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Research paper

Self-rated risk as a predictor of suicide attempts among high-risk adolescents

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ABSTRACT

Background. Predicting suicide attempts is a challenging task for clinicians and researchers, particularly among high-risk individuals (i.e. adolescents with lifetime suicide attempts). In this study, we examined whether adolescents were able to predict their own risk of attempting suicide in the future and whether borderline personality disorder (BPD) or depressive symptoms impacted the predictive value of self-ratings.

Methods. Structured clinical assessments were conducted at baseline and after 12 months in a high-risk sample of treatment-seeking adolescents (n = 134; 12-17y.; 90% female) with at least one lifetime suicide attempt.

Results. During the follow-up period, n = 51 participants (38%) attempted suicide at least once. Self-rated risk was a significant predictor for the recurrence of a suicide attempt, whereas BPD and depression were not. While there was no significant interaction between self-rated risk and BPD, a negative interaction emerged between self-rated risk and depression in the prediction of a suicide attempt. Greater depression severity diminished the predictive value of self-ratings.

Limitations. Depression severity was measured using a questionnaire, not a clinical interview. The findings may not be applicable to less burdened samples.

Conclusions. Asking high-risk adolescents to rate their own risk of attempting suicide appears to be an easy to apply method in improving the prediction of future suicide attempts in the clinical context.

1. Introduction

According to the World Health Organization (WHO; 2019), every year close to 800,000 individuals commit suicide, making it one of the leading causes of death worldwide. For each suicide death there are expected to be more than 20 suicide attempts (WHO, 2014) and the prevalence rate is alarming. In the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a suicide attempt is defined as "a self-initiated sequence of behaviors by an individual who, at the time of initiation, expected that the set of actions would lead to his or her own death" (American Psychiatric Association, 2013). Notably, a much higher proportion of the population report suicidal ideation without necessarily attempting to end their life (Klonsky and May, 2014). The importance of studying suicide attempts as a distinct phenomenon and risk factor for suicide has been highlighted through the proposition of a new condition for further study in the DSM-5: Suicidal Behavior Disorder could be diagnosed in individuals who have attempted suicide at least once within the past two years, whereas suicidal ideation is not a criterion (American Psychiatric Association, 2013). Distinguishing between those who think about suicide and those who act on such thoughts is critical in order to improve the understanding of suicidality, and to facilitate early detection and intervention for those particularly at risk.

Suicidal ideation and behavior (SIB) are especially common among adolescents and young adults. According to a systematic review of population-based studies, almost 10% of youths report having ever attempted suicide during their lifetime and up to 30% have had suicidal thoughts (Evans et al., 2005). In clinical samples, these numbers are

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even higher: In a sample of adolescent patients with depression, 23% reported at least one suicide attempt in the past and among adolescent patients with bipolar disorder, up to 57% confirmed suicidal thoughts at some point in their life (Asarnow et al., 2011; Hauser et al., 2013). One group of adolescents that is at particularly high risk for suicide attempts is the group of previous suicide attempters (Kirkcaldy et al., 2006). Hultén et al. (2001) examined rates of repeated suicide attempts and found 24% of adolescents to attempt suicide again within one year of the index attempt. In another follow-up study over a period of 8 to 10 years, Groholt and Ekeberg (2009) reported a repetition rate of 44% among adolescent suicide attempters.

In order to prevent suicide attempts, it is key to recognize individuals at high risk and find ways to predict such behaviors as accurately as possible. It is widely acknowledged that predicting suicide attempts is a difficult task for researchers and clinicians and the clinical utility of traditional suicide risk assessment is limited (Franklin et al., 2017; Lindh et al., 2019). In the present study, the focus therefore lies on a different source of information that may have the potential to yield better predictive validity: The individual affected by it. Former studies have examined adolescent patients' ability to predict future SIB and mixed findings have been reported. Janis and Nock (2008) tested if community adolescents with a history of suicidal or non-suicidal self-injurious thoughts and behaviors were able to rate the probability of such thoughts and behaviors to occur over the following six months. Individually, this effect was confirmed, but when controlling for past history of self-injurious thoughts and behaviors, self-ratings no longer explained additional variance in the respective statistical models. In a study of adolescents and young adults presenting at a psychiatric emergency department, Czyz et al. (2016), on the other hand, found self-rated expectation to refrain from suicidal behavior to predict actual suicide attempts in the following 18 months better than clinician-administered severity of suicidal ideation or any other covariate and to improve the accuracy of risk assessments.

Suicide attempts do commonly occur in the context of various psychiatric disorders. Two disorders that have been shown to put individuals at particularly high risk for suicide attempts are borderline personality disorder (BPD) and depression. BPD is characterized by a core symptomatology of instability in affect regulation, interpersonal relationships, and self-image and is composed of nine criteria (American Psychiatric Association, 2013). The characteristic instability in different domains is often reflected in impulsivity, risk-taking, and self-injuring behavior as well as suicidality. About three in four individuals with BPD attempt suicide at some point in their life and 10% eventually die by suicide (Black et al., 2004). Respective data are missing for adolescents (Kaess et al., 2014). Suicide attempts often occur impulsively and the intensity of suicidal thoughts fluctuates rapidly in adolescence (Auerbach et al., 2017; Czyz et al., 2019), making the prediction of suicide attempts even more difficult. The distinct pattern of instability in a range of intra- and interpersonal domains, commonly supplemented by issues with impulse control and different forms of suicidal or non-suicidal behavior, may lead to biased self-assessment and difficulties in anticipating one's own future behaviors in patients with BPD symptomatology.

Symptoms of depression range from low mood and reduced energy over feelings of hopelessness to suicidal thoughts and behaviors (WHO, 1992). In the general population, adolescents with depressive symptoms were clearly identified as being at higher risk for SIB (Evans et al., 2004) and using a meta-analytic approach on longitudinal data, Gili et al. (2019) found affective disorders to be the only significant predictor of suicide attempts out of several categories of mental disorders. Interestingly, though, higher levels of depression are not necessarily linked to higher risk for suicide attempts. While an association between suicidal ideation and depression was confirmed in a sample of psychiatric outpatients, the correlation between suicidal ideation and attempts was strongest at lower depression levels (Rogers et al., 2018). Lethargy and loss of energy, which is frequent in severe depression, is assumed to hinder the transformation from suicidal ideation to suicidal behaviors. Beck (1976) postulated a well-known model of cognitive biases characteristic for depression, including negative thoughts about the self, the world and the future. This tendency for negative views has been found in depressed adolescents as well (Platt et al., 2017). Self-ratings of future behavior may therefore be shaped by pessimistic expectations and a biased perception of oneself and the future in general, leading to less dependable estimations.

On the basis of the research presented above, several research questions will be addressed in the present study: First, we investigate whether self-rated risk for future suicidal behavior accurately predicts the recurrence of suicide attempts over the course of one year. Second, we test whether this effect remains significant after controlling for age, sex, number of past suicide attempts and psychopathology (BPD; depression). Third, we examine whether psychopathology (BPD and depression) moderates the relationship between self-rated risk for future suicide attempts and the occurrence of suicide attempts in a one-year follow-up period.

2. Methods

2.1. Participants and procedure

Adolescents between the age of 12 and 17 years who were treatment-seeking at the specialized outpatient clinic for adolescent risk-taking and self-harm behavior at the Clinic of Child and Adolescent Psychiatry, University Hospital Heidelberg, Germany (AtR!Sk; Ambulanz für Risikoverhalten und Selbstschädigung) routinely underwent structured clinical assessments by specifically trained clinicians. Patients reporting at least one lifetime suicide attempt at baseline who returned for the 12-months follow-up were included in analyses. For detailed information on the clinic and its patients, please refer to Kaess et al. (2017). Patients were consecutively recruited for the AtR!Sk cohort study. This study was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2013) and approved by the local ethics committee (ID S-449/2013) in Heidelberg, Germany. After participants or their legal guardians (if under 16 years) had signed written informed consent, patients' data was included in the cohort data set and study participants were re-invited and re-assessed after 12 months using a slightly adapted set of instruments.

2.2. Instruments

The following instruments were used in the baseline diagnostic appointment and in the 12-months follow-up assessment. All interviews and questionnaires were presented in their validated German translation.

Demographic data. A standardized set of interview questions was used in all patients, assessing age and sex as well as information about school type, family and living situation.

Psychiatric diagnoses. The Mini-International Neuropsychiatric Interview for Children and Adolescents (M.I.N.I.-KID; Sheehan et al., 2010) is a structured interview for the assessment of axis I psychiatric disorders according to DSM-IV and ICD-10 (International classification of diseases and related health problems; WHO, 1992).

Suicidal ideation and behavior. The German version of the Self-Injurious Thoughts and Behaviors Interview (SITBI-G; Fischer et al., 2014) measures the occurrence, frequency, and characteristics of suicidal ideation, suicide plans, suicide attempts, thoughts about non-suicidal self-injury (NSSI), and actual NSSI. One item assesses the self-rated risk for suicide attempts in the future on a 5-point Likert scale with higher values indicating an increased self-rated risk ("On the scale of 0 to 4, what do you think the likelihood is that you will make a suicide attempt in the future?"). Suicide attempts were defined in accordance with the DSM-5 criterion for Suicidal Behavior Disorder (American Psychiatric Association, 2013; see Introduction). The fulfilment of the

criterion was thoroughly explored by specially trained clinical psychologists. The occurrence of a suicide attempt in the following year was extracted from data collection one year later ("How many suicide attempts have you made in the past year?") and dichotomized. Fischer et al. (2014) report good psychometric properties for the German version of this interview.

Borderline personality disorder. In order to assess borderline symptomatology, the respective module of the Structured Clinical Interview for DSM-IV Axis II (SCID-II; Wittchen et al., 1997) was conducted. The nine criteria of BPD (fear of abandonment, unstable and intense relationships, unstable self-image, impulsive behaviors, recurrent self-harm, affect instability, chronic feelings of emptiness, intense anger, stress-related paranoid ideation or dissociative symptoms) are rated on a scale from 1 (not fulfilled), 2 (partially fulfilled) to 3 (fulfilled). If five or more criteria are met, a BPD is diagnosed and the fulfillment of three or four criteria is considered as subclinical. In the present analyses, the number of fulfilled criteria (rated as 3) is used as an indicator for symptom severity.

Depression. The Symptom Checklist Revised (SCL-90-R; Franke and Derogatis, 2002) is a self-report questionnaire measuring symptom severity in the last seven days on a 5-point Likert scale that ranges from 0 ("not at all") to 4 ("extremely"). Depressive symptoms, such as lethargy, crying, and feeling hopeless, are assessed with one out of nine subscales consisting of 13 items. In the present dataset, the depression subscale showed good internal consistency with a Cronbach's alpha of .88.

2.3. Statistical analysis

For the dependent variable, data were collected one year after the baseline assessment. Due to the binary character of the outcome variable, univariate and hierarchical multivariate logistic regressions were calculated. A possible moderating influence of both forms of psychopathology was analyzed as an interaction effect between self-rated risk and BPD as well as depression. Age, sex, and number of suicide attempts before the baseline were included as control variables. Suicidal ideation and NSSI, despite their possible theoretical importance, were omitted due the variance restriction in our selected clinical sample (see sample characteristics). Except for sex, which was binary, standardized values are reported in Tables 2 and 3 in order to allow comparison between the independent variables. The area under the receiver operating characteristic curve (AUC) was computed for each model as an indicator for accuracy of prediction, with an AUC of 0.50 revealing prediction to be at chance and 1.00 showing perfect accuracy (Zou et al., 2007). Analyses were conducted using Stata/SE (Version 16.0, Stata Corp LLC, College Station, TX, USA) and the alpha-level was set to 0.05.

3. Results

3.1. Descriptive statistics

From $N = 482$ adolescents included in the AtR!Sk cohort study (participation rate was 92%), $n = 227$ adolescents reported a lifetime suicide attempt at baseline (47%). Of those, $n = 93$ participants were subject to attrition at 12-months follow-up (41%), leaving a total sample of $n = 134$ adolescents (see Fig. 1). Compared to participants who returned for the 12-months follow-up, a F9 diagnosis from the ICD-10 was significantly more common in adolescents who were lost to attrition, as was the fulfillment of the "impulsive behaviors" BPD criterion ($\chi^2(1) = 5.47$, $p = .019$; $\chi^2(1) = 5.06$, $p = .025$, respectively). Both groups did not differ regarding any other baseline characteristics.

Thirty-nine percent of adolescents went to a Gymnasium (secondary school terminating with the general qualification for university entrance), 32% a Realschule (secondary school terminating with a secondary school level-I certificate), 10% a Hauptschule (secondary elementary school) and 19% attended some other form of school. While

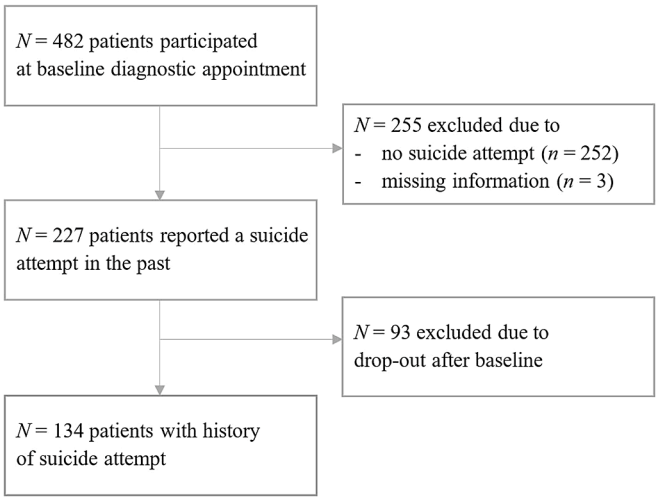

Fig. 1. Participant flow chart.

39% of the sample lived with both birth parents, 38% lived with one and 23% reported other living situations. At baseline, 44% of the sample reported having attempted suicide once in the past, 30% two or three and 26% four or more times. Every single participant has had suicidal thoughts at some point in his or her life (100%) and 98% reported to have ever engaged in NSSI.

Around one quarter of the sample attempted suicide once during the 12-months follow-up (24%), 6% made two or three attempts and 8% reported four or more suicide attempts. Half of the sample met five or more BPD criteria (51%) and 36% had subclinical BPD symptomatology (3 or 4 criteria). Compared to data obtained from a norm sample of community adolescents, 82% of participants had at least slightly elevated depression scores and half of them (53%) showed strongly increased values (Franke and Derogatis, 2002), which could be expected in this specific clinical sample. As presented in Table 1, baseline characteristics did not differ between participants with a suicide attempt in the following year and the ones without an attempt, except for self-rated risk.

3.2. Logistic regression analysis

As shown in Table 2, self-rated risk was a significant independent predictor for a suicide attempt over the course of one year ($p = .009$). For each increase in the risk prediction score by one standard deviation, the odds for a suicide attempt during the following year increased 64%. Age, sex, and number of previous suicide attempts did not predict a suicide attempt ($p = .511$; $p = .529$; $p = .544$, respectively), and neither did BPD ($p = .584$) nor depression severity ($p = .093$). Self-rated risk had the highest predictive accuracy for future suicide attempts with an AUC of 0.64.

Adding the control variables age, sex, and number of past suicide attempts into a multivariate model did not influence the effect of self-rated risk on the probability of a suicide attempt ($p = .010$), as shown in Table 3 (step 1). When BPD was included, the association remained stable ($p = .009$; step 2). However, the inclusion of depression as a predictor resulted in the effect of self-rated risk on suicide attempts to become non-significant ($p = .053$), yielding a model with no variable reaching statistical significance on its own (step 2).

The results of both interaction analyses are presented in Table 3, step 3. There was no significant interaction between self-rated risk and BPD ($p = .390$) and both main effects did not reach levels of statistical significance ($p = .089$; $p = .363$). The interaction between depression and self-rated risk was significant ($p = .028$) in predicting a future suicide attempt, as were the main effects of depression ($p = .019$) and self-rated risk ($p = .010$). As shown in Table 3 and Fig. 2, the interaction between

Table 1
Baseline sample characteristics.

	Total *N* = *134*	SA *n* = *51*	No-SA *n* = *83*	Test statistic	*p*
Age in years, *M (SD)*	15.2 (1.4)	15.1 (1.4)	15.2 (1.4)	$t(132) =$ 0.65	.514
Female sex, *n (%)*	121 (90)	45 (88)	76 (92)	$\chi^2(1) =$ 0.40	.527
Diagnoses, *n (%)*[1]					
F1 Mental and behavioral disorders due to psychoactive substance use	34 (25)	10 (20)	24 (29)	$\chi^2(1) =$ 1.45	.229
F3 Affective disorders	95 (71)	39 (77)	56 (68)	$\chi^2(1) =$ 1.24	.265
F4 Neurotic, stress-related and somatoform disorders	47 (35)	22 (43)	25 (30)	$\chi^2(1) =$ 2.35	.125
F5 Behavioural syndromes associated with physiological disturbances and physical factors	19 (14)	10 (20)	9 (11)	$\chi^2(1) =$ 1.99	.158
F9 Behavioural and emotional disorders with onset usually occurring in childhood and adolescence	36 (27)	10 (20)	26 (31)	$\chi^2(1) =$ 2.21	.137
Self-rated risk for SA, *M (SD)*	1.7 (1.2)	2.1 (1.1)	1.5 (1.2)	$t(132) =$ -2.74	.007
Number of past SA, *M (SD)*	4.9 (11.4)	4.1 (7.8)	5.4 (13.1)	$t(132) =$ 0.62	.539
Number of BPD criteria, *M (SD)*	4.5 (1.8)	4.7 (2.0)	4.5 (1.7)	$t(132) =$ -0.54	.587
Fulfillment of BPD criterion, *n (%)*					
Fear of abandonment	36 (27)	14 (28)	22 (27)	$\chi^2(1) =$ 0.01	.905
Unstable relationships	67 (50)	26 (51)	41 (49)	$\chi^2(1) =$ 0.03	.859
Unstable self-image	51 (38)	21 (42)	30 (36)	$\chi^2(1) =$ 0.34	.560
Impulsive behaviors	37 (28)	12 (24)	25 (30)	$\chi^2(1) =$ 0.69	.407
Recurrent self-harm	129 (97)	49 (98)	80 (96)	$\chi^2(1) =$ 0.01	.927
Affect instability	98 (73)	38 (75)	60 (72)	$\chi^2(1) =$ 0.08	.778
Chronic feelings of emptiness	77 (58)	33 (65)	44 (53)	$\chi^2(1) =$ 1.77	.184
Intense anger	59 (44)	20 (39)	39 (47)	$\chi^2(1) =$ 0.77	.379
Stress-related paranoid ideation or dissociative symptoms	54 (41)	24 (47)	30 (37)	$\chi^2(1) =$ 1.56	.211
Depression severity, *M (SD)*	2.3 (0.8)	2.4 (0.9)	2.2 (0.8)	$t(127) =$ -1.71	.090

Note. *M* = mean, *SD* = standard deviation, *n* = sample size, SA = suicide attempt, BPD = borderline personality disorder.
[1] F0 (organic mental disorders), F2 (schizophrenia, schizotypal and delusional disorders), F7 (mental retardation), F8 (disorders of psychological development) were not fulfilled by any patient and were therefore omitted. Only the borderline module of the SCID-II was conducted and the frequency of F6 (disorders of adult personality and behavior) cannot be reported.

Table 2
Results of univariate logistic regression analyses for suicide attempt.

	OR	*CI*	*p*	*AUC*
Self-rated risk	1.64	1.13; 2.38	.009	0.64
Age	0.89	0.63; 1.26	.511	0.54
Sex[1]	1.45	0.46; 4.58	.529	0.52
No. of past SA	0.88	0.59; 1.32	.544	0.52
BPD	1.10	0.78; 1.57	.584	0.53
Depression	1.38	0.95; 2.02	.093	0.61

Note. *OR* = odds ratio, *CI* = 95% confidence interval, *p* = p-value, *AUC* = area under the curve, SA = suicide attempt, BPD = borderline personality disorder
[1] Statistical values for sex are unstandardized.

both factors was negative: With increasing depression severity, self-rated risk lost its significance as a predictor for a suicide attempt. The AUC in multivariate analyses (Table 3) was comparable to the univariate predictive effect of self-rated risk and the highest AUC emerged in the interaction model including self-rated risk and depression (AUC = 0.67).

4. Discussion

The goal of the present study was to examine the predictive value of self-rated risk for future suicide attempts among high-risk adolescents and to control for factors that may mitigate the reliability of self-ratings. Specifically, BPD and depression were expected to not only be prevalent, but to be associated with a higher probability of suicide attempts in the following year and to lead to less precise self-ratings of such behavior. We found mixed results: Higher self-rated risk was associated with significantly increased probability of a future suicide attempt. BPD and depression severity were both high in this sample, but neither of them were found to be significant independent predictors of suicide attempts. Furthermore, while no interaction between BPD and self-rated risk in the prediction of suicide attempts emerged, a significant negative interaction between depression and self-rated risk was found. These findings and their implications are discussed below.

Our finding of self-rated risk being a predictor for a subsequent suicide attempt is in line with a study by Czyz et al. (2016). In both studies, at-risk adolescents were able to predict their probability of attempting suicide in the following 12 to 18 months. Janis and Nock (2008), on the other hand, did not find self-ratings to improve the prediction of future self-injurious thoughts and behaviors beyond the assessment of such thoughts and behaviors in the past. The inconsistencies might be attributable to differently defined outcomes: Predicting suicide attempts as clearly defined behaviors may be less prone to inaccuracy compared to the prognosis of self-injuring thoughts and behaviors in general. Self-rated risk therefore seems to be a good predictor for the occurrence of suicide attempts over one year among at-risk adolescents. This finding may add to existing research and clinical assessments of suicide attempts by incorporating self-prognosis as a reliable and easy to assess add-on to traditional risk scales.

Contrary to previous research (Black et al., 2004; Evans et al. 2004; Gili et al., 2019), neither BPD nor depressive symptoms independently predicted suicide attempts. A possible explanation could be that patients with BPD or depression are at higher risk for suicide attempts compared to the general population, but when examining clinical samples, the severity of psychopathology does not differentiate well between people with and without suicide attempts. This finding fits with the ideation-to-action framework of suicide research and the assumption that established risk factors, such as psychiatric disorders, do not distinguish well between suicide ideators and attempters (Klonsky and May, 2014). In line with this theory, BPD and depression may be associated with general suicidal tendencies and in the general population, they serve as critical risk factors for self-harming behavior. In high-risk clinical samples, though, BPD and depression may not be well suited to predict specific suicidal behavior or to make a distinction between patients who attempt suicide and those who do not. According to our study, these findings can be interpreted as evidence that among psychiatric patients, more emphasis should be placed on the individual's own assessment in addition to psychiatric diagnoses in order to identify adolescents at risk for suicide attempts.

Furthermore, adolescents with high levels of BPD were able to predict their own suicidal behavior and BPD characteristics, such as instability in affect and identity as well as impulsivity, seemed to have no influence on the predictive value of self-ratings regarding subsequent suicidal behavior. Further research on self-prognosis of future behavior in other domains among individuals with BPD may provide additional insight into the characteristic instability in identity and eventually support decision-making in the clinical context. Self-ratings regarding future suicide attempts of adolescents with BPD should therefore be

Table 3
Results of multivariate logistic regression analyses for suicide attempt.

	OR	*CI*	*p*	*AUC*		*OR*	*CI*	*p*	*AUC*
Step 1									
Self-rated risk	1.67	1.13; 2.45	.010						
Age	0.98	0.67; 1.44	.935						
Sex[1]	1.24	0.37; 4.18	.734						
No. of past SA	0.83	0.55; 1.26	.385	0.66					
BPD					**Depression**				
Step 2					**Step 2**				
Self-rated risk	1.63	1.13; 2.36	.009		Self-rated risk	1.48	0.99; 2.20	.053	
BPD	1.07	0.74; 1.54	.722	0.64	Depression	1.22	0.82; 1.81	.318	0.64
Step 3					**Step 3**				
Self-rated risk	2.51	0.87; 7.27	.089		Self-rated risk	7.50	1.62; 34.75	.010	
BPD	1.35	0.71; 2.57	.363		Depression	3.08	1.21; 7.85	.019	
Self-rated risk x BPD[1]	0.93	0.79; 1.10	.390	0.65	Self-rated risk x Depression[1]	0.58	0.35; 0.94	.028	0.67

Note. OR = odds ratio, *CI* = 95% confidence interval, *p* = p-value, *AUC* = area under the curve, SA = suicide attempt, BPD = borderline personality disorder
[1] Statistical values for sex and interaction effects are unstandardized.

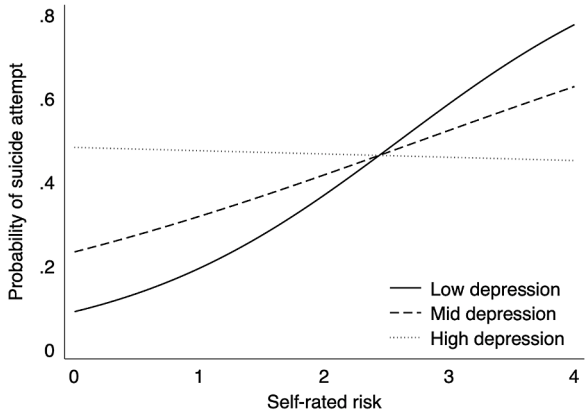

Fig. 2. Interaction between self-rated risk and depression in the prediction of a suicide attempt. Low depression = mean - 1 standard deviation; mid depression = mean; high depression = mean + 1 standard deviation.

taken seriously by clinicians and not disregarded as being instable, inaccurate or even manipulative.

Depression severity, on the other hand, did have an influence on the predictive value of self-rated risk: Participants with low levels of depression were able to predict their risk of attempting suicide in the near future, whereas participants with high depression levels were not. This finding can be interpreted as an interplay between negative views of the self and the future (Platt et al., 2017) and an interrupted process from suicidal ideation to suicide attempts in highly depressed individuals due to lethargy (Rogers et al., 2018). Adolescents with greater depression severity may feel negative about themselves and the future and believe they will attempt suicide again, but end up having too little energy to actually commit an attempt. It should be noted, though, that severity of depression was generally high in this sample and the difficulties in self-ratings did not apply to mild or moderate levels of depression, but rather severe forms.

The topic of prediction accuracy should also be addressed. While age, sex, number of past suicide attempts, and BPD were close to random as predictors, depression yielded slightly better results and in line with findings presented above, the highest AUC was found for self-rated risk as an univariate predictor and the model including the interaction between self-rated risk and depression. In other medical fields, higher AUCs are considered acceptable (Zou et al., 2007), but the values presented in this paper correspond to moderate prediction effects in psychiatry in general (Rice and Harris, 2005) and even slightly outperform popular suicide risk scales (Lindh et al., 2019). The limited accuracy of prediction in suicidality research and the clinical context has been discussed extensively (e.g., Franklin et al., 2017) and even though our results were significant, further improvement of accuracy remains an essential goal for future studies.

4.1. Strengths and limitations

There are some limitations to this study. First, the sex ratio is skewed and the clear majority of this sample were females. Even though we did not find any significant effects of sex, we cannot rule out that these exist due to the small number of male participants. While the longitudinal character of the study is a great advantage, the 12-months time frame did not allow us to examine short-term effects, limiting clinical implications. Furthermore, symptoms of BPD and depression were highly prevalent. While the examination of such a specific high-risk sample is a clear strength, no statement can be made regarding these findings in less burdened samples or the general population. Also, this may to some extent explain the finding that neither BPD nor depression severity were significant predictors for suicide attempts in the present study with this specific clinical sample. It should also be noted that a questionnaire was used to measure depression severity, and not a clinical interview. This could in part explain the high prevalence of depression in this sample, since such questionnaires are mainly used as screening tools and psychiatric symptoms may be overestimated. To test general clinical utility, these findings should be replicated over shorter periods of time and in more diverse samples, in particular with a more balanced gender ratio and various levels of psychopathology severity.

5. Conclusions

We found self-rated risk to be a significant predictor for actual suicide attempts in the following year in an at-risk sample of treatment-seeking adolescents, even when controlling for key covariates. In this clinical sample, neither BPD nor depression severity were significant predictors and BPD characteristics seemed to have no influence on the predictive value of self-ratings. Severe depression did impact the precision with which participants were able to rate their risk to attempt suicide again, which should be considered when administering self-ratings of future suicidal behavior. In conclusion, asking an adolescent at high risk for suicide attempts about his or her personal estimation of showing such behaviors in the future, a question that is short and easy to implement in routine care, may allow better prediction of suicide attempts and improve reliability of risk assessments in the clinical context.

Contributors

MK designed and supervised the study. GFW and DG were responsible for data collection and recruitment. FRo performed the analyses and wrote the manuscript. CR and SL contributed to the analyses. CR, GFW, DG, JK, FRe, and MK edited the manuscript and provided a final

review. All authors gave final approval of this version to be published.

Declarations of Competing Interest

None.

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