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Investigating the interplay between mental health conditions and social connectedness on suicide risk: Findings from a clinical sample of adolescents

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Abstract

This study examined whether school and community connectedness buffer the relationships between mental health conditions and suicide risk in a clinical sample of adolescents with histories of substance use disorders. Data from 294 adolescents were examined, with approximately 58% reporting lifetime suicidal ideation and/or prior attempts. Multinomial logistic regression was used to examine main and interaction effects on a three-category measure of suicide risk. Depression severity and panic disorder were associated with elevated suicidal ideation risk, whereas disordered eating was associated with elevated risk of attempts. Higher school-based positive peer interactions, school safety, and neighborhood social connection levels were associated with reduced suicide attempt risk. Moderation analyses revealed that high neighborhood social connection levels may partially mitigate the elevated likelihood of attempting suicide associated with disordered eating. Findings suggest clinical populations of adolescents may benefit from approaches aiming to promote social connectedness, further supporting a comprehensive approach to suicide prevention.

Keywords

Suicide; social connectedness; depression; panic disorder; eating disorders

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Authors' Contributions

LMB was responsible for conceptualization, formal analysis, visualization, manuscript writing, and funding acquisition; FM was responsible for written contributions to the manuscript, manuscript review, and edits; LMN was responsible for written contributions to the manuscript, manuscript review, and edits; and ETS was responsible for supervision, manuscript review, edits, and funding acquisition.

Ethics Declarations

Ethical Approval

The Institutional Review Board at University of Minnesota approved all recruitment, enrollment, and data collection procedures for the parent study.

Competing Interests

The authors have no relevant financial or personal conflicts of interests to disclose.

Suicidality is a national public health crisis, accounting for nearly one-fifth of deaths among U.S. adolescents aged 15–19 in 2021 [1]. In a recent national survey, 22.2% of high school respondents seriously considered suicide over the past year, whereas 10.2% reported a suicide attempt [2]. In the same survey, 29.3% of respondents reported poor mental health related to stress, depression, and anxiety over the past 30 days. An annual review of suicide deaths in the U.S. revealed that only 37.2% of decedents ever received mental health treatment [3], highlighting the importance of a comprehensive approach to suicide prevention that includes both clinical treatment and public health strategies [4]. Prominent theories have identified social isolation and lack of belonging as critical components in the development of suicidal thoughts and behaviors [5, 6], leading the Centers for Disease Control and Prevention to identify promoting social connectedness as a key strategy for reducing suicide [7]. As such, the current study examines whether school and community connectedness buffer the association between mental health conditions and suicide risk in a clinical sample of adolescents with histories of substance use disorders.

Mental Health Conditions

A large body of research has focused on mental health characteristics as key risk factors for suicidality. Depression is one of the most well-studied risk factors for suicide risk; a recent meta-analysis examining predictors of suicidal ideation and attempts found that elevated depression predicted higher rates of ideation, but depression severity did not differ between those who ideated and those who attempted suicide [8]. Similar associations have also been observed in clinical samples of adolescents [9–11]. Prior research has also examined the relationship between disordered eating, panic disorder, and suicidality, demonstrating a strong relationship between suicide and eating disorder diagnoses as well as even sub-threshold eating disorder symptoms [12, 13]; unhealthy weight control behaviors, such as fasting and purging, have also been found to predict higher odds of suicidal ideation and attempts in adolescent samples [14, 15]. Conflicting findings have emerged from studies on panic disorder in adolescents, with some reporting no evidence of a relationship between panic disorder and suicidal ideation or attempts [16, 17], and others reporting significant associations even when controlling for other comorbid disorders [18, 19].

Connectedness and Suicide

Connectedness in adolescent suicide research has been operationalized as self-reported feelings of being supported or cared for as well as social bonds in settings such as schools and communities [20]. Ideation-to-action theories, which frame the development of suicidal ideation and progression from ideating to attempting suicide as distinct processes, have identified both mental health and connectedness as key components in these processes. The interpersonal theory of suicide [5] proposes that feelings of sadness and hopelessness along with thwarted belongingness result in the development of suicidal ideation, whereas habituation to pain leads to the acquired capability to attempt suicide. In addition, the three-step theory [6] postulates: (1) the combination of hopelessness and psychological pain result in the development of moderate suicidal ideation; (2) moderate ideation escalates to strong ideation when psychological pain and hopelessness exceed connectedness; and (3) strong ideation progresses to attempts when increased capacity—facilitated by dispositional,

acquired, and practical factors—is present. Empirical tests have supported these theories, highlighting the importance of increasing connectedness in individuals reporting mental health concerns [21, 22].

A recent meta-analysis found that stronger school connectedness was associated with reduced odds of suicidal ideation and attempts in community (i.e., general population) and higher-risk (e.g., sexual and gender minorities) samples of youth [23]. In particular, prior research on school connectedness suggests social connections with teachers [24–27] and peers [26, 28, 29] are associated with lower rates of suicidal ideation and/or attempts. Additionally, school safety indicators as measures of structural support have been identified as significant predictors of suicidality [30–33]. Although few studies have examined the relationship between suicidality and connectedness within broader social contexts, various measures of community connectedness have been associated with reduced ideation and/or attempt risk in adolescent samples [27, 32, 34, 35]. Furthermore, engagement in community service and helping activities may be beneficial as prior research has found that volunteerism [36] and perceived prosocial attributes [37] were associated with reduced suicide risk levels and ideation, respectively.

Protective Effects

Youth spend a considerable amount of time at school and within their communities during adolescence, prompting the need to examine whether social connections forged in these extra-familial settings can help buffer the elevated risk of suicidality associated with mental health conditions. A prior study examining the relationship between mental health conditions and suicidal ideation in a sample of U.S. high school students found that adolescents with disordered eating and low school-based peer support reported more severe suicidal ideation than adolescents with disordered eating and high school-based peer support [28]. However, the same study found the relationship between depression levels and ideation severity did not vary across different levels of school-based peer support. Conversely, another study conducted with a community sample of adolescents found that community connectedness buffered the association between depression and reasons for living (a proxy for suicide risk), such that youth with more severe depression and high levels of community connectedness reported more reasons for living compared to those with low or moderate community connectedness [38]. Although the buffering effects of volunteerism and community service has been understudied, one prior study found that the relationship between depression and suicidal ideation was buffered by prosocial attributes in samples of young adults in Europe and Asia [37]. Taken together, these findings suggest that school and community connectedness may buffer the association between certain mental health conditions and suicide risk, although results may vary across samples or types of support examined.

Study Aims

To the best of our knowledge, prior research examining these protective effects have been limited to community samples of youth, creating a gap in knowledge regarding whether mental health conditions and social connectedness interact to predict lower suicidal ideation

and attempt risk in clinical samples of adolescents (i.e., those receiving mental or behavioral health treatment). Under a comprehensive public health approach to suicide prevention, it is important to better understand how social connections might be leveraged to buffer the effects of mental health conditions among youth most vulnerable to suicidal thoughts and behaviors. As such, the current study seeks to help fill this gap in knowledge by assessing: (a) which mental health conditions (depression severity, disordered eating, panic disorder) are associated with suicide risk; and (b) which measures of school connectedness (teacher support, school-based positive peer interactions, school safety) and community connectedness (neighborhood social connection and community engagement) are associated with suicide risk; and (c) whether these connectedness measures buffer the associations between mental health conditions and suicide risk.

Methods

Sample

We performed secondary analysis of data collected for a quasi-experimental evaluation of recovery high school attendance effects on recovery and psychosocial outcomes [39]. Recruitment for the parent study took place in Minnesota, Wisconsin, and Texas, where 294 participants were recruited upon discharge from formal substance use treatment or enrollment in a recovery high school; detailed recruitment methods are described in prior publications [39, 40]. Participants completed retrospective baseline measures, with follow-up data collected at 3-month, 6-month, and 12-month follow-ups. The Institutional Review Board at University of Minnesota approved all recruitment, enrollment, and data collection procedures.

The current study analyzes baseline assessment data from the parent study. Of the 294 participants, 55.1% of participants identified as male and 72.1% as White; participants ranged in age from 13 to 19 ($M = 16.3$, $SD = 1.1$). Participants had high rates of mental health conditions, with 93.5% meeting criteria for at least one mental health condition outside of a substance use disorder. Approximately 58% reported lifetime suicidal ideation and/or prior attempts. Descriptive statistics of demographic and baseline measures are presented in Table 1.

Measures

Suicide Risk: The M.I.N.I. [41] was used to assess suicide risk using the following screening items: “In your lifetime, was there a time when you thought you would be better off dead or wish you were dead?” (no/yes); “During that time when you felt that you’d be better off dead, did you think about suicide?” (no/yes); and “Did you attempt suicide?” (no/yes). These items were used to construct a three-category outcome variable: (1) non-suicidal group comprised of participants who did not report either thinking about or attempting suicide; (2) ideation only group comprised of those who reported thinking about suicide but did not attempt suicide; and (3) prior attempt group comprised of those who reported a prior suicide attempt.

Mental Health Conditions: Data on past year major depressive disorder (MDD), disordered eating, and panic disorder were also collected using the M.I.N.I. MDD severity was operationalized as the total number of MDD symptoms endorsed (range 0–9). Participants screened positive for disordered eating if they reported past-year purging, laxative use, binge eating, or rapid weight loss (1 = positive; 0 = negative). Finally, participants were considered as having a panic disorder (1 = yes; 0 = no) if they met DSM-IV criteria for panic disorder (e.g., recurrent unexpected panic attacks, persistent concern about having additional attacks). Approximately 80% of the sample met the criteria for at least one of these three mental health conditions (see Table 1).

School Connectedness: Three subscales from the School Climate Inventory were used to assess different dimensions of school connectedness [42]. Participants responded to subscale items on a five-point scale to report frequency of their experiences (1 = never to 5 = always), and the responses were averaged together to create subscale composite scores. The five items comprising the positive peer interactions (PPI) subscale asked how often participants experienced prosocial peer attitudes and interactions at school (e.g., “Students in this school get to know each other really well”; $\alpha = .84$). The teacher support subscale consisted of six items that asked how often participants felt their teachers cared for or supported them (e.g., “Teachers go out of their way to help students”; $\alpha = .88$). The six items comprising the safety problems subscale asked participants how often they were exposed to verbal threats, physical harm, and crime at school ($\alpha = .73$). The safety problems subscale scores were reverse coded to represent school safety, with higher scores indicating safer school climates.

Community Connectedness: Two subscales from the Civic Identity/Civic Engagement Instrument for Youth were used to assess past-year community involvement [43]. The eight items comprising the civic participation subscale asked participants how often they engaged in helping activities (e.g., “Helped a neighbor”, 1 = never to 5 = very often), engaged in service activities (e.g., “Been a mentor or peer advisor”, 1 = never to 6 = every week), or been leaders in a club or organization (1 = never to 6 = five or more times). These items were standardized and averaged together to create a community engagement composite score ($\alpha = .79$). The six-item neighborhood social connection (NSC) subscale assessed community social connectedness (e.g., “In my neighborhood, there are lots of people who care about me”). Participants rated their agreement with each statement on a five-point scale (1 = strongly disagree to 5 = strongly agree); items were averaged together to create a composite score ($\alpha = .77$).

Control Variables: All models controlled for substance use at baseline, which was assessed using the Timeline Followback method [44]. Participants reported the number of days they used alcohol, cannabis, and other illicit drugs in the three months prior to their substance use disorder treatment (each ranging from 0–91 days). Sex (1 = female; 0 = male), race (1 = white, 0 = other race), and age were also included in the models as demographic control variables. MDD severity was retained as a control variable in all models given the extensive evidence base on the relationship between depression and suicidality and

high prevalence of MDD in the sample. Models that assessed school connectedness also controlled for recovery high school attendance (1 = yes; 0 = no).

Analysis

Across the 294 participants, there was a small amount of missing data ($n = 1-4$) on items assessing suicide risk, school connectedness, and community connectedness due to item non-response. To analyze the full sample, missing data were multiply imputed by chained equations [45], and model estimates were pooled in accordance with Rubin's rules [46]. Descriptive statistics and bivariate comparisons were used to examine unadjusted differences in mental health and control variables between the non-suicidal ($n = 123$, 41.8%), ideation only ($n = 89$, 30.3%), and prior attempt ($n = 82$, 27.9%) groups. Unadjusted group differences were assessed using independent t -tests and Cohen's d effect sizes for continuous variables or chi-square tests of independence and odds ratio effect sizes for categorical variables. All analyses assessed statistical significance at the $\alpha = .05$ level.

Multinomial logistic regression was used to examine if school and community connectedness buffered the effects of mental health conditions. All continuous variables were mean-centered and standardized prior to inclusion in the models. Unconditional main effects models were estimated for each unique combination of mental health condition and social connectedness measures. Multiplicative interaction terms were subsequently added to the models to test for moderating (buffering) effects. Each model was re-estimated with an alternative reference group to compare the risk groups. Statistically significant interaction terms were probed by estimating marginal effects across the range of the independent variables.

Results

Bivariate Risk Group Comparisons

Compared to the non-suicidal group, the ideation only group reported significantly higher depression severity ($d = 1.20$), disordered eating (29.1% vs. 13.9%, $OR = 2.55$), and panic disorder (42.6% vs. 17.1%, $OR = 3.58$). The prior attempt group reported significantly higher rates of disordered eating (53.6% vs. 29.1%, $OR = 2.81$) compared to the ideation only group, but the differences in depression severity and panic disorder were not statistically significant. Of the school and community connectedness measures, the prior attempt group reported significantly lower school safety than the ideation only group ($d = -0.36$); no significant differences in school-based PPI, teacher support, NSC, or community engagement were detected between suicide risk groups (see Table 1 for full comparisons).

Regression Results

Major Depression Disorder: Table 2 presents regression coefficients, relative risk ratios (RRRs), and confidence intervals around the RRRs from the multinomial logistic regression models testing the main effects and interactions between MDD severity and connectedness measures. Main effects models indicated MDD severity was significantly higher in the ideation only group compared to the non-suicidal group, with RRRs ranging from 3.38 (95% CI [2.25, 5.09], $p < .001$) to 3.46 (95% CI [2.31, 5.19], $p < .001$); there were no significant

differences in MDD severity between the ideation only and prior attempt groups. Main effects models also indicated school-based PPI ($RRR = 0.70$, 95% CI [0.51, 0.97], $p = .033$), school safety ($RRR = 0.61$, 95% CI [0.43, 0.87], $p = .006$), and NSC ($RRR = 0.71$, 95% CI [0.51, 0.98], $p = .040$) were significantly lower in the prior attempt group compared to the ideation only group. There was no evidence that measures of school or community connectedness moderated the associations of MDD severity on suicide risk.

Disordered Eating: Table 3 presents regression coefficients, RRRs, and confidence intervals around the RRRs from the multinomial logistic regression models testing the main effects and interactions between disordered eating and measures of connectedness. In main effects models, disordered eating rates did not differ between the ideation only and non-suicidal groups. However, disordered eating rates were significantly higher in the prior attempt group compared to ideation only group, with RRRs ranging from 2.24 (95% CI [1.07, 4.69], $p = .014$) to 2.53 (95% CI [1.21, 5.28], $p = .033$). Main effects models also indicated school-based PPI ($RRR = 0.68$, 95% CI [0.49, 0.95], $p = .023$), school safety ($RRR = 0.63$, 95% CI [0.45, 0.90], $p = .007$), and NSC ($RRR = 0.67$, 95% CI [0.48, 0.94], $p = .021$) were significantly lower in the prior attempt group compared to the ideation only group.

In the model assessing NSC and disordered eating, there were no significant main or interaction effects when comparing ideation only to non-suicidal participants. Main effect results indicate that participants with prior attempts had significantly lower NSC ($RRR = 0.67$, 95% CI = [0.48, 0.94], $p = .021$) and higher rates of disordered eating ($RRR = 2.53$, 95% CI = [1.21, 5.28], $p = .014$) compared to ideation only participants. However, there was a significant interaction between disordered eating and NSC on the likelihood of attempts ($RRR = 0.29$, 95% CI = [0.12, 0.69], $p = .006$), such that adolescents with low NSC who screened positive for disordered eating had the highest predicted probability of a prior attempt, but the probability of an attempt decreased as NSC increased (see Figure 1). There was no evidence that the other measures of connectedness and suicide risk moderated the association between disordered eating and suicide risk.

Panic Disorder: Tables 4 presents regression coefficients, RRRs, and confidence intervals around the RRRs from the multinomial logistic regression models testing the main effects and interactions between panic disorder and connectedness measures. Main effects models indicated panic disorder rates were significantly higher in the ideation only group compared to the non-suicidal group, with RRRs ranging from 2.27 (95% CI [1.10, 4.70], $p = .021$) to 3.46 (95% CI [2.31, 5.19], $p = .021$); there were no significant differences in panic disorder rates between the ideation only and prior attempt groups. Main effects also indicated school-based PPI ($RRR = 0.70$, 95% CI [0.50, 0.96], $p = .028$), school safety ($RRR = 0.63$, 95% CI [0.45, 0.89], $p = .006$), and NSC ($RRR = 0.72$, 95% CI [0.52, 0.99], $p = .046$) were significantly lower in the prior attempt group compared to the ideation only group. There was no evidence that school or community connectedness moderated the associations between panic disorder and suicide risk.

Discussion

The results of this study provide crucial knowledge about the relationships between mental health conditions, social connectedness, and suicide risk in a clinical sample of adolescents with histories of substance use disorders. Results indicated that MDD severity and panic disorder diagnosis were associated with elevated suicidal ideation risk, whereas disordered eating was associated with elevated risk of suicide attempts. We also found that higher levels of school-based positive peer interactions, school safety, and neighborhood social connection were associated with reductions in suicide attempt risk, even after adjusting for MDD severity. Moderation analyses indicated that adolescents who screened positive for disordered eating and reported low neighborhood social connection were at the greatest risk of attempting suicide, but at high levels of neighborhood social connection, their attempt risk was equivalent to those who screened negative for disordered eating.

To the best of our knowledge, this is the first study to examine the potential protective effects of school and community connectedness in a clinical sample of adolescents with histories of substance use disorders. As such, these findings fill an important gap as they suggest that similar clinical populations may benefit from approaches that aim to promote social connectedness, further supporting a comprehensive approach to suicide prevention [4]. Whereas the increased suicidality risk associated with MDD, disordered eating, and panic disorder highlight the importance of implementing evidence-based clinical treatments to address these mental health conditions, the reduced attempt risk associated with school-based positive peer interactions, school safety, and neighborhood social connection underscore the importance of efforts to bolster supportive relationships and environments. Given the finding that higher levels of neighborhood social connection may partially mitigate the elevated likelihood of attempting suicide associated with disordered eating, stronger community ties may be particularly beneficial for adolescents who engage in disordered eating behaviors.

The results of this study also revealed differential relationships between certain mental health conditions and suicide risk level. Consistent with results of prior studies conducted with other adolescent clinical samples [10, 11], the findings from both our unadjusted and adjusted models indicate that MDD severity is a risk factor for suicidal ideation but not attempts among youth with histories of substance use disorders. Similarly, despite some studies reporting no evidence of a relationship between panic disorder and suicide risk [16, 17], our results support prior findings of a significant relationship between panic disorder and ideation risk [18, 19]. In contrast, screening positive for disordered eating was associated with higher risk of suicidal ideation and attempts in unadjusted risk group comparisons, but only the association with increased suicide attempt risk remained significant after adjusting for covariates. A possible explanation for the unique relationship between disordered eating and increased attempt risk is that individuals who repeatedly engage in pain-inducing weight control behaviors (e.g., overexercising and purging) demonstrate higher acquired capacity for suicide due to greater pain insensitivity, making them more likely to attempt suicide than those who do not engage in those behaviors [47–49]. Moreover, the relationship between disordered eating and attempt risk may be further bolstered by high comorbidity with traumatic experiences. Approximately 70% of

youth who screened positive for disordered eating also reported histories of physical abuse, sexual abuse, or being attacked with a weapon, all of which were associated with higher odds of attempting suicide [9].

We found no evidence that school or community connectedness buffered the associations between mental health conditions and suicidal ideation in this sample. Given that psychopathology and low social connectedness are thought to be key contributing factors to suicidal ideation [5, 6], we expected measures of school and community connectedness to be significantly lower in the ideation only group compared to the non-suicidal group. This unexpected result could be a measurement artifact given the tools used to measure suicidality. As suggested by the three-step theory [6], connectedness may differ between those with moderate (i.e., passively thinking about suicide) versus strong ideation (i.e., active desire to die by suicide), but our ideation only group was based on a M.I.N.I. item that was a unidimensional assessment of ideation. Thus, any protective effects present may have gone undetected when comparing a potentially heterogeneous ideation only group to the non-suicidal group. In contrast, other studies [28, 37] that have reported significant buffering effects between mental health conditions and suicidal ideation used instruments that measured ideation on a semi-continuous scale, and as such, were able to assess ideation severity. It is also possible that these null findings can be attributed to ceiling effects resulting from our clinical sample of adolescents who have more severe mental health conditions than would be expected in a community sample. As such, this may account for the differences between our findings and studies conducted with community samples [28, 37, 38]. Finally, there may be other dimensions of social connectedness that are important to study that were not accounted for in the present study (e.g., familial connectedness), highlighting the need for future research to examine the effects of additional dimensions of social connectedness in other clinical samples of youth.

Limitations

Despite the novelty of the present study, the findings should be considered in light of its limitations. First, although suicidality was reassessed at the 6- and 12-month follow-ups in this sample, we were unable to examine longitudinal changes in suicide risk in our analysis due to the limited number of participants reporting suicidal ideation or attempts within the past six months at those follow-ups. Therefore, the cross-sectional design used here prohibited us from examining the degree to which temporal changes in suicide risk may be associated with mental health and social connectedness. Second, the majority of this sample experienced comorbid mental health conditions. We attempted to address this in the models examining panic disorder and disordered eating by controlling for MDD severity as it was the most common co-occurring mental health condition in this sample; however, given methodological and data limitations (e.g., limited subgroup sample sizes, multi-collinearity among mental health conditions), we were unable to examine specific comorbid subgroups or fully control for the extent of all possible comorbidities. Thus, it is possible that other underlying comorbidities may contribute to the reported findings. Third, this sample was comprised of U.S. adolescents with histories of substance use disorders, the majority of whom were White and middle-class. As such, these findings may not be generalizable to racial and sociocultural heterogeneous populations or other types of

clinical samples. Fourth, these findings relied exclusively on self-report data, and as such, our constructs of social connectedness are more accurately described as perceived school and community connectedness. Although self-report data are prone to biases, they may be clinically meaningful in the context of this study as the effectiveness of social connections can be effective only to the extent they are perceived [50]. Taken together, future research would benefit from replicating the findings from the present study in larger and more diverse samples, incorporating additional sources of data (e.g., observation, collateral reports), examining comorbid mental health conditions, and employing longitudinal designs to strengthen claims made about the relationships between connectedness, mental health symptoms, and suicidality among adolescents.

Implications

Despite these noted limitations, the findings from the current study provide important implications for clinical practice and assessment. Given the relationship between social connectedness and well-being, clinicians should assess various sources of social support and dimensions of connectedness in adolescents' environments. Best practices in comprehensive suicide risk assessment call for thorough assessment of one's supports and strengths [51], which should include relationships with family, peers, school safety and engagement, and neighborhood engagement. Bolstering adolescents' environmental supports and connection is paramount to the treatment of factors that contribute to suicide risk, but clinicians should be aware that these benefits could be more directly linked to adolescent perceptions of connectedness. Notably, the four items with the greatest factor loading on the NSC subscale used in the current study were (a) "Adults in my town or city make me feel important", (b) "Adults in my town or city listen to what I have to say", (c) "In my town or city, I feel like I matter to people", and (d) "In my neighborhood, there are lots of people who care about me" [43]. While each item relates to an adolescent's neighborhood environment, we believe that they could also be incidental measures of an adolescent's self-image vis-à-vis their social connections within their community. In short, the protective power of these connections may lie in their perceived value to adolescents.

Importantly, diagnoses of MDD [52, 53] and eating disorders [54, 55] have been shown to be associated with reduced self-image in adolescents. Youth who have been diagnosed with MDD are at increased risk of negative self-evaluations of their social acceptability [52] that could result in distorted perceptions of social support. Likewise, there is some evidence to suggest that individuals who have been diagnosed with an eating disorder may experience disruptions in their social cognitive functioning [56]. Interventions to reduce suicide risk should therefore aim to increase both an adolescent's social connections and enhance the self-value that such connections confer. To that end, interventionists who work directly with adolescents should remain cognizant of clients' cultural and contextual values such that clients can reap the benefits of intervention, irrespective of the social environment to which they will return [57].

Fostering supportive relationships outside of individual treatment is crucial for enhancing social connectedness. Establishing peer support groups in schools and neighborhoods for adolescents with similar identities or lived experiences can help members form ties by

providing emotional support to one another and cultivating a sense of community [58]. Similarly, strength-based mentorship programs with trusted adults may help reduce social disconnectedness [57] and bolster hopefulness for the future [59]. Stigma and shame associated with mental health conditions and suicidality are barriers to social connectedness as they can drive youth to isolate themselves and prevent them from seeking services [57]. Schools and communities can counteract these effects by implementing campaigns that normalize mental health concerns and promote help-seeking norms, facilitating a culture in which youth feel more accepted and free to be their authentic selves [20, 29].

Taken together, the findings of this study suggest that promoting social connectedness may help reduce suicide risk in adolescent populations at elevated risk for suicide. As such, a comprehensive approach to suicide prevention consisting of both targeted mental health treatment and enhanced social support is crucial. The importance of social connectedness shows us that, just as suicide prevention should not be siloed to mental health treatment, involvement beyond mental health clinicians is needed. Suicide prevention should be a joint effort that also involves youth-facing professionals (e.g., social workers, school personnel) in order to help bolster social connectedness. By integrating these two components, we will be better positioned to address the growing epidemic of adolescent suicide.

Summary

Promoting social connectedness has been identified as a national suicide prevention strategy; however, to the best of our knowledge, no prior research has examined whether mental health conditions and social connectedness interact to predict lower suicidal ideation and attempt risk in clinical samples of adolescents with substance use histories. The results of this study help fill this gap in literature by examining the relationships between mental health conditions, social connectedness, and suicide risk in a clinical sample of adolescents. Using baseline data collected from 294 adolescents with histories of substance use disorder, unadjusted and adjusted statistical models were estimated to examine three suicide risk groups: non-suicidal, suicidal ideation only, and prior suicide attempts. Unadjusted comparisons of suicide risk groups revealed that major depression disorder severity and panic disorder diagnosis were associated with higher odds of lifetime suicidal ideation, but screening positive for disordered eating was associated with higher odds of a prior suicide attempt. Main effect regression models found that higher levels of school-based positive peer interactions, school safety, and neighborhood social connection were associated with reductions in suicide attempt risk. A potential buffering relationship was observed showing that, among adolescents who screened positive for disordered eating, attempt risk was significantly lower for those with higher versus lower neighborhood social connection. Findings suggest clinical populations of adolescents may benefit from suicide prevention approaches that aim to promote social connectedness, providing important implications for clinicians working with adolescent populations at greater risk for suicidal thoughts and behaviors.

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Availability of Data and Materials

Due to its sensitive nature, supporting data cannot be made openly available. Details of the data and how to request access are available from the parent study's Principal Investigator, Andrew Finch at Vanderbilt University.

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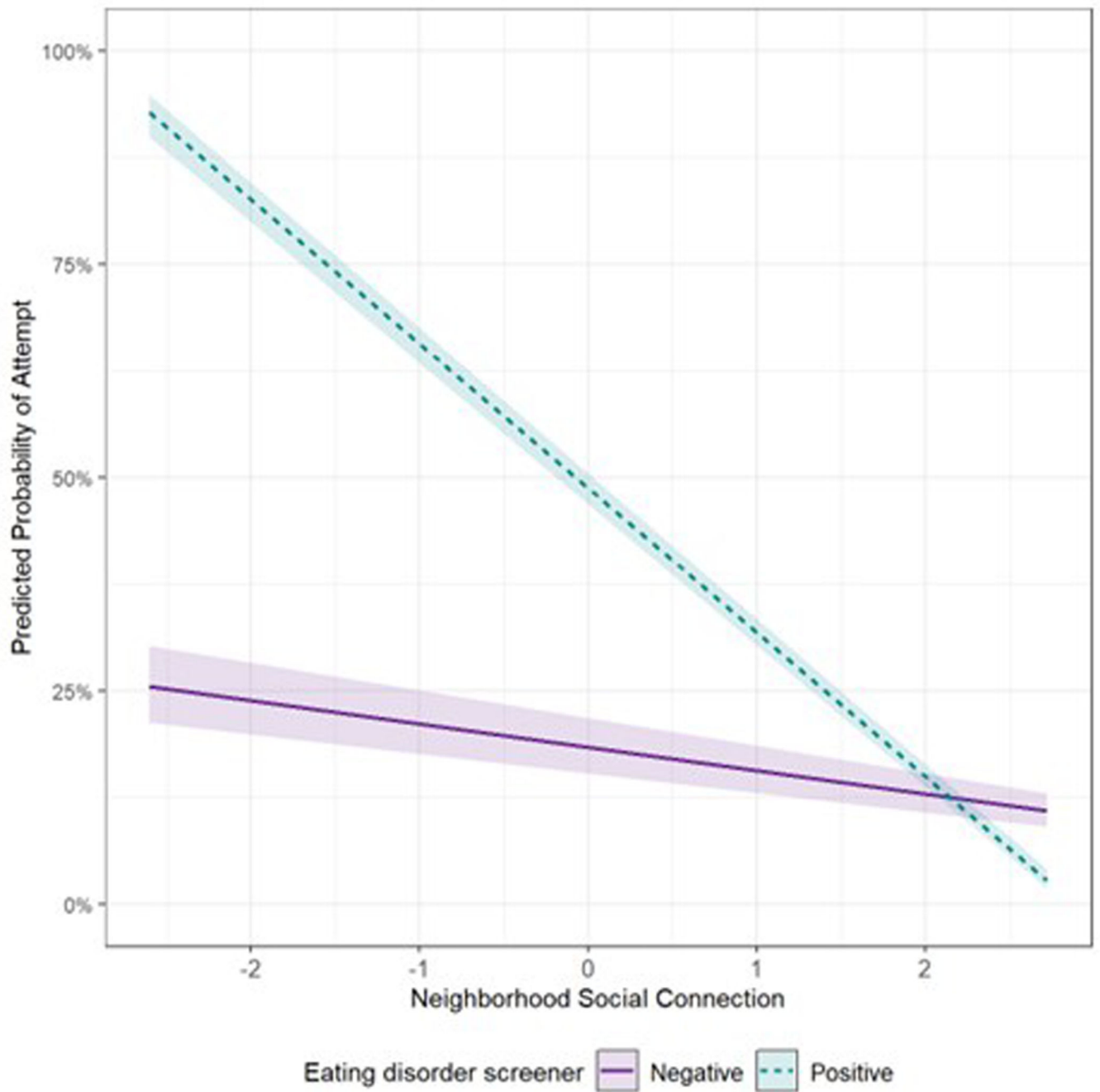


Figure 1.
The Interactive Effects of Neighborhood Social Connection and Disordered Eating on the Probability of a Prior Suicide Attempt vs. Ideation Only

Table 1
Descriptive Statistics and Comparisons of Participant Characteristics Across Suicide Risk Groups

Variables	Range	Non-suicidal <i>n</i> = 123				Ideation only <i>n</i> = 89				Prior attempt <i>n</i> = 82				Total sample <i>n</i> = 294				Ideation only vs. Non-suicidal		Prior attempt vs. Ideation only	
		<i>M</i>	<i>or</i>	%	<i>SD</i>	<i>M</i>	<i>or</i>	%	<i>SD</i>	<i>M</i>	<i>or</i>	%	<i>SD</i>	<i>M</i>	<i>or</i>	%	<i>SD</i>	<i>d</i>	<i>OR</i>	<i>d</i>	<i>OR</i>
Control Variables																					
Female	0–1	29.36		%		44.82		%		68.16		%		44.90		%			1.95*	—	2.64**
Age	13–19	16.31		1.10		16.42		1.13		16.22		1.03		16.32		1.09		0.09	—	—	—
White	0–1	69.82		%		74.23		%		73.22		%		72.11		%		—	1.25	—	—
Attended RHS	0–1	43.72		%		59.66		%		50.10		%		50.34		%			1.92*	—	0.95
Alcohol use	0–91	15.88		24.32		18.50		21.54		20.39		27.88		17.94		24.58		0.11	—	—	0.08
Cannabis use	0–91	54.32		35.63		59.28		32.17		50.35		35.02		54.71		34.50		0.15	—	—	—
Other drug use	0–91	22.15		32.25		26.38		31.36		31.70		36.39		26.10		33.32		0.14	—	—	0.16
Mental Health Conditions																					
MDD severity	0–9	3.83		3.41		7.41		2.33		7.94		2.18		6.06		3.38		1.20**	—	—	0.23
Disordered eating	0–1	13.87		%		29.13		%		53.55		%		29.59		%		—	2.55**	—	2.81**
Panic disorder	0–1	17.13		%		42.58		%		54.77		%		35.37		%		—	3.58**	—	1.63
Social Connectedness																					
PPI	1–5	3.20		0.70		3.33		0.67		3.12		0.73		3.22		0.70		0.19	—	—	—
School safety	2.17–5.00	4.37		0.53		4.21		0.62		3.97		0.71		4.21		0.63		-0.28	—	—	-0.36*
Teacher support	1–5	3.10		0.86		3.04		0.83		2.89		0.77		3.02		0.83		-0.07	—	—	—
NSC	1–5	3.08		0.70		2.98		0.77		2.76		0.68		2.96		0.75		-0.13	—	—	—
CE	-0.94–2.27	-0.04		0.60		0.01		0.66		0.05		0.67		0.00		0.64		0.08	—	—	0.06

Note. Results are pooled estimates across 50 multiply imputed datasets. *M* = mean; *SD* = standard deviation; *d* = standardized mean difference effect size; *OR* = odds ratio effect size; RHS = recovery high school; MDD = major depressive disorder; PPI = positive peer interactions; NSC = neighborhood social connection; CE = community engagement.

* $p < .05$

** $p < .01$.

Table 2
Results of Multinomial Regression Models Testing the Interactions Between MDD Severity and Connectedness Measures

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}
Main effects						
PPI	0.12	1.13	0.81, 1.57	-0.35 *	0.70	0.51, 0.97
MDD severity	1.21 **	3.36	2.24, 5.04	0.40	1.49	0.82, 2.70
Interaction model						
PPI	0.12	1.12	0.80, 1.58	-0.33	0.72	0.46, 1.11
MDD severity	1.22 **	3.37	2.24, 5.07	0.39	1.48	0.81, 2.68
PPI × MDD severity	-0.02	0.98	0.65, 1.48	-0.03	0.97	0.55, 1.72
Main effects						
SS	-0.14	0.87	0.60, 1.26	-0.49 **	0.61	0.43, 0.87
MDD severity	1.21 **	3.34	2.22, 5.03	0.28	1.33	0.74, 2.39
Interaction model						
SS	-0.21	0.81	0.55, 1.18	-0.21	0.81	0.51, 1.31
MDD severity	1.22 **	3.40	2.24, 5.17	0.28	1.33	0.73, 2.42
SS × MDD severity	0.11	1.11	0.76, 1.62	-0.55	0.58	0.32, 1.03
Main effects model						
TS	-0.07	0.94	0.67, 1.30	-0.18	0.84	0.60, 1.16
MDD severity	1.22 **	3.37	2.25, 5.05	0.41	1.50	0.83, 2.72
Interaction model						
TS	-0.09	0.91	0.65, 1.28	-0.06	0.94	0.62, 1.44
MDD severity	1.22 **	3.40	2.25, 5.15	0.39	1.47	0.81, 2.67
TS × MDD severity	0.16	1.18	0.81, 1.71	-0.28	0.75	0.43, 1.32
Main effects model						
NSC	-0.16	0.85	0.61, 1.19	-0.35 *	0.71	0.51, 0.98
MDD severity	1.23 **	3.42	2.28, 5.12	0.37	1.45	0.80, 2.63
Interaction model						
NSC	-0.17	0.85	0.60, 1.20	-0.34	0.71	0.46, 1.10
MDD severity	1.23 **	3.42	2.28, 5.14	0.37	1.45	0.78, 2.67
NSC × MDD severity	0.05	1.05	0.70, 1.57	-0.03	0.97	0.54, 1.75
Main effects model						
CE	-0.10	0.90	0.54, 1.51	0.08	1.08	0.66, 1.77
MDD severity	1.24 **	3.46	2.31, 5.19	0.36	1.43	0.79, 2.56
Interaction model						
CE	-0.27	0.77	0.40, 1.46	-0.08	0.93	0.40, 2.16

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}
MDD severity	1.36**	3.90	2.45, 6.21	0.40	1.48	0.79, 2.80
CE × MDD severity	0.63	1.89	0.77, 4.63	0.21	1.24	0.39, 3.95

Note. Results are pooled estimates across 50 multiply imputed datasets. Models controlled for demographics, substance use, and recovery high school attendance (when assessing school connectedness). *b* = unstandardized logit coefficient; *RRR* = relative risk ratio; *CI*_{RRR} = confidence interval around relative risk ratio; MDD = major depression disorder; PPI = positive peer interactions; SS = safety support; TS = teacher support; NSC = neighborhood social connection; CE = community engagement.

*
p < .05,

**
p < .01.

Table 3

Results of Multinomial Regression Models Testing the Interactions Between Disordered Eating and Connectedness Measures

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}
Main effects						
PPI	0.10	1.11	0.80, 1.55	-0.38 *	0.68	0.49, 0.95
Disordered eating	0.49	1.63	0.70, 3.77	0.88 *	2.41	1.16, 5.05
Interaction model						
PPI	0.14	1.16	0.80, 1.67	-0.25	0.78	0.52, 1.17
Disordered eating	0.55	1.74	0.72, 4.19	0.89 *	2.42	1.15, 5.10
PPI × Disordered eating	-0.29	0.74	0.32, 1.76	-0.32	0.73	0.36, 1.45
Main effects						
SS	-0.15	0.86	0.59, 1.25	-0.49 **	0.62	0.43, 0.88
Disordered eating	0.51	1.67	0.72, 3.87	0.81 *	2.24	1.07, 4.71
Interaction model						
SS	-0.11	0.89	0.59, 1.35	-0.47 *	0.62	0.40, 0.97
Disordered eating	0.59	1.80	0.73, 4.40	0.80 *	2.22	1.05, 4.67
SS × Disordered eating	-0.29	0.74	0.26, 2.18	-0.02	0.98	0.49, 1.99
Main effects model						
TS	-0.08	0.92	0.66, 1.28	-0.24	0.79	0.56, 1.11
Disordered eating	0.52	1.68	0.72, 3.90	0.89 *	2.43	1.16, 5.07
Interaction model						
TS	-0.16	0.85	0.59, 1.23	-0.11	0.89	0.58, 1.37
Disordered eating	0.47	1.59	0.68, 3.76	0.89 *	2.44	1.16, 5.14
TS × Disordered eating	0.38	1.46	0.62, 3.40	-0.36	0.70	0.34, 1.42
Main effects model						
NSC	-0.18	0.84	0.60, 1.17	-0.40 *	0.67	0.48, 0.94
Disordered eating	0.54	1.72	0.74, 4.01	0.93 *	2.53	1.21, 5.28
Interaction model						
NSC	-0.28	0.75	0.52, 1.10	-0.03	0.97	0.64, 1.47
Disordered eating	0.40	1.48	0.60, 3.70	0.93 *	2.52	1.15, 5.52
NSC × Disordered eating	0.49	1.64	0.66, 4.06	-1.25 **	0.29	0.12, 0.69
Main effects model						
CE	-0.13	0.88	0.52, 1.48	-0.03	0.97	0.58, 1.62
Disordered eating	0.52	1.68	0.72, 3.90	0.83 *	2.30	1.10, 4.79
Interaction model						
CE	-0.14	0.87	0.47, 1.61	0.13	1.14	0.58, 2.27

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{<i>RRR</i>}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{<i>RRR</i>}
Disordered eating	0.53	1.69	0.72, 4.00	0.86*	2.35	1.12, 4.92
CE × Disordered eating	-0.02	0.98	0.31, 3.05	-0.33	0.72	0.26, 1.96

Note. Results are pooled estimates across 50 multiply imputed datasets. Models controlled for demographics, substance use, depression severity, and recovery high school attendance (when assessing school connectedness). *b* = unstandardized logit coefficient; *RRR* = relative risk ratio; *CI*_{*RRR*} = confidence interval around relative risk ratio; PPI = positive peer interactions; SS = safety support; TS = teacher support; NSC = neighborhood social connection; CE = community engagement.

*
p < .05,

**
p < .01.

Table 4
Results of Multinomial Regression Models Testing the Interactions Between Panic Disorder and Connectedness Measures

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}
Main effects						
PPI	0.08	1.08	0.77, 1.52	-0.36 *	0.70	0.50, 0.96
Panic disorder	0.86 *	2.36	1.14, 4.90	0.34	1.40	0.72, 2.73
Interaction model						
PPI	-0.02	0.98	0.65, 1.48	-0.17	0.84	0.52, 1.35
Panic disorder	0.82 *	2.27	1.09, 4.76	0.35	1.42	0.72, 2.77
PPI × Panic disorder	0.26	1.29	0.63, 2.64	-0.36	0.70	0.37, 1.33
Main effects						
SS	-0.09	0.92	0.63, 1.34	-0.49 *	0.61	0.43, 0.87
Panic disorder	0.85 *	2.33	1.12, 4.85	0.21	1.23	0.63, 2.40
Interaction model						
SS	-0.05	0.95	0.61, 1.48	-0.36	0.70	0.44, 1.10
Panic disorder	0.86 *	2.36	1.13, 4.92	0.13	1.14	0.58, 2.26
SS × Panic disorder	-0.24	0.78	0.33, 1.83	-0.29	0.75	0.38, 1.48
Main effects model						
TS	-0.08	0.92	0.66, 1.28	-0.18	0.84	0.60, 1.16
Panic disorder	0.88 *	2.41	1.16, 5.00	0.29	1.33	0.69, 2.57
Interaction model						
TS	-0.18	0.83	0.55, 1.25	-0.04	0.96	0.60, 1.52
Panic disorder	0.87 *	2.39	1.15, 4.96	0.27	1.30	0.67, 2.53
TS × Panic disorder	0.26	1.30	0.65, 2.62	-0.28	0.75	0.39, 1.45
Main effects model						
NSC	-0.18	0.83	0.59, 1.18	-0.33 *	0.72	0.52, 0.99
Panic disorder	0.85 *	2.34	1.13, 4.83	0.31	1.37	0.71, 2.64
Interaction model						
NSC	-0.27	0.77	0.49, 1.19	-0.13	0.88	0.53, 1.44
Panic disorder	0.84 *	2.32	1.11, 4.82	0.27	1.32	0.68, 2.56
NSC × Panic disorder	0.18	1.19	0.59, 2.42	-0.37	0.69	0.35, 1.35
Main effects model						
CE	-0.16	0.85	0.50, 1.44	0.05	1.05	0.64, 1.72
Panic disorder	0.85 *	2.35	1.14, 4.86	0.32	1.37	0.72, 2.64
Interaction model						
CE	-0.29	0.75	0.36, 1.53	0.45	1.56	0.72, 3.41

	Ideation only vs. Non-suicidal			Prior attempt vs. Ideation only		
	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}	<i>b</i>	<i>RRR</i>	95% <i>CI</i> _{RRR}
Panic disorder	0.86 *	2.36	1.13, 4.93	0.34	1.40	0.73, 2.69
CE × Panic disorder	0.21	1.23	0.43, 3.53	-0.65	0.52	0.19, 1.40

Note. Results are pooled estimates across 50 multiply imputed datasets. Models controlled for demographics, substance use, depression severity, and recovery high school attendance (when assessing school connectedness). *b* = unstandardized logit coefficient; *RRR* = relative risk ratio; *CI*_{RRR} = confidence interval around relative risk ratio; PPI = positive peer interactions; SS = safety support; TS = teacher support; NSC = neighborhood social connection; CE = community engagement.

*
p < .05,

**
p < .01.