Protective Associations of School Connectedness With Risk of Depression in Nova Scotia Adolescents

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Objective: To determine whether school connectedness demonstrated an independent protective association with risk of depression in students in grades 10 to 12 attending a high school in a rural community in southwestern Nova Scotia.

Methods: Students at a high school in rural Nova Scotia participated in a self-completion survey in May 2009. Students were asked about a wide range of health-related factors to determine their needs for health services and promotion. Examining girls and boys separately, we used logistic regression to examine associations of an established measure of school connectedness with risk of depression as measured by the 12-item Center for Epidemiologic Studies Depression (CES-D) Scale, while including numerous potential confounding variables in our models.

Results: The response rate was 95.2% among registered students present in class during the survey. Four hundred eight students (216 girls and 192 boys) completed both the CES-D12 and the School Connectedness Scale. Higher school connectedness was independently protective of risk of depression in girls (OR 0.85; 95% CI 0.78 to 0.93, P < 0.01) and in boys (OR 0.81; 95% CI 0.71 to 0.91, P < 0.01).

Conclusions: Among adolescents in rural Nova Scotia, higher school connectedness has protective associations with risk of depression in both girls and boys, independent of a wide range of factors known to be associated with depression in adolescents. School may be a key place for helping adolescents to develop positive mental health.

Objective : Déterminer si le sentiment d’appartenance à l’école a démontré une association protectrice indépendante avec le risque de dépression chez les élèves de la 10e à la 12e année fréquentant une école secondaire dans une communauté rurale du sud-ouest de la Nouvelle-Écosse.

Méthodes : Les élèves d’une école secondaire d’un secteur rural de la Nouvelle-Écosse ont participé à un sondage auto-déclaré en mai 2009. Les élèves ont répondu à des questions sur une vaste série de facteurs liés à la santé afin de déterminer leurs besoins en matière de services de santé et de promotion de la santé. Examinant séparément les réponses des filles et des garçons, nous avons utilisé la régression logistique pour examiner les associations d’une mesure établie du sentiment d’appartenance à l’école avec le risque de dépression tel qu’il est mesuré par l’échelle de dépression en 12 items du centre d’études épidémiologiques (CES-D), en incluant dans nos modèles de nombreuses variables potentielles de confusion.

Résultats : Le taux de réponse était de 95,2 % chez les élèves inscrits présents en classe durant le sondage. Quatre cent huit élèves (216 filles et 192 garçons) ont répondu à la CES-D12 et à l’échelle du sentiment d’appartenance à l’école. Un sentiment d’appartenance à l’école élevé était indépendamment protecteur du risque de dépression chez les filles (RC 0,85; IC à 95 % 0,78 à 0,93, P < 0,01) et les garçons (RC 0,81; IC à 95 % 0,71 à 0,91, P < 0,01).

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Conclusions: Chez les adolescents d’un secteur rural de la Nouvelle-Écosse, un sentiment d’appartenance à l’école élevé a des associations protectrices avec le risque de dépression chez les filles et les garçons, indépendamment d’une vaste série de facteurs réputés être associés à la dépression chez les adolescents. L’école peut être un endroit clé pour aider les adolescents à développer une bonne santé mentale.

A dolescence is a period that often involves changes in behaviour and psychology that can put young people at risk, including risks related to sexual activity, substance use, and depression, all of which are interrelated. During this period, adolescents spend much of their time in school, and school is felt to play a substantial role in whether they are at risk for, or protected from, various negative health and social outcomes.

School connectedness is viewed as whether students feel accepted, respected, included, and supported by others at school. It also involves students’ beliefs that adults in the school care about their learning. School connectedness becomes more important to adolescents as they begin to rely more on others in their social environment and less on those in their family environment. Students experiencing a weak connection with their school are known to be at an increased risk of engaging in various risk behaviours, including poor self-rated health, early debut of sexual intercourse and multiple sexual risk behaviours, suicidal behaviours, weapons violence, and substance use, as well as having negative psychological and academic outcomes.

There is a limited amount of research examining associations of school connectedness and depression. However, the existing literature suggests that higher school connectedness is protective of depressive outcomes. Among the first research that examined such associations was a large cross-sectional study of US students in grades 7 to 12, which found that higher school connectedness was associated with less emotional distress and suicidality. A longitudinal study of over 2000 students in 3 Australian states showed that lower school connectedness predicted depressive symptoms after 1 year in both boys and girls, while another large study in the state of Victoria, Australia, found that participants with low school connectedness, but good social connectedness at baseline (Grade 8), were at an elevated risk of anxiety or depressive symptoms 2 years later (Grade 10). However, these studies controlled for very few factors known to be associated with depression, and no study examining school connectedness and depression in Canadian adolescents has, to our knowledge, been carried out. It is important to assess the effects of school connectedness within different cultures, as culture has a strong influence on psychological development, values, behaviours, and personal relationships. Examining these relationships is essential, as school is where young people spend most of their time, and there are ways in which their feelings of connectedness to school could be increased through appropriate intervention.

Many factors are known to be associated with depression in adolescents. Those who are doing poorly academically have been shown to be at risk of depression. Teenagers with an increased likelihood of engaging in alcohol and (or) other substance use behaviours than teenagers without depression, and depression predicts later heavier use of alcohol and but not of marijuana. Adolescents who live in single-parent homes are more likely to be depressed, as are those who have poorer relationships with their parents, and adolescents from families of lower socioeconomic status. Adolescents with higher levels of measures of religiosity, for example, frequency of attendance at religious services and personal importance of religion, are less likely to be at risk for depression, and those who indicate having a sexual minority sexual orientation are more likely to be depressed.

Our study aimed to determine whether school connectedness demonstrated an independent protective association with risk of depression in students in grades 10 to 12 attending a high school in a rural community in southwestern Nova Scotia.

Clinical Implications

- Interventions to increase school connectedness provide a potential avenue of intervention to assist adolescents with their mental health. Such avenues should be considered by psychiatrists and other health professionals who work in school settings.
- Assessment of young people’s feelings of being connected to their school may be an important consideration for certain situations, such as discharging adolescents with depression from hospital.
- Educational policies that enhance school connectedness may have a role in primary prevention of depression in adolescents.

Limitations

- We used cross-sectional, self-reported survey data, which may be subject to reporting bias.
- The sample came from a single school in rural Nova Scotia, which may limit generalizability.

Method

Setting and Participants

Students in grades 10 to 12 attending a high school in Yarmouth, Nova Scotia, were asked to participate in a survey examining a range of background information, risk behaviours, and health outcomes in support of plans for community-based interventions to enhance adolescent health. Yarmouth is a rural seaside community of just over 7000 citizens in southwest Nova Scotia with levels of income and education that are somewhat below those found in Nova Scotia overall. The population is largely English speaking and Caucasian.
Survey Administration
All students present in class on the day of the survey in May 2009 were administered a confidential self-completion survey during a standard length (1 hour) class. Administration of the survey was overseen by teachers who had been trained by the research team 1 week before the survey was carried out. Students’ parents were informed in advance by mail about the survey, providing an opportunity for them to seek clarification about the survey’s purpose and contents from the research team, but active parental consent for their child(ren) to participate was not sought. Students provided written indication of informed consent prior to completing the survey.

Teachers were instructed not to approach students’ desks as they completed surveys, but to answer questions from their own desks. Research team members were present to address student concerns and questions that arose during the survey. The survey protocol and its administration were approved by the Dalhousie University Health Sciences Research Ethics Board.

Measures
All measures used in the survey had been pretested at another school in the same area of the province and had demonstrated acceptable internal consistency as measured by Cronbach alpha and test–retest reliability as measured by correlation coefficients or by Cohen kappa.

The outcome variable was risk of depression, which was measured using the 12-item version of the Center for Epidemiologic Studies Depression (CES-D) Scale, ranging from 0 to 36, with a score of 12 or more indicating a moderate to high risk of depression, a cut point that has been validated for use in Canadian adolescents. The Cronbach alpha for the CES-D12 was 0.81.

The independent variable was perceived quality of connectedness with school (scale score ranging from 6 to 30 with a higher score indicating greater school connectedness). This measure was based on a scale from the National Longitudinal Study of Adolescent Health, which was designed to explore the determinants of health and health-related behaviours among American adolescents. The School Connectedness Scale asks students how strongly they agree or disagree with statements about whether teachers treat students fairly; whether teachers care about them; whether they feel close to people at school; whether they feel like part of their school; whether they feel happy to be at school; and whether they feel safe at school. This scale had a Cronbach alpha of 0.76.

In the survey, we also asked about factors that have previously been shown to be associated with depression in adolescence. These covariates included the following: students’ living situation (living with both parents, compared with having another living arrangement); perceived family wealth (above average wealth, compared with average or below average wealth); a maternal relationship scale derived from 2 statements, with item scores ranging from 1 to 3 (with a higher score meaning a stronger relationship and phrased: “Most of the time my mother is warm and loving towards me,” and, “Overall, I am satisfied with my relationship with my mother,” rated “not true,” “somewhat true” and “very true”); students’ average school mark obtained on their last report card of 70% or more, compared with 69% or less; and being a regular heavy substance user (not consuming 5 or more drinks at 1 sitting on 3 or more occasions within the 30 days previous to the survey and not using marijuana on more than 3 occasions within the previous 30 days), compared with 1 or both of these behaviours; frequency of religious attendance (measured as a response to 1 of 4 items with the options of “never,” “a few times a year,” “at least once a month,” and “at least once a week” and dichotomised as never or a few times a year, compared with at least once a month or at least once a week); and sexual orientation (reported as being completely heterosexual, compared with mostly heterosexual, bisexual, mostly homosexual, completely homosexual, or unsure).

Statistical Analysis
In our analyses, we included students who had responded to all of the CES-D items and all of the School Connectedness Scale items. Analyses were carried out separately by sex, as males and females are known to be susceptible to distinct risk factors for depression. First, we examined the independent variable and the covariates by sex, testing continuous variables using Student t tests for independent samples and categorical variables using the chi-square statistic. Then we carried out unadjusted simple logistic regressions of the independent variable and covariates for the outcome risk of depression. We then constructed adjusted logistic regression models including all of the covariates, while also controlling for the age of respondents, for associations with risk of depression. Hosmer–Lemeshow goodness of fit tests were performed for both multivariate models. All analyses were carried out using SPSS Version 17.0.

Results
Descriptive Statistics
Among 455 students present in class during the survey, 433 (95.2%) participated. Four hundred and eight responded to both the CES-D12 and the 6-item School Connectedness Scale; 216 of the respondents were girls (52.9%) and 192 were boys (47.1%). Overall, 28.9% were at moderate to high risk of depression. As seen in Table 1, girls were younger than boys, more often reported no regular heavy substance use, and less often reported a completely heterosexual orientation than boys. Girls also more often reported symptoms of being at moderate to high risk of depression than boys (36.1%, compared with 20.8%, respectively, $P = 0.001$). Girls and boys did not differ in mean School Connectedness Scale scores.

Unadjusted Analyses
In the unadjusted logistic regressions, girls (Table 2) were less likely to have reported symptoms of being at moderate to high risk of depression if they were living with both parents, if they had a stronger maternal relationship, if they indicated more frequent attendance at religious services,
Table 1 Characteristics of the sample by sex

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Males</th>
<th>Females</th>
<th>Statistical test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, range 15 to 19 years, mean (SD)</td>
<td>16.70</td>
<td>16.4</td>
<td>( t = 2.77, df = 406, P = 0.006 )</td>
</tr>
<tr>
<td>Living with both parents, %</td>
<td>49.5</td>
<td>49.5</td>
<td>( \chi^2 = 0.000, df = 1, P = 0.99 )</td>
</tr>
<tr>
<td>Above average perceived family wealth, %</td>
<td>32.8</td>
<td>18.5</td>
<td>( \chi^2 = 11.01, df = 1, P = 0.001 )</td>
</tr>
<tr>
<td>Maternal relationship, score range 2 to 6, mean (SD)</td>
<td>5.1 (1.2)</td>
<td>4.9 (1.4)</td>
<td>( t = 1.21, df = 396, P = 0.23 )</td>
</tr>
<tr>
<td>School mark of ≥70%, %</td>
<td>74.9</td>
<td>82.0</td>
<td>( \chi^2 = 3.00, df = 1, P = 0.08 )</td>
</tr>
<tr>
<td>Not a regular heavy substance user, %</td>
<td>65.2</td>
<td>80.9</td>
<td>( \chi^2 = 12.88, df = 1, P &lt; 0.001 )</td>
</tr>
<tr>
<td>More frequent religious service attendance, %</td>
<td>19.3</td>
<td>31.0</td>
<td>( \chi^2 = 7.39, df = 1, P = 0.007 )</td>
</tr>
<tr>
<td>Totally heterosexual orientation, %</td>
<td>89.4</td>
<td>81.3</td>
<td>( \chi^2 = 5.21, df = 1, P = 0.02 )</td>
</tr>
<tr>
<td>School connectedness, score range 6 to 30, mean (SD)</td>
<td>20.7 (3.8)</td>
<td>21.0 (3.9)</td>
<td>( t = 0.66, df = 406, P = 0.51 )</td>
</tr>
<tr>
<td>At moderate to high risk of depression, %</td>
<td>20.8</td>
<td>36.1</td>
<td>( \chi^2 = 11.54, df = 1, P = 0.001 )</td>
</tr>
</tbody>
</table>

Table 2 Unadjusted and adjusted associations of predictor variables with risk of depression in females

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>P</th>
<th>AOR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.02 (0.77 to 1.37)</td>
<td>0.88</td>
<td>0.97 (0.68 to 1.39)</td>
<td>0.88</td>
</tr>
<tr>
<td>Living with both parents</td>
<td>0.50 (0.28 to 0.87)</td>
<td>0.01</td>
<td>0.95 (0.46 to 1.64)</td>
<td>0.88</td>
</tr>
<tr>
<td>Above average perceived family wealth</td>
<td>0.82 (0.40 to 1.71)</td>
<td>0.60</td>
<td>1.37 (0.54 to 3.49)</td>
<td>0.51</td>
</tr>
<tr>
<td>Maternal relationship</td>
<td>0.55 (0.44 to 0.69)</td>
<td>&lt;0.001</td>
<td>0.54 (0.42 to 0.70)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>School mark of ≥70%</td>
<td>0.42 (0.21 to 0.86)</td>
<td>0.42</td>
<td>0.63 (0.26 to 1.53)</td>
<td>0.31</td>
</tr>
<tr>
<td>Not a regular heavy substance user</td>
<td>0.74 (0.37 to 1.49)</td>
<td>0.40</td>
<td>0.84 (0.35 to 2.06)</td>
<td>0.71</td>
</tr>
<tr>
<td>More frequent religious service</td>
<td>0.31 (0.16 to 0.62)</td>
<td>0.001</td>
<td>0.33 (0.14 to 0.78)</td>
<td>0.01</td>
</tr>
<tr>
<td>orientation</td>
<td>0.33 (0.10 to 0.67)</td>
<td>0.002</td>
<td>0.45 (0.19 to 1.05)</td>
<td>0.07</td>
</tr>
<tr>
<td>School connectedness</td>
<td>0.85 (0.78 to 0.92)</td>
<td>&lt;0.001</td>
<td>0.85 (0.78 to 0.93)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

and if they reported a totally heterosexual orientation. Girls who reported a higher level of school connectedness were significantly less likely to have reported symptoms that placed them at moderate to high risk of depression (OR 0.85; 95% CI 0.78 to 0.92).

Also in unadjusted analysis, boys (Table 3) were less likely to have reported depressive symptoms if they had a stronger maternal relationship, and if they reported a totally heterosexual orientation. As with girls, boys who reported a higher level of school connectedness were less likely to have reported symptoms placing them at moderate to high risk of depression (OR 0.77; 95% CI 0.69 to 0.86).

Adjusted Analyses

Among girls (Table 2), while controlling for respondent age, reporting a stronger maternal relationship remained protective of risk of depression (OR 0.54; 95% CI 0.42 to 0.70); living with both parents and being heterosexual were no longer significantly protective, though the latter was marginally so (\( P = 0.07 \)). More religious service attendance remained protective (OR 0.33; 95% CI 0.14 to 0.78). Higher school connectedness was independently protective of risk of depression (OR 0.85; 95% CI 0.78 to 0.93).

For boys (Table 3), having a stronger maternal relationship did not remain associated with risk of depression, while reporting a completely heterosexual orientation remained protective (OR 0.24; 95% CI 0.07 to 0.78). As with girls, higher school connectedness was independently protective of risk of depression (OR 0.81; 95% CI 0.72 to 0.91).

Discussion

Our study of adolescents attending school in a rural Nova Scotia community found that overall, 28.9% were at moderate to high risk of depression, similar to the proportion observed in a large epidemiologic study of Nova Scotia adolescents. We found independent protective associations of a measure of school connectedness with moderate to high risk of depression as assessed by the CES-D12, a measure that has been validated for assessment of adolescents in Atlantic Canada. These protective associations were similar in girls and boys. Not reporting oneself as totally heterosexual was also a risk factor for depression for boys and was marginally associated with risk of depression for girls. For girls, having a stronger maternal relationship and more frequent religious service attendance also were protective for risk of depression.

Few other studies have examined these associations, and to our knowledge this is the first Canadian study that has done so. Our findings support previous work, and though our study is small by comparison, it includes

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more variables that could confound the relation between risk of depression and school connectedness. A large American cross-sectional study\(^9\) showed strong protective effects of school connectedness on emotional distress as measured by a 17-item scale that included symptoms of depression, while controlling for demographic, but not other factors. School connectedness in that study\(^{10}\) was measured by a scale containing 5 of the 6 items used in our study. The first prospective study\(^{11}\) of association between school connectedness and risk of depression took place in over 2000 adolescents, aged 12 to 14 years, followed over a 1-year period. It showed that baseline low school connectedness, as measured by the 18-item Psychological School Membership Scale,\(^{6}\) was associated with depressive symptoms, as measured by the Children’s Depression Inventory\(^{40}\) after 1 year for both sexes, but there was no attempt in this study to control for variables that might confound such relations. Another study\(^{13}\) of more than 2500 students followed from grades 8 to 10 found that students with the lowest school connectedness at baseline, as measured by a 20-item School Connectedness Scale, were more likely to be depressed or anxious 2 years later. This study\(^{13}\) controlled for family structure, sex, interpersonal conflict, and substance use. Our study controls for a wider range of potential confounders, including religiosity, heavy substance use, sexual orientation, maternal relationship quality, and academic performance, providing further evidence of an independent protective association of school connectedness for risk of depression in adolescents in a Canadian context.

The school environment’s ability to develop a sense of connectedness or belonging in its students has promising implications for the mental health of adolescents, especially as modifiable factors that have the potential to increase school connectedness in students have been identified. A recent review\(^{40}\) of the literature concluded that 4 school-related factors contributed to school connectedness: organizational structure (for example, smaller schools and smaller class sizes); functional aspects of schools (for example, fair and clear disciplinary expectations and increased parental involvement in school); the school’s built environment (for example, well maintained facilities and interesting architecture); and, interpersonal support (for example, positive relationships among students and staff). One intervention study\(^{41}\) in elementary schools in Seattle, Washington, showed that teacher training in classroom management to enhance school bonding, parent training to promote family and school bonding, and student training in social competence positively affected students’ attitudes toward school and increased levels of measures of school attachment. Such research indicates that school-related factors are amenable to change through actions that can be implemented by schools themselves. Taken together with findings of protective associations of feelings of school connectedness for risk of depression, this provides evidence that developing conditions that enhance school connectedness could improve the mental health of students.

Our study has limitations, including the students being from a single school in rural Nova Scotia, which may limit its generalizability; its reliance on self-report, which may bias findings; and, its relatively small sample size. The cross-sectional nature of the study also does not allow for causality to be assessed, and low school connectedness may well be a result of anhedonia of depression rather than a cause of depressive symptoms. Further research, preferably longitudinal in nature, is indicated to establish whether school connectedness has similar associations with risk of depression in other settings in Canada.

**Conclusions**

Despite the small numbers of participants in our study, we were able to demonstrate independent associations of school connectedness with being at risk for depression. We conclude that school connectedness, which, in our study and in others, has shown associations with adolescents’ risk of depression, provides a potential avenue of intervention to assist adolescents with their mental health. Such avenues should be considered by psychiatrists and other health professionals who work in school environments. Our findings may also have policy implications in terms of education programs and the primary prevention of depression in adolescents.

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**Table 3 Unadjusted and adjusted associations of predictor variables with risk for depression in males**

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>P</th>
<th>AOR OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.24 (0.86 to 1.80)</td>
<td>0.26</td>
<td>1.24 (0.77 to 2.00)</td>
<td>0.31</td>
</tr>
<tr>
<td>Living with both parents</td>
<td>0.91 (0.45 to 1.82)</td>
<td>0.78</td>
<td>1.58 (0.66 to 3.79)</td>
<td>0.34</td>
</tr>
<tr>
<td>Above average perceived family wealth</td>
<td>0.62 (0.28 to 1.37)</td>
<td>0.24</td>
<td>0.66 (0.26 to 1.71)</td>
<td>0.29</td>
</tr>
<tr>
<td>Maternal relationship</td>
<td>0.68 (0.50 to 0.91)</td>
<td>0.009</td>
<td>0.82 (0.57 to 1.18)</td>
<td>0.31</td>
</tr>
<tr>
<td>School mark of ≥70%</td>
<td>0.49 (0.23 to 1.05)</td>
<td>0.06</td>
<td>0.66 (0.26 to 1.70)</td>
<td>0.39</td>
</tr>
<tr>
<td>Not a regular heavy substance user</td>
<td>0.71 (0.35 to 1.47)</td>
<td>0.36</td>
<td>0.65 (0.26 to 1.63)</td>
<td>0.36</td>
</tr>
<tr>
<td>More frequent religious service attendance</td>
<td>0.54 (0.19 to 1.48)</td>
<td>0.22</td>
<td>0.79 (0.21 to 2.98)</td>
<td>0.72</td>
</tr>
<tr>
<td>Totally heterosexual orientation</td>
<td>0.21 (0.08 to 0.54)</td>
<td>0.007</td>
<td>0.24 (0.07 to 0.78)</td>
<td>0.02</td>
</tr>
<tr>
<td>School connectedness</td>
<td>0.77 (0.69 to 0.86)</td>
<td>&lt;0.001</td>
<td>0.81 (0.72 to 0.91)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Acknowledgements
We thank the Nova Scotia Health Research Foundation for its support (File 20064113). We also thank Ms Doris Landry for her facilitation of our work in Yarmouth through South West Health Public Health Services, and Mr Brent Jamieson, Principal of Yarmouth Consolidated Memorial High School and the staff and students at the school for making our work possible.

References