J Affect Disord.* 125, 383-387.

- Karukivi, M., Joukamaa, M., Hautala, L., Kaleva, O., Haapasalo-Pesu, K. M., Liuksila, P. R., Saarijärvi, S., 2011. Does perceived social support and parental attitude relate to alexithymia? A study in Finnish late adolescents. *Psychiatry Res.* 187, 254-260.
- Karukivi, M., Saarijärvi, S., 2014. Development of alexithymic personality features. *World J Psychiatry.* 4, 91-102.
- Klonsky, E. D., 2009. The functions of self-injury in young adults who cut themselves: Clarifying the evidence for affect-regulation. *Psychiatry Res.* 166, 260-268.
- Klonsky, D. E., May, A. M., Glenn, C. R., 2013. The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. *J Abnorm Psychol.* 122, 231-237.
- Kupfer, J., Brosig, B., Brähler, E., 2000. Überprüfung und Validierung der 26-Item Toronto Alexithymie-Skala anhand einer repräsentativen Bevölkerungsstichprobe. *Z Psychosom Med.* 46, 368–384.
- Kupfer, J., Brosig, B., Brähler, E., 2001. TAS-26. Toronto Alexithymie-Skala-26. Toronto Alexithymia Scale (TAS; Taylor, G.J., Ryan, D. & Bagby, R.M., 1985) - German version/zpid. Hogrefe, Göttingen.
- Lane, R. D., Sechrest, L., Reidel, R., Weldon, V., Kaszniak, A., Schwartz, G. E., 1996. Impaired verbal and nonverbal emotion recognition in alexithymia. *Psychosom Med.* 58, 203-210.
- Lang, C. M., Sharma-Patel, K., 2011. The relation between childhood maltreatment and self-injury: a review of the literature on conceptualization and intervention. *Trauma Violence Abuse.* 12, 23-37.

- Li, S., Zhang, B., Guo, Y., Zhang, J., 2015. The association between alexithymia as assessed by the 20-item Toronto Alexithymia Scale and depression: A meta-analysis. *Psychiatry Res.* 227, 1-9.
- Lloyd-Richardson, E. E., Perrine, N., Dierker, L., Kelley, M. L., 2007. Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychol Med* 37, 1183-1192.
- Maniglio, R., 2011. The role of child sexual abuse in the etiology of suicide and non-suicidal self-injury. *Acta Psychiatr Scand.* 124, 30-41.
- McKay, M., Wood, J. C., Brantley, J., 2007. The dialectical behavior therapy skills workbook. New Harbinger Publications, Inc, Oakland, CA.
- Neuschwander, M., In-Albon, T., Adornetto, C., Roth, B., Schneider, S., 2013. Interrater-Reliabilität des Diagnostischen Interviews bei psychischen Störungen im Kindes- und Jugendalter (Kinder-DIPS). *Z. Kinder Jugendpsychiatrie Psychother.* 41, 319-334.
- Nock, M. K., 2010. Self-injury. *Annu Rev Clin Psychol.* 6, 339-363.
- Ogrodniczuk, J. S., Piper, W. E., Joyce, A. S., 2011. Effect of alexithymia on the process and outcome of psychotherapy: A programmatic review. *Psychiatry Res.* 190, 43-48.
- Paivio, S. C., McCulloch, C. R., 2004. Alexithymia as a mediator between childhood trauma and self-injurious behaviors. *Child Abuse Negl.* 28, 339-354.
- Parker, J. D., Eastabrook, J. M., Keefer, K. V., Wood, L. M., 2010. Can alexithymia be assessed in adolescents? Psychometric properties of the 20-item Toronto Alexithymia Scale in younger, middle, and older adolescents. *Psychol Assess.* 22, 798-808.
- Polk, E., Liss, M., 2007. Psychological characteristics of self-injurious behavior. *Pers Individ Dif.* 43, 567-577.

- Säkkinen, P., Kaltiala-Heino, R., Ranta, K., Haataja, R., Joukamaa, M., 2007. Psychometric properties of the 20-item toronto alexithymia scale and prevalence of alexithymia in a finnish adolescent population. *Psychosomatics*. 48, 154-161.
- Samur, D., Tops, M., Schlinkert, C., Quirin, M., Cuijpers, P., Koole, S. L., 2013. Four decades of research on alexithymia: Moving toward clinical applications. *Front Psychol*. 4, 861.
- Schneider, S., Unnewehr, S., Margraf, J., 2009. Diagnostisches Interview psychischer Störungen im Kindes- und Jugendalter (Kinder-DIPS). Springer, Heidelberg.
- Selby, E. A., Bender, T. W., Gordon, K. H., Nock, M. K., Joiner, T. E., Jr., 2012. Non-suicidal self-injury (NSSI) disorder: a preliminary study. *Personal Disord*. 3, 167-175.
- Shaffer, D., Jacobson, C., 2009. Proposal to the DSM-V Childhood Disorder and Mood Disorder Work Groups to Include Non-suicidal Self-injury (NSSI) as a DSM-V Disorder. Columbia University: New York State Psychiatric Institute, United States.
- Spitzer, C., Mestel, R., Klingelhöfer, J., Gaensicke, M., Freyberger, H. J., 2004. Psychometric properties of the short version of the Fragebogen zu Dissoziativen Symptomen (FDS-20), a questionnaire assessing dissociative symptoms. *Psychother Psych Med*. 54, 165-172.
- Swannell, S., Martin, G., Page, A., Hasking, P., Hazell, P., Taylor, A., Protani, M., 2012. Child maltreatment, subsequent non-suicidal self-injury and the mediating roles of dissociation, alexithymia and self-blame. *Child Abuse Negl*. 36, 572-584.
- Taylor, G. J., Bagby, R. M., Parker, J. D., 1992. The Revised Toronto Alexithymia Scale: some reliability, validity, and normative data. *Psychother Psychosom*. 57, 34-41.

- Taylor, G. J., Bagby, R. M., Parker, J. D. A., 1997. Disorders of affect regulation: Alexithymia in medical and psychiatric illness. Cambridge University Press, New York, N.Y.
- Tolmunen, T., Honkalampi, K., Hintikka, J., Rissanen, M. L., Maaranen, P., Kylma, J., Laukkanen, E., 2010. Adolescent dissociation and alexithymia are distinctive but overlapping phenomena. *Psychiatry Res.* 176, 40-44.
- Tuisku, V., Kiviruusu, O., Pelkonen, M., Karlsson, L., Strandholm, T., Marttunen, M., 2014. Depressed adolescents as young adults-Predictors of suicide attempt and non-suicidal self-injury during an 8-year follow-up. *J Affect Disord.* 152, 313-319.
- Vaughn, M. G., Salas-Wright, C. P., Underwood, S., Gochez-Kerr, T., 2014. Subtypes of non-suicidal self-injury based on childhood adversity. *Psychiatr Q.* Aug (Pagination), No Pagination Specified.
- Wittchen, H. U., Zaudig, M., Frydreich, T., 1997. Structured Clinical Interview for DSM-IV – German Version. Hogrefe, Göttingen.
- Wupperman, P., Fickling, M., Klemanski, D. H., Berking, M., Whitman, J. B., 2013. Borderline personality features and harmful dysregulated behavior: The mediational effect of mindfulness. *J Clin Psychol.* 69, 909-911.
- Yates, T. M., Carlson, E. A., Egeland, B., 2008. A prospective study of child maltreatment and self-injurious behavior in a community sample. *Dev Psychopathol.* 20, 651-671.
- Zetterqvist, M., Lundh, L.-G., Dahlström, Ö., Svedin, C. G., 2013. Prevalence and function of non-suicidal self-injury (NSSI) in a community sample of adolescents, using suggested DSM-5 criteria for a potential NSSI disorder. *J Abnorm Child Psychol.* 41, 759-773.

Zetterqvist, M., Lundh, L.-G., Svedin, C. G., 2014. A cross-sectional study of adolescent non-suicidal self-injury: Support for a specific distress-function relationship. *Child Adolesc Psychiatry Mental Health* 8, 23.

Zlotnick, C., Shea, M. T., Pearlstein, T., Simpson, E., 1996. The relationship between dissociative symptoms, alexithymia, impulsivity, sexual abuse, and self-mutilation. *Compr Psychiatry*. 37, 12-16.