

School Connectedness and Suicidal Thoughts and Behaviors: A Systematic Meta-Analysis

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Among the protective factors associated with reduced risk for suicide, scientific inquiries into school connectedness are especially important considering that schools are ideally situated to provide interventions reaching the vast majority of youth. Although there is a wealth of research that supports the association between school connectedness and reduced self-report of adolescents having a suicidal thought or making a suicide attempt, inconsistencies in the way studies have measured and operationalized school connectedness limit synthesis across findings. This meta-analytic study investigates the literature exploring associations between school connectedness and suicidal thoughts and behaviors across general and subpopulations (high risk and sexual minority youth) using a random effects model. Eligible studies examined a measure of school connectedness explicitly referred to as “school connectedness” or “connections at school” in relation to suicidal ideation or suicide attempts among youth enrolled in school (Grades 6–12). Multiple metaregression analyses were conducted to explore the influence of school connectedness measurement variation, as well as participant characteristics. Results, including 16 samples, support that higher school connectedness is associated with reduced reports of suicidal thoughts and behaviors across general (odds ratio [*OR*] = 0.536), high-risk (*OR* = 0.603), and sexual minority (*OR* = 0.608) adolescents. Findings are consistent when analyzed separately for suicidal ideation (*OR* = 0.529) and suicide attempts (*OR* = 0.589) and remain stable when accounting for measurement variability. Although limited by its cross-sectional nature, findings support recent calls to increase school connectedness and proffer important implications for screening and intervention efforts conducted in schools.

Impact and Implications

Suicide remains a critically important public health concern among adolescents. The protective role of school connectedness against suicidal thoughts and behaviors is widely supported in the literature; however, this literature base is fragmented, varying across measures and samples. By accounting for variability across studies, this meta-analytic study reinforces the importance of enhancing school connectedness for suicide prevention and provides school psychologists with practical recommendations for screening and prevention efforts.

Keywords: school connectedness, suicide, adolescent, meta-analysis, sexual minority

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Suicide remains a significant public health concern, globally accounting for 8.5% of deaths among adolescents and young adults between ages 15 to 29 (World Health Organization, 2016). Considering the critical importance of suicide prevention, a large body of literature has investigated the influence of protective factors against suicidal thoughts and behaviors (STB) during adolescence. In recent years, the idea that perceived connectedness may serve as a protective factor against STB during adolescence has garnered considerable attention. Scientific inquiries have focused on adolescent connectedness to parents, family, peers, school, and communities in relation to a wide range of health behavior outcomes (Barber & Schluterman, 2008). Understanding the influence of school connectedness on STB is especially important given the critical role schools play in adolescent development and because schools are ideally situated to provide interventions reaching the vast majority of youth.

A rich literature base supports an inverse relationship between adolescent school connectedness and STB (e.g., Whitlock, Wyman, & Moore, 2014). Synthesis of these findings, however, is limited by inconsistencies in the way studies have measured and operationalized school connectedness and the wide variability of participant sample characteristics included in studies. This fragmentation limits our understanding of the practical, theoretical, and scientific implications of school connectedness as a protective factor against STB. For example, are there particular categories of school connectedness that school psychologists should prioritize over others? Are there critical subpopulations that school psychologists and researchers should target their intervention efforts toward in order to prevent STB? The meta-analytic study presented here, which elucidates the influence of measurement and sample variation on the association between school connectedness and STB, will help answer these questions.

School Connectedness: Definition and Measurement

One of the most widely accepted definitions of school connectedness was initiated by the Wingspread declaration on school connections (Blum & Libbey, 2004). As described by Waters and Cross (2010), *school connectedness*

may be defined as “the belief by students that adults in the school community care about students’ learning and about them as individuals” (p. 165). In practice, this includes supportive academic expectations, positive teacher–student interactions, and a safe environment. Based on a review of the literature, Barber and Schluterman (2008) operationalized school connectedness to include three distinct components—interpersonal relationships, relationship to the school, and attitudes toward school importance. Taken together, school connectedness may include (a) social affiliations: positive school relationships, feeling cared about and/or respected by adults at school, perceiving availability to interact with adults at school; (b) school belonging: feeling part of the school, feeling safe in school, feeling happy at school; (c) attitude about school importance: caring about school, trying to do one’s best at school; and (d) supportive learning environment: clear and appropriate expectations, perceived fairness.

A wide variety of instruments are available to measure student and staff perceptions of school connectedness, spanning from single-item questions (e.g., “Do you feel like you belong at this school?”) to more complex, multi-item instruments addressing several school connectedness categories. Most of these scales use a unit-weighted approach, averaging equally weighted items together to yield one composite score (Waters & Cross, 2010). One of the first scales to measure school connectedness was the Psychological Sense of School Membership Scale (PSSM; Goodenow, 1993). Although the PSSM was initially designed to yield a single school connectedness construct, factor analyses conducted after its development identified multiple underlying constructs (Lohmeier & Lee, 2011). Thus more recent scales, such as the School Connectedness Scale (Lohmeier & Lee, 2011), have included as many as seven components. The most commonly used instruments, however, yield a unidimensional measure of school connectedness. These include instruments designed to measure multiple constructs with a school connectedness subscale (e.g., the Adolescent Family and Social Life Questionnaire; Yen & Shieh, 2005) and single item queries of school or teacher connectedness (e.g., Seil, Desai, & Smith, 2014). One of the most widely used measures of school connectedness is the 3- to 7-item school connectedness scale developed

for the National Longitudinal Study of Adolescent Health (Add Health; Resnick et al., 1997). The Add Health Scale has demonstrated satisfactory reliability when examined as a five-item construct ($\alpha = .82$ to $.88$; Furlong, O'Brennan, & You, 2011); however, studies that use this scale may include as few as two items. Although the variability across these instruments highlights the richness of the school connectedness literature to date, it also makes the compilation of findings across studies (e.g., meta-analytic analysis) difficult.

School Connectedness and Health Risk Behaviors

Empirical evidence overwhelmingly supports the protective role of school connectedness against risky health behaviors. For example, a systematic literature review including 18 studies (Markham et al., 2010) provided evidence that adolescent school connectedness protects against early and frequent sexual activity. Another systematic review examining emotional health (Kidger, Araya, Donovan, & Gunnell, 2012) demonstrated that teacher support, general school connectedness, and additional components of school environment (i.e., happiness with school, feeling safe at school, feeling close to people at school) have an inverse relationship to negative emotional health and suicidal behavior. Finally, a recent review of connectedness and suicidal outcomes (Whitlock et al., 2014), which identified 10 studies focused on school context, revealed that school connectedness was largely associated with reduced STB. As noted by the researchers, however, two studies that used models accounting for multiple interactions and contexts did not indicate an inverse relationship between school connectedness and STB, suggesting more complex interactions may be at play.

The protective role of school connectedness against STB has also been revealed across more vulnerable groups, such as American Indian youth with a history of sexual abuse (Pharris, Resnick, & Blum, 1997), sexual minority or lesbian, gay, bisexual, and transgendered (LGBT) youth (Duong & Bradshaw, 2014; Whitaker, Shapiro, & Shields, 2016), and students with other risk factors, such as residing in high-risk communities (e.g., Kaminski et al., 2010), experiencing physical or sexual abuse

(e.g., Eisenberg, Ackard, & Resnick, 2007), having been investigated by child welfare (He, Fulginiti, & Finno-Velasquez, 2015), engaging in sexual activity (Stone, Luo, Lippy, & McIntosh, 2015), and experiencing bullying (Cole-Lewis, Gipson, Opperman, Arango, & King, 2016). Although these findings are based on diverse participant samples, they underscore the critical importance of enhancing school connectedness to protect against STB.

Shedding light on how connectedness may protect against STB, Whitlock and colleagues (2014) proposed a model identifying three pathways linking connectedness to STB: (a) intrapersonal responses and processes, encompassing perceived rejection and isolation; (b) collective responsibility and action, supporting more avenues for risk identification; and (c) positive norms and expectations, reinforcing help-seeking behavior and identifies STB risk as problematic. A number of foundational theoretical frameworks support these mechanisms, including ecological systems theory (Bronfenbrenner, 1979) and attachment theory (Ainsworth, 1979).

The Current Study

Adolescents who feel connected to their family, peers, and schools are less likely to engage in health risk behaviors. Although the former forms of connectedness (i.e., family, peers, and communities) may have critical implications for preventing STB, they are largely beyond the control of the school. School connectedness, however, is an important protective factor against STB that does fall within the purview of school psychology. Thus, the primary aim of this meta-analytic investigation is to examine the association between school connectedness and STB.

Although previous reviews have addressed the importance of adolescent connectedness in relation to STB (Whitlock et al., 2014) and additional reviews have explored school connectedness and school environment across a number of health outcomes (Kidger et al., 2012; Markham et al., 2010), the current study is the first to compare pooled effect sizes across studies specifically examining school connectedness in relation to STB. By reviewing findings from cross-sectional and longitudinal studies that examined adolescent (Grades 6–12) school con-

nectedness and STB, findings from this investigation will answer the following questions: (a) What is the strength of association between school connectedness and STB, and (b) How does the magnitude of association differ across varying subpopulations and measures of school connectedness? The primary hypothesis is that high levels of school connectedness will relate to reduced reports of STB across general, high-risk, and sexual minority samples. It is also hypothesized that effect sizes will remain consistent across differing categories of school connectedness.

Method

Literature Search

The systematic search and retrieval process used a standardized review protocol based on [Lipsey and Wilson's \(2001\)](#) meta-analysis guide and recommendations from [Meta-Analysis Reporting Standards \(APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008\)](#). The study aimed to identify and retrieve all empirical studies that examined the relation between school connectedness and suicidal ideation or suicide attempts conducted at any time in any geographical location. We conducted a comprehensive search of PsycINFO, Academic Search Premier, and PubMed from June 15, 2016 to July 24, 2016 using the search terms *school*, *connect**, and *suicid** and searched for studies in [Whitlock and colleagues' \(2014\)](#) review article. We conducted a thorough examination of titles, abstracts, and full articles to assess eligibility of studies. Studies were selected for meta-analysis based on the following eligibility criteria:

1. The study investigated the association between school connectedness and suicidal ideation (SI), suicide attempts (SA), or a combination of SI and SA, referred to as STB.
2. The measure of school connectedness was explicitly referred to as "school connectedness" or "connections at school" and included at least one of the four categories described previously (affiliation, belonging, attitudes, environment).
3. The study was published in English.

4. The sample included youth attending school in Grades 6–12.

We excluded studies that did not directly examine the association between school connectedness and SI, SA, or STB or did not report sufficient data to calculate a measure of effect between the variables of interest (e.g., studies examining school connectedness as a mediating or moderating variable only).

Data Extraction

Two review authors independently extracted and coded data based on a predetermined standardized coding manual. We selected the following moderator variables of interest a priori to test the potential for methodological factors to influence heterogeneity of effect sizes:

1. Region of recruitment (U.S. vs. international);
2. Percent Caucasian/White;
3. Percent female;
4. Timeframe of STB (past 2 weeks, past 12 months, or lifetime); and
5. Categories of school connectedness (social affiliation, school belonging, attitude about importance of school, or supportive learning environment). For each study, a dichotomous (yes/no) code was applied for each category resulting in four moderator variables.

To conduct sensitivity analyses examining effect sizes separately among subsamples, we also coded studies based on the population sampled. After accounting for eligibility criteria, two subsamples with a minimal number of studies to pool effect sizes emerged:

1. Samples described as risky, including students involved in child welfare, reporting feeling isolated or involvement in bullying, residing in high-risk neighborhoods, and reporting being sexually active.
2. Samples described as sexual minority or LGBT youth.

We measured coder consistency for high inference variables (school connectedness categories) with Cohen's kappa (affiliations, $\kappa = 1$; belonging, $\kappa = .842$; attitude, $\kappa = 1$; environment, $\kappa = .842$; [Yeaton & Wortman, 1993](#)).

Disagreements were resolved through discussion until consensus was reached between coders.

Statistical Method

We conducted meta-analyses using Biostat's Comprehensive Meta-analysis (www.meta-analysis.com; Borenstein, Hedges, Higgins, & Rothstein, 2015). A random effects model was selected a priori to account for sampling error and random effects variance (Lipsey & Wilson, 2001). The primary meta-analysis examined the average effect size of associations between school connectedness and any STB, including the mean of SI and SA in samples that included both outcomes or SI or SA in samples that included only one outcome. Two secondary meta-analyses examined associations between school connectedness and SI and SA separately. Sensitivity analyses also examined pooled effect sizes separately across studies investigating school connectedness and STB among high-risk and sexual minority youth. Finally, we examined qualitative findings from studies that reported associations between STB and school influences that were not identified as school connectedness but included overlapping measures with the four categories of school connectedness.

We calculated effect sizes measuring school connectedness and STB from descriptive data, that is, rates of occurrences, means and standard deviations, and inferential statistics, that is, odds ratio (*OR*) and correlation coefficients. For missing raw data necessary to compute effect size, we made a request to researchers for more information; otherwise, we excluded studies with missing data for effect size computation ($k = 1$). We converted final results to *OR* for comparing the association between school connectedness and STB across studies.

Because meta-analysis assumes that each measure of effect is representative of an independent study, we used a protocol to handle studies with more than one effect size and publications reporting on data from the same dataset. We calculated the average of effect sizes when studies reported findings separately across individual items of school connectedness. In the case of multiple publications reporting data from the same study, we prioritized the most recent publications and those that provided suf-

ficient data. When publications used overlapping data sets but reported effects from different subsamples, we selected the most inclusive sample for the primary analysis and analyzed findings for the subsamples of interest separately. When data were presented separately for subgroups (i.e., males and females) within an individual study, we conducted a meta-analysis to compute the combined effect size under a fixed effects model (Borenstein, Hedges, Higgins, & Rothstein, 2009). Finally, we selected effect sizes that reflected cross-sectional findings over longitudinal findings considering the majority of included studies were cross-sectional.

We analyzed homogeneity of effect size distribution with visual inspection of outliers and forest plots, as well as the Q statistic and I^2 (95% confidence interval [CI]) index. Heterogeneity is signaled by a statistically significant Q (Lipsey & Wilson, 2001) and estimated by the I^2 statistic, an index between 0% and 100% (Borenstein et al., 2009), which may be interpreted as low ($I^2 = 25\%$), moderate ($I^2 = 50\%$), or high ($I^2 = 75\%$; Higgins, Thompson, Deeks, & Altman, 2003). To measure level of publication bias, we used a combination of Egger's regression index, the funnel plot, Duval and Tweedie's trim and fill, and Rosenthal's fail-safe N .

The study conducted statistical tests of 8 moderators (region of recruitment, percent Caucasian/White, percent female, STB timeframe, and the school connectedness categories of affiliation, belonging, attitude, and environment) with weighted regression analysis (metaregression) and analog to analysis of variance (ANOVA) using a mixed effects model. We used ANOVA analog to investigate potential effect size differences across studies based on STB timeframe and region. We also conducted two multiple metaregression analyses: The first model included percent Caucasian/White and percent female as moderator variables and the second model included dichotomous variables (yes/no) representing the four categories of school connectedness (affiliation, belonging, attitude, and environment). We contacted authors for more information if specific items measuring school connectedness were not reported. Case analysis for studies with missing data for moderator variables was used.

Results

Search Results

The study identified a total of 1,169 titles via the bibliographic databases PsycINFO, Academic Search Premier, and Pubmed (see supplementary Figure S1 for PRISMA-style flow-chart). We reviewed 47 articles in full for eligibility, of which 23 were excluded from the quantitative synthesis. We maintained four of these studies in the qualitative synthesis because they did not identify the measure of interest as “school connectedness” but included items similar to school connectedness. A total of 20 publications and 17 samples met eligibility criteria of which 19 publications and 16 samples with sufficient data to calculate effect sizes were included in this study. Studies examined school connectedness in relation to SI ($k = 12$) and SA ($k = 10$), with a total of 16 samples examining any form of STB (see Table 1). For more information about school connectedness and STB measures see supplementary Table S1.

Primary Analysis

The primary analysis examined STB, including SI, SA, or a combination of SI and SA, across any sample. The analysis included a total of 16 samples, resulting in between 185,088–191,156 participants. The range of participants represents average effect sizes taken from publications that used overlapping samples with varying numbers of participants. Taken together, the studies resulted in a statistically significant mean effect size of odds ratio (OR) = 0.536 (95% CI: 0.460, 0.624), $p < .0001$ and included effect sizes that ranged between $OR = 0.215$ to $OR = 0.811$ (see Figure 1). The heterogeneity of variance analysis was significant, $Q(15) = 515.533$, $p < .0001$, $I^2 = 97.090$, signifying between-study variance. None of the moderator analyses, including multiple metaregression examining differences across school connectedness categories, were significant.

Trim and fill analysis did not recommend the imputation of any studies to reduce bias (see supplementary Figure S2a). Egger’s regression was not significant and Rosenthal’s N indicated a minimum of 4,746 studies to lead to a p value at or above alpha of .05. These findings indicate minimal risk for publication bias.

Secondary Analyses

School connectedness and suicidal ideation.

When meta-analysis was conducted separately with studies examining SI as an outcome, a total of 53,618 participants from 12 samples were included. The studies generated a statistically significant mean effect size of $OR = 0.529$ (95% CI: 0.433, 0.647), $p < .001$ (see Figure 2). The heterogeneity of variance analysis was significant, $Q(11) = 297.882$, $p < .001$, $I^2 = 96.307$, indicating between-study variance. ANOVA analog comparing studies conducted in the US, $OR = 0.618$ (95% CI: 0.520, 0.734), $k = 10$, to those that were conducted internationally, $OR = 0.226$ (95% CI: 0.190, 0.269), $k = 2$, was significant, $Q(1) = 64.339$, $p < .001$; however, the small number of studies conducted internationally precludes drawing definitive conclusions about these differences. None of the additional moderator analyses were significant.

Rosenthal’s N of 2,188 to lead to a p value at or above alpha of .05 and nonsignificant results from Egger’s regression supported minimal risk for publication bias. Trim and fill analysis recommended the imputation of one study resulting in a mean effect size of $OR = 0.505$ (95% CI: 0.409, 0.623) under the random effects model (see supplementary Figure S2b).

School connectedness and suicide attempts.

A total of 10 studies examined school connectedness and SA across any sample, including a total of 57,637 participants. The mean effect size of $OR = 0.589$ (95% CI: 0.493, 0.704), $p < .0001$ was statistically significant (see Figure 3). The heterogeneity of variance analysis was significant, $Q(9) = 198.636$, $p < .0001$, $I^2 = 95.469$, indicating significant between-study variance. The multiple metaregression models were not conducted due to missing data and the presence of collinearity; none of the other moderator analyses were significant.

Trim and fill analysis recommended the imputation of one study to reduce publication bias, resulting in a mean effect size of $OR = 0.627$ (95% CI: 0.525, 0.749) under the random effects model (see supplementary Figure S2c). Minimal risk for publication bias was indicated by a Rosenthal’s N of 1,827 to lead to a p value at or above alpha of .05 and nonsignificant results from Egger’s regression.

Table 1
Summary of Included Studies

Study name, location (years)	Citation	Sample population	n	# of schools	Grade(s)	% Female	% Caucasian/White	STB outcome
Add Health, U.S. (1994–1995)	Kidd et al. (2006)	General	9,142	132	7–12	52.0	65.1	SA
ALSPAC, south-west England (NR)	Russell & Toomey (2013)	General; Sexual minorities	14,738	80	NR	NR	NR	SI
CDC's Let's Connect, Midwest region of U.S. (NR)	Kidger et al. (2015) Cole-Lewis et al. (2016)	General Victims of bullying or students with low connections	2,475 161	NR NR	NR NR	NR 65.8	NR 30.7	SA SI
Govender ^a , KwaZulu-Natal, South Africa (2008)	Govender et al. (2013)	General	209	2	8–10	53.1	0	SI
Iowa Youth Survey, Iowa, US (2010)	Beck-Cross (2012)	General	9,910	307	11	0	88.4	SI; SA
Langille ^a , Canada's Atlantic provinces (Nova Scotia, New Brunswick, and Newfoundland and Labrador) (NR)	Langille et al. (2015)	General	4,365	NR	7, 9, 10, 12	49.2	NR	SI; SA
Linkages, U.S. (2004)	Logan et al. (2011); Logan et al. (2009)	Residing in high risk community with prior abuse	2,598	NR	7, 9	50.6	21.1	SI

(table continues)

Table 1 (*continued*)

Study name, location (years)	Citation	Sample population	<i>n</i>	# of schools	Grade(s)	% Female	% Caucasian/White	STB outcome
Milwaukee YRBS, Milwaukee, Wisconsin, U.S. (2007–2009)	Stone et al. (2015)	Experienced sexual contact; Experienced sexual contact and sexual minorities	2,290 (SD); 1,818 (SA)	NR	NR	47.3 (SD); 49.5 (SA)	NR	SI; SA
Minnesota Student Survey, Minnesota, U.S. (1993)	Neumark-Sztainer et al. (1997)	General	123,132	NR	6, 9, 12	49.9	87.4	STB
National Survey of Child and Adolescent Well-Being, U.S. (2008–2009)	He et al. (2015)	Investigated by child welfare	995	NR	NR	59.9	39.3	SI
New York City YRBS, New York, U.S. (2009)	Duong & Bradshaw (2014)	Sexual minorities	951	105	9–12	69.5	9.4	SA
Ontario Students Drug Use and Health Survey, Ontario, Canada (2009)	Seil et al. (2014)	General	8,910	105	9–12	55.5	16.6	SI; SA
Project for Health of Adolescents in Southern Taiwan, southern Taiwan (2004)	Sampasa-Kanyinga & Hamilton (2016)	General	4,955	198	7–12	49.0	62.5	SI; SA
Taiwan (2004)	Tang et al. (2009)	General	10,233	52	NR	51.0	NR	SA

Table 1 (continued)

Study name, location (years)	Citation	Sample population	<i>n</i>	# of schools	Grade(s)	% Female	% Caucasian/ White	STB outcome
San Francisco Unified School District's, 2011 California Healthy Kids Survey, California, U.S. (2011)	Whitaker et al. (2016)	LGBT	356	NR	NR	53.7	9.6	SI
Student Health and Safety Survey, northeastern U.S. (2004)	Kaminski et al. (2010)	Residing in high risk community	4,131	16	7, 9, 11, 12	51.5	33.6	SI; SA
West of Scotland 11 to 16/16 + Study, Scotland (1999)	Young et al. (2011)	General	1,698	43	NR	NR	NR	SA; STB

Note. Add Health = National Longitudinal Study of Adolescent Health; ALSPAC = Avon Longitudinal Study of Parents and Children; CDC = Centers for Disease Control and Prevention; Linkages = Youth Violence Survey: Linkages Among Different Forms of Violence; LGBT = lesbian, gay, bisexual, and transgender; NR = not reported; SA = suicide attempt; SI = suicidal ideation; STB = suicidal thoughts and behaviors; U.S. = United States; YRBS = Youth Risk Behavior Survey.

^a In the case that no study name was reported, the first author was used to identify the study.

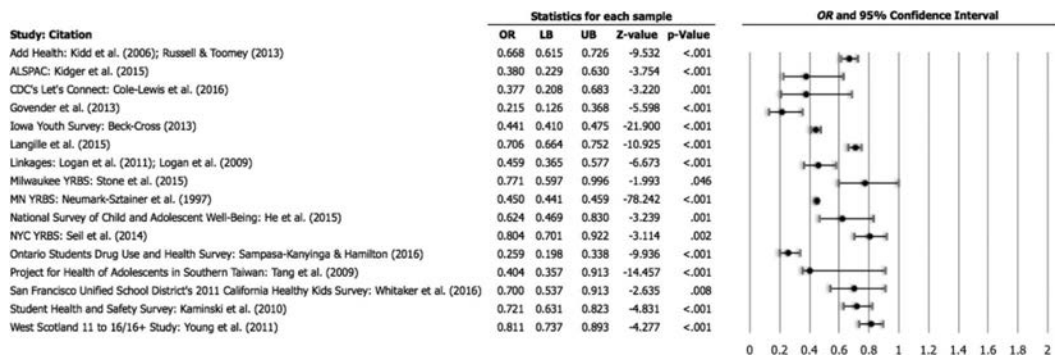


Figure 1. Overview of meta-analysis of school connectedness and suicidal thoughts and behaviors in general samples ($k = 16$, summary odds ratio (OR) calculated with random effects model). LB = Lower Bound; UB = Upper Bound.

Sensitivity Analyses

High-risk youth. Five studies including between 9,707–10,179 participants examined school connectedness and any form of STB in high-risk samples (i.e., high risk communities, youth engaging in sexual contact, youth investigated by child welfare, and youth reporting perceived disconnectedness and/or bullying experiences). The mean effect size taken from high-risk samples remained significant, $OR = 0.603$ (95% CI: 0.480, 0.757), $p < .0001$ (see Figure 4). The heterogeneity of variance analysis was significant, $Q(4) = 16.249$, $p = .003$, $I^2 = 75.383$, indicating significant between study variance. Note that moderator analyses were not conducted due to the small number of studies included in the analysis. Rosenthal's N of 99 to lead to a p value at or above alpha of .05 and nonsignificant results from Egger's regression indicated minimal risk for publication

bias. Trim and fill analysis recommended the imputation of one study resulting in a similar mean effect size of $OR = 0.634$ (95% CI: 0.507, 0.792) under the random effects model (see supplementary Figure S2d).

Sexual minority youth. The analysis pooling effect sizes across studies examining school connectedness and any form of STB within sexual minority samples included four studies with between 2,436–2,485 participants. The mean effect size was statistically significant, $OR = 0.608$ (95% CI: 0.509, 0.726), $p < .0001$ (see Figure 5). Heterogeneity of variance analysis indicated minimal between study variance, $Q(3) = 3.897$, $p = .273$, $I^2 = 23.015$; therefore, moderator analyses were not conducted. Analyses examining publication bias indicated minimal bias across studies. Rosenthal's N suggested 37 nonsignificant effect sizes would lead to a p value at or above alpha of .05 and Egger's

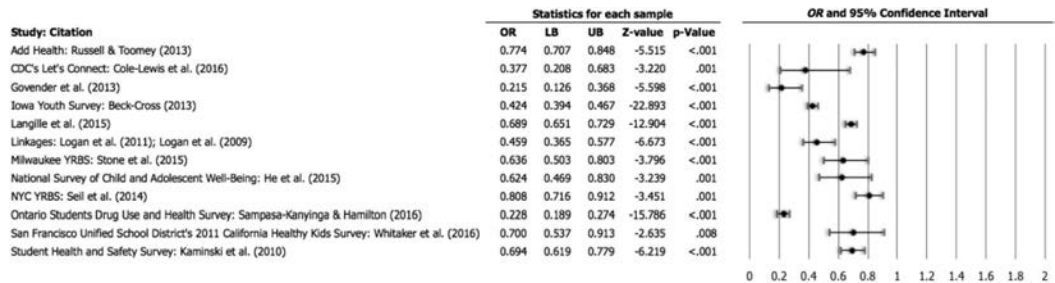


Figure 2. Overview of meta-analysis of school connectedness and suicidal ideation in general samples ($k = 12$, summary odds ratio (OR) calculated with random effects model). LB = Lower Bound; UB = Upper Bound.

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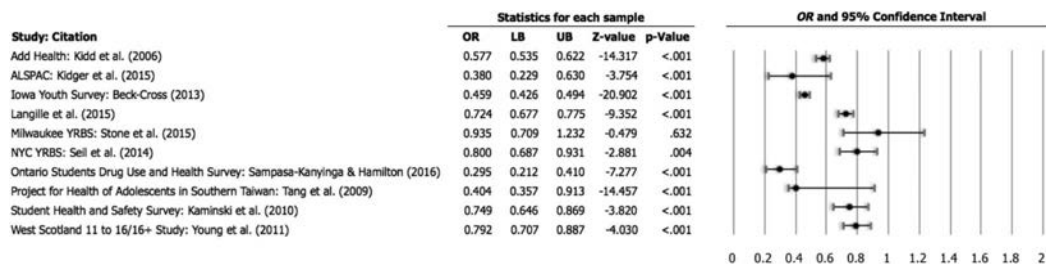


Figure 3. Overview of meta-analysis of school connectedness and suicide attempts in general samples ($k = 10$, summary odds ratio (OR) calculated with random effects model). LB = Lower Bound; UB = Upper Bound.

regression was not significant. Trim and fill analysis did not recommend the imputation of any studies (see supplementary Figure S2e).

Additional School Influences of Suicidal Thoughts and Behavior

We excluded a total of four studies from the quantitative analyses because they used similar measures of school connectedness but identified them as a different construct (e.g., school attachment, school engagement, school climate). In general, studies examining STB and constructs closely aligned to school connectedness demonstrated significant bivariate associations (Borowsky, Taliaferro, & McMorris, 2013; Carter, McGee, Taylor, & Williams, 2007; De Pedro, 2012; Pharris et al., 1997).

Discussion

Findings from the present study, which pooled effect sizes across 18 samples and included nearly 200,000 participants, clearly indicate that students reporting a connection to their schools are significantly less likely to report having suicidal thoughts or report making a suicide attempt. Results support the primary

hypothesis that higher school connectedness would relate to reduced reports of STB across general ($OR = 0.536$), high-risk ($OR = 0.603$), and sexual minority ($OR = 0.608$) adolescents. This association was consistent across general adolescent samples when analyzed separately for suicidal ideation ($OR = 0.529$) and suicide attempts ($OR = 0.589$). This stability across a diversity of samples, as well as the finding that among general samples these associations remained consistent after accounting for variations across ethnic and racial representation and region, underscores the importance of enhancing school connectedness for all students. These findings synthesize a large and fragmented body of literature that has identified school connectedness as an important protective factor against STB during adolescence.

The nonsignificant results from the moderator analyses support the second hypothesis, that effect size variability would remain stable across four categories of school connectedness (social affiliation, belonging, attitude, and environment). In other words, the association between school connectedness and STB demonstrated comparable magnitudes across studies using a variety of measures of school connect-

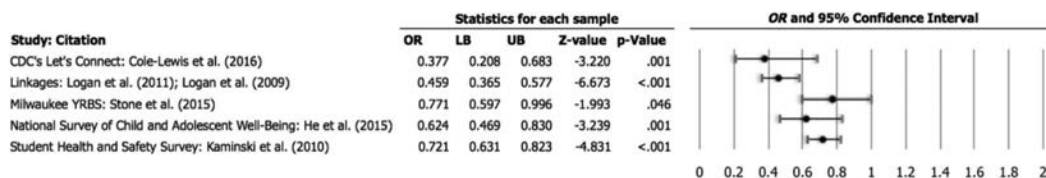


Figure 4. Overview of meta-analysis of school connectedness and suicidal thoughts and behaviors in high-risk samples ($k = 5$, summary odds ratio (OR) calculated with random effects model). LB = Lower Bound; UB = Upper Bound.

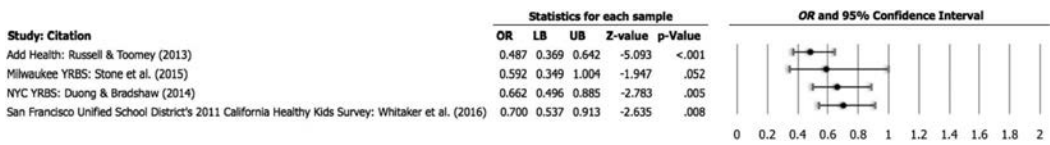


Figure 5. Overview of meta-analysis of school connectedness and suicide attempts in lesbian, gay, bisexual and transgendered samples ($k = 4$, summary odds ratio (OR) calculated with random effects model). LB = Lower Bound; UB = Upper Bound.

edness. Although preliminary, results suggest that a wide variety of measures of school connectedness may be used to support the identification of youth at-risk for STB, contributing to ongoing discussions about the best measurement of school connectedness.

Limitations

Although meta-analysis has a number of methodological strengths, particularly for pooling weighted estimates of effects to achieve greater power than individual studies, there are also important limitations to this analysis. Meta-analysis is frequently limited by reduced power for moderator variable detection (Hedges & Pigott, 2004); therefore, the finding that effect size variability did not differ based on the moderators of interest may be a result of limited variability as opposed to consistent findings across studies. Indeed, given the significant heterogeneity between effect sizes indicated by the large I^2 statistics, a primary limitation of the present study is that the contributors to variation across effects remain unclear.

A related limitation of meta-analysis pertains to the influence of study methodology on variability of effect sizes. Although moderator analysis did not support heterogeneity of effect sizes due to region of recruitment, measurement of school connectedness, and timeframe of STB, these represent only a sample of the potential differences across study methodology. For example, variability could be due to participant characteristics (age and grade of students), school characteristics (e.g., private vs. public, size, school climate, etc.), or community characteristics.

Meta-analysis is also limited by the potential for publication bias, where null effects may not be adequately represented due to the “file drawer” effect. In addition to including dissertations, we used a number of methods to mea-

sure publication bias (e.g., trim and fill analysis, etc.) supporting minimal publication bias within the present study. In an effort to further examine the potential for publication bias, we also calculated effect sizes from the publically available New York City (NYC) YRBS dataset (NYC Department of Health and Mental Hygiene, 2007; 2009) and compared them to the effect sizes we calculated from Seil and colleagues (2014) peer-reviewed article. The mean effect sizes were comparable, reinforcing the study’s statistical findings of minimal publication bias (see supplementary Table S2).

Results from the present study were also limited by its cross-sectional nature. Although the findings presented here do not allow for temporal inference, it is noteworthy to highlight that effect sizes calculated from the longitudinal analyses part of this study did reflect that school connectedness predicted reduced risk for STB across time, ranging between $OR = 0.380$ to $OR = 0.774$ (Kidd et al., 2006; Kidger et al., 2015; Russell & Toomey, 2013).

A final limitation concerning the present study involves its focus on bivariate analyses. Although a portion of the included studies also analyzed school connectedness as a protective factor against STB accounting for additional covariates, only direct effect sizes pertaining to school connectedness and STB were analyzed. Studies that consider multiple contexts in addition to school connectedness have revealed mixed findings depending on the additional variables examined in the model. In general, however, when multiple forms of connectedness are accounted for, parent and family connectedness appear to be the most salient of the connectedness protective factors against STB, whereas school connectedness is often cited as a powerful secondary protective factor for STB (e.g., Borowsky et al., 2013; Eisenberg et al., 2007). Thus, even after accounting for addi-

tional critical factors associated with STB, school connectedness has shown a positive influence on STB in school aged youth. Considering how well suited schools are for providing prevention efforts at a population level, school connectedness remains a critically important protective factor of STB.

Implications for Research

Although preliminary research supports that school connectedness is associated with reduced reports of suicidal ideation and attempts between 1 and 2 years later (e.g., [Kidger et al., 2012](#); [McNeely & Falci, 2004](#)), the long-term consequences of school connectedness as a protective factor against suicidal outcomes are less certain than the cross-sectional findings described here. Further research investigating school connectedness as a predictor of STB over time will help elucidate a temporal relationship with STB. Longitudinal research should also identify whether or not there is a critical period of time during development when enhancing school connectedness may be the most effective for preventing suicide.

Another important avenue of research that remains relatively unexplored is school connectedness within clinical populations, such as youth hospitalized for STB. To date, the only program designed to support school reintegration following hospitalization for STB is Bridge for Resilient Youth in Transitions ([White, Langman, & Henderson, 2006](#)). Its intensive model provides ongoing academic and social support following hospitalization, most likely contributing to enhanced feelings of school connectedness. Future research examining school connectedness in clinical populations will be important for the development of school transition programs designed to bolster school connectedness.

Finally, future research addressing the lack of evidence-based preventions and interventions for improving school connectedness and preventing suicide will support practical steps toward applying theoretical and empirical findings to practice. Although a recent review of the literature identified four programs that demonstrated improvements in school connectedness to reduce risk-taking behavior ([Chapman, Buckley, Sheehan, & Shochet, 2013](#)), none of the interventions examined STB as an outcome. The vast majority of

interventions also required systematic school-wide changes, supporting the need for an increased understanding of the efficacy of simpler intervention designs ([Chapman et al., 2013](#)). Future interventions should capitalize on the rich literature base examining school connectedness and STB to inform the most salient inquiries and evaluations should be based on meaningful (i.e., behavioral) outcomes.

Implications for Practice

School suicide prevention programs have a long history of promoting a “culture of connectedness” in order to effectively identify youth considering suicide ([Lieberman, Poland, & Cowan, 2006](#), p. 12; [Miller, 2011](#)). By fostering trusting relationships between adults and students, students are more willing to break promises or secrecy and seek help when they or their peers experience suicidal thoughts or behaviors ([Lieberman, Poland, & Kornfeld, 2014](#)). Although there is a dearth of evidence-based school suicide prevention programs, interventions effective in preventing adult suicide have also targeted enhanced social connectedness and belonging ([Miller, 2011](#)). Thus, school psychologists should promote school connectedness not only as a method for intervention, but also as a way to lay the groundwork for suicide prevention efforts that rely on a culture of connectedness ([Centers for Disease Control and Prevention, 2012](#); [Lieberman et al., 2014](#)).

According to the Wingspread Declaration, to foster school connectedness schools should maintain high and supportive academic expectations, fairly apply just disciplinary policies, build trusting school relationships, staff skilled teachers, support high expectations from family, and ensure that students feel connected to at least one adult in the school ([Blum & Libbey, 2004](#)). Because of their expertise in assessment and intervention and their collaborative role in the school, school psychologists are well suited to support increased school connectedness. At the whole school level, school psychologists can work closely with administrators and the school problem-solving team to promote activities supporting student and adult interpersonal interactions. Collaborative efforts can also provide opportunities for student ownership over school policies and school facilities ([Waters, Cross, & Runions, 2009](#); [Waters, Cross, &](#)

Shaw, 2010); for example, by way of student government and clubs. As consultants to faculty and staff, school psychologists can foster a collaborative teaching environment and enhanced faculty-student relationships by encouraging faculty and staff to participate in activities outside of the classroom (e.g., collaborating across disciplines, standing in the hallways in between class periods).

Particular care should also be taken to identify and support students most at risk to suicide, including those who feel disconnected from school and who may be less likely to engage in school activities. In addition to educating students, faculty, and staff about suicide warning signs, schools should consider supplementing existing school-wide surveys with a simple measure of school connectedness (i.e., items from the Add Health Survey; Resnick et al., 1997) to identify high-risk youth. Once high-risk students are identified, the school psychologist or another designated staff member may decide a more thorough suicide risk assessment is warranted. When conducting these assessments, it is important that the practitioner maintain a connection to the student by being empathic, supportive, and respectful (Lieberman et al., 2014).

Depending on the nature of the student's risk, school psychologists may implement a targeted intervention designed to increase school connectedness or they may refer the student for outside services. For example, school psychologists may consider interventions like Check and Connect, a program that is used to increase school engagement by using systematic monitoring by way of an assigned mentor (Alvarez & Anderson-Ketchmark, 2010), as well as school-based mentoring programs, which have shown potential for improving student connections, reduced absenteeism, and disciplinary referrals (Gordon, Downey, & Bangert, 2013). Even in more extreme cases that may require outside services, school psychologists should continue to support student connectedness given that both quality and accessibility of adult relationships are critical factors in preventing adolescent suicide (Seeley, Rohde, & Jones, 2010).

Conclusion

Results from the present study indicate that students reporting a connection to school are less likely to report having suicidal thoughts or

report making a suicide attempt. Although there are other important protective factors associated with STB, prevention and intervention efforts aimed at bolstering school related influences of STB remain critically important because schools serve the vast majority of youth. Therefore, findings from the present study support recent calls to increase school connectedness across schools worldwide (Blum & Libbey, 2004; Murray & Pianta, 2007). Because findings were stable across multiple categories of school connectedness, schools administering school connectedness assessments to aid with suicide prevention efforts should be encouraged to select the simplest and most accessible instrument. Future research focused on developing and evaluating interventions that target school connectedness to prevent STB will fill a significant gap in the literature.

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