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School-based programs for increasing connectedness and reducing risk behavior: A systematic review

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Abstract

School connectedness has a significant impact on adolescent outcomes, including reducing risk taking behavior. This paper critically examines the literature on school-based programs targeting increased connectedness for reductions in risk taking. Fourteen articles describing seven different school-based programs were reviewed. Programs drew on a range of theories to increase school connectedness, and evaluations conducted for the majority of programs demonstrated positive changes in school connectedness, risk behavior, or a combination of the two. Many of the reviewed programs involved widespread school system change, however, which is frequently a complex and time consuming task. Future research is needed to examine the extent of intervention complexity required to result in change. This review also showed a lack of consistency in definitions and measurement of connectedness as well as few mediation analyses testing assumptions of impact on risk taking behavior through increases in school connectedness. Additionally, this review revealed very limited evaluation of the elements of multi-component programs that are most effective in increasing school connectedness and reducing adolescent risk taking.

Keywords: school connectedness; adolescent; risk taking; programs

School-based Programs for Increasing Connectedness and Reducing Risk Behavior: A Systematic Review

The school social context is critical in shaping adolescent behavior. School connectedness, in particular, has been repeatedly identified as an important protective factor. It has been shown to be positively associated with school retention and emotional health and wellbeing, and negatively associated with adolescents' involvement in risk taking behaviors (e.g., Bond et al., 2007; Dornbusch, Erickson, Laird & Wong, 2001; Shochet, Smyth and Homel, 2007).

Students' connectedness to school decreases throughout adolescence (Monahan, Oesterle & Hawkins, 2010; Whitlock, 2004). Importantly, however, school connectedness is considered to be a modifiable construct, as it has been found to vary in accordance with a number of school-based factors that may be targeted in intervention programs. For example, it has been suggested that programs that act to modify the school environment may influence students' connectedness (Eggert & Kumpfer, 1997).

A number of review articles have examined and synthesized various aspects of the diverse body of research on school connectedness, including definitions, measurement, and associated adolescent outcomes (e.g. Maddox & Prinz, 2003; Libbey, 2004; O'Farrell & Morrison, 2003; Jimerson, Campos & Greif, 2003; Fredericks, Blumenfeld & Paris, 2004). Within the literature, the terminology used to describe this construct varies widely across disciplines and includes, for example, connectedness, bonding, and attachment (Libbey, 2004). Definitions do, however, share common elements relating to the school social context and relationships, and as a whole may refer to 'the extent to which students feel personally accepted, respected, included and supported by others in the school social environment' (Goodenow, 1993, p. 80). Additionally, research across disciplines has revealed links

between the construct, regardless of terminology, and important student outcomes (e.g. Resnick, Harris & Blum, 1993; Wentzel, 1998; Shochet et al., 2007).

Despite acknowledged inconsistencies in definition and measurement, a number of school-based programs have been developed that target change in school connectedness, in an attempt to improve student outcomes. Critical reviews have identified and summarized many important issues relating to the construct, including definitional and measurement issues; however research has not yet attempted to draw together information from school-based programs. It is therefore timely and important to move beyond simply understanding the construct to identifying possibilities for potential enhancement of school connectedness for behavior change and associated program evaluations.

The aim of this paper is to conduct a systematic review of programs that have targeted increasing school connectedness as a means of reducing adolescent risk taking behavior. Although school connectedness impacts on multiple adolescent outcomes, including wellbeing and academic achievement, to provide a manageable scope for this review the focus is on risk taking behavior. The varying terminology renders research synthesis somewhat problematic; however while referring to ‘connectedness’ throughout, this review incorporates research that makes use of other related terms.

School Connectedness and Risk taking

Research has identified associations between school connectedness and a number of adolescent outcomes, including positive links with academic motivation and achievement (e.g., Goodenow, 1993; Wentzel, 1998; Wentzel, Battle, Russell & Looney, 2010), emotional and physical health (e.g., McLellan, Rissel, Donnelly & Bauman, 1999; Shochet et al., 2007), and negative associations with risk taking behavior (e.g., Resnick et al., 1993). Importantly, longitudinal research has shown that students’ connectedness to school is related to reduced risk taking later in adolescence. For example, research using data from the National

Longitudinal Study of Adolescent Health showed that higher levels of school connectedness were strongly related to students' delayed initiation of cigarette smoking, alcohol and marijuana use, delinquency, and violent behavior one year later (Dornbusch et al., 2001).

A large body of research has identified negative associations between school connectedness and a variety of adolescent risk behaviors, including alcohol and substance use, and delinquent and violent behaviors such as carrying weapons, damaging property, and gang membership (e.g., Battistich & Hom, 1997; McClellan, Rissel, Donnelly & Bauman, 1999; Resnick et al., 1993; Voisin et al., 2005). Research has also shown that students' connectedness to school is negatively associated with transport-related risk behaviors, such as riding with dangerous and drink drivers and underage driving, as well as associated transport injuries (Chapman, Buckley, Sheehan, Shochet & Romaniuk, 2011). Chapman and colleagues' (2011) research importantly identified school connectedness as a protective factor for risk taking behaviors extending beyond the school setting. While other factors are also notably important in determining risk taking behavior, such as for example peer and family influences, this research indicated that school factors, which may be more readily influenced through school-based prevention programs, do play a part in shaping adolescents' behavior both within and external to the school environment.

Theoretical Foundations

The literature relating to school connectedness arose from a number of disciplines, and initially focused on examining links with important adolescent outcomes. As the relationship between students' connectedness and risk taking behavior became established, researchers began to clarify these links through determining possible theoretical underpinnings. A number of theories describing the mechanisms behind school connectedness and its impact on behavior have been used to inform the development of school-based risk taking prevention programs. While this section does not incorporate all of

these, several of the most widely cited, and those that provide the foundation for the programs included in this review, are discussed here.

Attachment theory

Attachment theory states that through early parent-child these interactions, a foundation for bonding is developed, which then may extend to other relationships including friends, teachers and other adults. Research has shown that bonding to adults other than parents has positive effects in terms of childhood resilience (Werner & Smith, 1992). School bonding and bonding with teachers and other adults within the school environment is an important extension of attachment theory that has been used to explain the link between connections within the school and problem behavior.

Social control theory

Social control theory, as proposed by Hirschi (1969), was developed to explain the causes of delinquent behavior in young people. Hirschi stated that bonds to people or institutions promote conformity and act as inhibitors to delinquent and risky behavior. Conversely, low levels of bonding 'free' adolescents to participate in risk behavior. Hirschi conceptualized bonding as being comprised of four primary dimensions, existing for parent, peer and school bonds. According to this theory, risky and delinquent behavior is a result of weak social bonds, including low attachment, commitment, involvement, and belief (i.e. students' commitment to the values, norms and rules of their school).

Social development model

Social control theory has been re-conceptualized and extended since Hirschi's original conceptualization, and has been integrated with other theories. These include self control theory (Gottfredson & Hirschi, 1990), which states that poor school bonding does not cause risk behavior, but is rather an outcome of low self control; and the social development model (Catalano & Hawkins, 1996), which extends social control theory by including factors that

are necessary to establish social bonds, such as opportunities and skills for, and reinforcement of, involvement. The social development model, which also incorporates aspects of social learning (Bandura, 1997), and differential association (Matsueda, 1982; 1988) theories, suggests that bonds with pro-social others, including peers and school, is associated with decreased risk taking, and highlights the importance of attachment and commitment to the group. According to this model, when social groups such as in the school environment produce bonds with corresponding degrees of attachment and commitment, and promote standards for positive behavior, adolescents behave in ways that are consistent with these standards and values (Hawkins et al., 1999). Like social control theory, the social development model focuses on the importance of attachment, commitment, involvement and belief. Unlike social control theory, however, involvement is seen as part of the socialization process that results in bonding, while beliefs in the values and norms of the social unit are seen as a consequence of these bonds and a mediator between bonding and behavioral outcomes (Catalano et al., 2004). The social development model also draws upon the principles of social learning theory in its inclusion of skills for and reinforcement of involvement within the school social environment.

School Factors and Connectedness

Reflecting some of these theoretical mechanisms, a number of studies have identified school-based factors that are associated with increased school connectedness, and which may be targeted in intervention programs. Several relate to structural features of the school and its policies. For example, McNeely, Nonnemaker and Blum (2002) found that students' connectedness was higher when schools enforced tolerant disciplinary policies and when school populations were small. Importantly, school connectedness is also increased when adolescents feel that they have some influence over institutional policies (Whitlock, 2006).

The majority of studies however identify important factors relating to teacher practices and the classroom environment. For example McNeely et al. (2002), using data from the National Longitudinal Study of Adolescent Health, found that students reported higher connectedness when their teacher managed the class in a controlled and positive way. Furthermore, research has indicated that strategies most likely to enhance school connectedness include high expectations from teachers and parents for school performance and completion, consistent enforcement by school staff of collectively agreed upon disciplinary policies, effective classroom management, and having supportive and positive student-adult relationships within the school (Bergin & Bergin, 2009; Pianta, 2000; Voisin et al., 2005; Wentzel, 1998). A study by Goodenow (1993) also showed that perception of teacher support was the most significant predictor of 6th to 8th grade students' connectedness.

Research Aim

Previous research has shown that school connectedness is an important protective factor in adolescent development, and is associated with reduced risk taking behavior and related injury. School connectedness has also been shown to be potentially modifiable, particularly through changing school-related factors identified as important in developing connectedness. Prevention researchers have recognized the importance of school connectedness in healthy adolescent development, and in recent years, programs that aim to increase students' connectedness to school have been developed and evaluated. The aim of the current research was to conduct a systematic review of those programs that have targeted changes in school connectedness to reduce adolescent risk taking behavior. In doing so, this paper will examine the contributions that these programs have made to research in school connectedness and adolescent risk behavior, and will identify and synthesize findings relating to effective means for reducing risk behavior.

Method

A systematic literature review was conducted using online databases, for articles available as at August, 2011. Key phrases were prepared and searched in combination, as shown in Table 1, within scholarly databases including PubMed, PsycInfo, ERIC (Education Resources and Information Clearinghouse), Science Direct, and Proquest Education and Psychology.

Construct Definitions

As previously noted, the terminology used to describe the construct of school connectedness varies widely depending upon the discipline within which it is discussed, and the theory from which it is examined. According to Jimerson et al. (2003), however, there are several shared dimensions underlying these constructs, including, affective (e.g. students' feelings about school, teachers and their peers), behavioral (e.g. observable actions and performance including participation in school activities) and cognitive dimensions (e.g. students' perceptions and beliefs including their motivations and expectations relating to school). This review draws upon Jimerson et al.'s (2003) multi-dimensional definition. As such, the search phrases incorporated the varied but related terms as discussed by these authors, including connectedness, attachment, bonding, engagement, affiliation, membership and school community. These search terms are shown in Table 1.

Risk taking behavior can be defined as any action that involves choice, uncertain outcomes and the potential for negative consequences (Furby & Beyeth-Marom, 1992; Igra & Irwin, 1996; Irwin 1990). This review is particularly concerned with those risk behaviors that have the potential to cause injury among adolescents, as well as those that take place in social environments, such as among peer groups. Only those risk taking behaviors that have the potential to cause injury and that commonly take place in social settings have been included within this review (leading to the exclusion of, for example, sexual risk taking). Alcohol was included as it often takes place in a social setting and can be related to injury. Drugs was not

included as a separate search term as programs targeting only drug use other than alcohol are not commonly universal prevention programs, but instead target high risk students.

Inclusion and Exclusion Criteria

Articles were selected for inclusion in this review based on seven criteria. Each article was required to describe an intervention or program that: was a universal prevention program (as opposed to selective or indicated prevention programs, which focus only on high risk students), was implemented within schools with participants aged between 5-18 years, aimed to increase school connectedness and reduce risk taking behavior, had been evaluated using a pre and post-test design with control group, and evaluated changes in school connectedness and risk taking. Additionally, as school connectedness can be broadly defined and operationalized, articles were only included that described an intervention or program that incorporated aspects of school change such as teacher training in classroom management or connectedness enhancement. This criterion enabled the exclusion of articles which may have focused solely on individual relationship building within the school (e.g. mentoring programs). Finally, articles were only included if they were published within the past 15 years (i.e. since August, 1996). This period was chosen to reflect the recent rapid growth in the use of the terms school connectedness and school belonging. The databases searched showed an approximate three-fold increase in use of the terms between 1992-1996 and 1997-2002.

Articles were excluded if they reported only on changes in attitudes (e.g. attitudes toward risk taking behaviors, as opposed to actual participation in risk behaviors) and if they, as discussed within definitions of constructs, aimed to change risk behaviors not occurring within a social environment, such as a peer group (e.g. sexual risk taking).

Search Procedure

The key phrases identified in Table 1 were searched in combination within the six databases. Additionally, cited references in identified articles were examined for inclusion. At the conclusion of the search process, 321 peer-reviewed articles, book chapters and books were identified and catalogued. Doctoral theses were also examined; however all of the programs described were reported in journal articles or book chapters. The title and abstract of each of these references was examined for relevance to the search criteria, and the full text of 26 of these articles was obtained for a more thorough review. Fourteen articles describing seven different school-based programs met all relevant inclusion criteria and are described in the current review.

Table 1

Key Search Phrases

Key phrases

School connectedness OR School attachment OR School bonding OR School engagement
OR School affiliation OR School membership OR School community

AND

Intervention OR Program* OR Prevention

AND

Violence OR Delinquency OR Alcohol OR Risk taking OR Injury

Results and Discussion

Results of the systematic review are summarized in Table 2. A small number of papers from the original 321 were found to report on programs and associated evaluations, leading to the large reduction of papers to 14 reviewed. Due to heterogeneity in intervention and research design across the few programs that have been reported in the literature, studies are not pooled but are instead presented in a tabular summary as well as in the narrative. Each

of these programs is summarized in the table according to key program components and intervention methods, as well as the study evaluation details, including key outcomes and significant findings. The sample size and follow-up time frame, as well as effect sizes and/or other available statistical results are presented where available in the original document.

Several programs were described across multiple studies, and in these cases, details of intervention strategies are collated from across the relevant articles, but evaluation results are summarized from each study. The narrative sections of this review describe these programs in greater detail, including a focus on the theoretical development of the intervention components, the contribution that these studies make to our understanding of school connectedness as a means of changing adolescent health risk behavior, and an examination of potential directions for future research.

Table 2 *Included Studies*

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Child Development Project (CDP)	Whole of elementary school intervention comprising (a) intensive classroom program, (b) school-wide component, and (c) family involvement component. Activities and curricula included: cooperative learning (students work in pairs or small groups); literature-based reading and language arts curriculum; school-wide activities (e.g. science fair; family nights); family involvement activities (take-home classroom learning).	1. Battistich, Schaps, Watson, Solomon, & Lewis (2000)	1. Students from 24 elementary schools (12 intervention and 12 matched comparison) assessed each year for four years.	1. Students at “high implementation” schools: increased sense of school community (ES = .47) c.f. decrease among control school students (ES = -.09); decreased alcohol use ($M = -.05$), marijuana use ($M = -.02$) and delinquent behaviors including, e.g. gang fights ($M = .03$), c.f. increase among control school students (ES = .15, .22, .15, respectively).
		2. Battistich, Schaps, & Wilson (2004)	2. 700 students in 3 “high implementation” and 3 “low implementation” elementary schools and 546 students in matched comparison schools, followed up in middle school.	2. “High implementation” students: higher scores than controls on 10 of 11 school attitudes (e.g. school as community, $F = 6.43$, $p < .02$, respect for teachers, $F = 7.93$, $p < .005$), more positively engaged peers, $F = 8.03$, $p < .005$, lower delinquency, $F = 4.67$, $p < .04$. No difference in alcohol or other drug use.

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Going Places	<p>Middle school program comprising:</p> <p>(a) Social skills curriculum delivered by trained language arts teachers. Designed to influence attitudes and expectations about substance use and antisocial behavior, improve self-efficacy and social skills; 18 lessons in 6th, 12 lessons in 7th, 6 lessons in 8th Grade.</p> <p>(b) Parent education, e.g. video for 6th grade parents on authoritative parenting; newsletters.</p> <p>(c) School environment enhancement, e.g. social marketing strategies; posters in cafeteria.</p>	<p>Simons-Morton, Haynie, Saylor, Davis Crump, & Chen (2005)</p>	<p>1,484 students from 7 middle schools (3 intervention; 4 control schools) surveyed at beginning and end of Grade 6, end of Grades 7 and 8, and beginning Grade 9.</p>	<p>No significant effects found for engagement. No effects for alcohol use and antisocial behavior.</p>
Gatehouse Project	<p>Whole of high school program comprising: establishment of school-based adolescent health team, identification of school-specific risk and protective factors, identification of effective strategies. Strategies included, e.g. negotiation of classroom rules, small group work, interactive teaching, use of curriculum (e.g. incorporation of social emotional competence elements), teacher training on positive climate.</p>	<p>Bond et al. (2004)</p>	<p>2,678 students from 12 intervention and 14 control high schools participated in first wave in Grade 8, followed up again in Grade 8 and then annually for two years.</p>	<p>Differences found between intervention and control school students on “any drinking” (OR [Wave 4] = .83) and “friends’ alcohol use” (OR [Wave 4] = .63) across three follow up waves. No significant effects on social or school relationships.</p>

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Positive Action Program	Elementary school program comprising: (a) Detailed K-6 classroom curriculum, consisting of over 140 15-20 minute lessons per grade. Taught by teachers and consisting of units on, e.g., self-concept, positive actions for body and mind. Included stories, role-plays, games, and posters. Teachers received professional development on classroom management and positive reinforcement. (b) School-wide climate program; inclusive, varied and comprehensive activities for whole of school. (c) Family and community involvement program.	1. Flay, Aldred & Ordway (2001) 2. Li et al. (2011)	1. 13 elementary schools in Nevada and 8 schools in Hawaii for 2-3 years of program, and 2 matched control schools for each district. 2. 510 Grade 5 students from 14 elementary schools (7 intervention and 7 matched control schools) completed follow up; 290 matched to baseline (Grade 3).	1. School reported data in Nevada showed significant effects for program schools on violence when compared to matched controls. PA program reduced incidents of violence by 85% on average. In Hawaii, disciplinary referrals were reduced by 77% on average among program schools. 2. Program effects included 31% reduction in substance use and 26% reduction in violence among program school students. Program students endorsed significantly fewer items for substance use (incidence rate ratio [IRR] = 0.69), and for serious violence (IRR = 0.63).

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Raising Healthy Children (RHC)	Elementary school program comprised of: (a) School intervention strategies, e.g. teacher and staff development on proactive classroom management, interactive teaching and cooperative learning. (b) Student intervention strategies, e.g. after school tutoring and study clubs, development of interpersonal problem solving skills. (c) Family intervention strategies, e.g. multiple session parenting workshops on behavior management and academic support skills.	1. Catalano et al. (2003) 2. Catalano, Haggerty, Oesterle, Fleming, & Hawkins (2004)	1. 938 students in Grades 1 or 2 from 10 elementary schools (497 in program schools and 441 in control schools) followed up after 18 months. 2. 938 students in Grades 1 or 2 from 10 elementary schools (five intervention and five control schools) followed up yearly.	1. Teacher reported data – program school students had greater commitment to school than control school students ($t = 1.97, p = .048$); control students had higher levels of antisocial behavior ($t = -2.29, p = .022$). 2. Teacher reports of student behavior – intervention school students had increased commitment to school and reductions in problem behavior at end of 2 nd and 3 rd years of data collection, compared to control school students.
		3. Brown, Catalano, Fleming, Haggerty, & Abbott (2005)	3. 959 students in Grades 1 or 2 from 10 schools followed up in Grades 6 – 10.	3. Students in intervention schools showed greater decreases in frequency of alcohol (standardized ES = .91) and marijuana use (standardized ES = 1.44) than control students during middle to high school periods. No effects on use versus nonuse.

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Seattle Social Development Project (SSDP)	Elementary school program (Grades 1-6) comprising three components: (a) Teacher training in classroom management and instruction, including proactive management, interactive teaching and cooperative learning. (b) Child social and emotional skills development, including strategies to increase interpersonal problem solving skills and refusal skills. (c) Parent training on behavior management, academic support skills and skills to reduce risks for drug use.	1. Hawkins et al. (1992) 2. Hawkins, Catalano, Kosterman, Abbott, & Hill (1999)	1. 919 students from 18 elementary schools – assignment of schools or classrooms to intervention (received program from Grade 1) or control. Data collected when entering Grade 5. 2. 598 students from 18 schools (full intervention, late intervention and no intervention control groups) followed up from Grade 6 to age 18 years.	1. Intervention students were significantly more attached ($F = 15.27, p < .025$) and committed to school ($F = 5.73, p < .025$) than control students, and had significantly lower rates of alcohol ($\chi^2 = 3.13, p < .05$) and delinquency initiation ($\chi^2 = 2.64, p < .05$). 2. Less violent behaviors (-11.4% difference, $p = .04$), heavy drinking (data not provided), greater attachment (M difference = 0.20, $p = .006$) and commitment to school (M difference = 0.15, $p = .03$) at age 18 among full intervention group compared with control. No effects for drug use or risk taking for late intervention group.

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Seattle Social Development Project (SSDP) (Continued)		3. Hawkins, Guo, Hill, Battin-Pearson, & Abbott (2001)	3. 598 students from 18 schools (full intervention, late intervention and no intervention control groups) followed up at ages 13-16 and 18 years.	3. Curvilinear change in school bonding among full intervention group, decreasing to age 16 and then increasing to age 18. Increased bonding was related to less crime, including lifetime violence ($r = -0.19, p < .001$) and substance use at 18, including alcohol use ($r = -0.27, p < .001$). School bonding in control and late intervention groups declined from age 13 to 18.
		4. Catalano et al. (2004)	4. 808 elementary school children – 156 in full intervention (received from 1 st - 6 th grade), 267 in late intervention (received from 5 th – 6 th grade), 141 in parent training only, 220 in control group – followed up yearly until age 16, then when 18, 21, 24 and 27 years (retention rates > 90%).	4. By Grades 10-12 school bonding was significantly higher among full intervention than control students. In Grade 12, full intervention school students also reported less alcohol use and violence. No results for bonding or behavior reported for 21 – 27 years.

Program name	Key program components and intervention methods	References	Evaluation participants and timeframe	Key outcomes
Seattle Social Development Project (SSDP) (Continued)		5. Hawkins, Kosterman, Catalano, Hill, & Abbott (2005)	5. 605 participants from 18 schools (full intervention, late intervention and no intervention control) interviewed at age 21.	5. Higher functioning in school and work, e.g. greater constructive engagement (M difference = 0.37, $p = .01$) and improved emotional and mental health at 21, e.g. emotional regulation (M difference = -0.15, $p = .005$). No effects found for alcohol, marijuana use or crime.
Information + Psychosocial Competence = Protection (IPSY)	Grade 5 life skills program consisting of 15 lessons of 90 or 45 minutes, with seven lesson booster sessions for Grades 6 and 7. Taught by trained school teachers, using interactive teaching methods. Combined promotion of life skills, such as communication, problem solving and coping, with training of skills related to substance use. Also incorporated lessons focusing on school (e.g. experiences of and attitudes toward school) and interactive teaching methods.	Wenzel, Weichold & Silbereisen (2009)	952 students from 23 intervention and 21 control schools surveyed at 4 time points from Grades 5 – 7.	Positive program effects on school bonding ($F = 25.64, p < .001$) and alcohol use, including e.g., 30 day frequencies of beer consumption ($F = 12.14, p < .01$). Effects on school bonding partially mediated effects of program on alcohol use; variance explained by mediation ranged from 9% to 15% for each alcohol use variable.

General Program Features

Rationale and conceptualization

The majority of programs were developed, implemented and evaluated in the United States, apart from the Gatehouse Project (Bond et al., 2004), which was developed in Australia, and the German Information + Psychosocial Competence = Protection (IPSY) program (Wenzel et al., 2009). The rationale for development of each of the programs was described similarly, and primarily involved moving from a focus on individual-level risk and protective factors to contextual means of prevention through ongoing school and class-related strategies. All studies highlighted the importance of positive relationships within and connectedness, bonding, or attachment to school in predicting behavioral outcomes. All of the included intervention programs therefore aimed to increase students' connectedness to school; however, this was broadly described across studies, and included for example, the creation of caring communities within schools (Child Development Project; Battistich et al., 1997; 2000; 2004), the aim of increasing students' bonding to school (e.g. Seattle Social Development Project; Catalano et al., 2004; Hawkins et al., 1992; 1999; 2001; 2005), as well as the increase of students' school engagement (e.g. Going Places; Simons-Morton et al., 2005). The operationalization and corresponding measurement of these constructs also differed across studies; however commonly incorporated elements of attachment (e.g. relationships at school) and commitment to school.

Target behaviors

Each of the interventions also aimed to decrease students' risk taking behavior, be it alcohol or drug use (mentioned specifically among the aims for five programs) violence (mentioned specifically for one program), or general delinquency and problem behavior (mentioned among the aims for four programs). Although beyond the scope of this study, a number of other program aims were discussed in the included studies, including

improvements in academic achievement, social and ethical development, and increased emotional wellbeing.

Intervention strategies

The majority of the interventions focused on widespread, whole-of-school system change, with many putting in place a framework for identifying needs and instituting change rather than prescribing specific program elements. As such, intervention components as described in the included studies operated across a number of levels, including the classroom or curriculum level (all seven programs), the school level, including for example, school climate change or management and disciplinary strategies (six programs), and within the broader social environment, incorporating parent and family involvement components (five programs). One exception was the IPSY program, which was primarily a curriculum-based program incorporating a one-day facilitator training program for teachers (Wenzel et al., 2009). Although this program did not incorporate many of the whole-of-school environment change strategies as described in the other programs, it did focus on the development of relationships between students and their teachers during their participation in the curriculum elements (Wenzel et al., 2009).

Several programs also incorporated curriculum-based components as part of a whole-of-school strategy. For example, the Going Places program included 18 class lessons in 6th Grade, 12 lessons in 7th Grade, and 6 lessons in 8th Grade, focusing on problem solving, self-control, school involvement and communication (Simons-Morton et al., 2005). While this suggests something of program duration and intensity, other aspects of these programs, including school environment components, were designed to be ongoing and pervasive across the school context. For example, the curriculum component of Going Places was implemented in conjunction with parent education and ongoing social environment enhancement elements (Simons-Morton et al., 2005).

Target age group

Programs differed in their target school level or age group. The majority of programs were for elementary schools and students, including the Child Development Project (CDP; Battistich et al., 2000; 2004), the Seattle Social Development Project (SSDP; Catalano et al., 2004; Hawkins et al., 1992; 1999; 2001; 2005), and the Positive Action Program (Flay et al., 2001; Li et al., 2011). The rationale for early intervention within these programs commonly focused on the promotion of strong bonds that would reduce later initiation of problem behavior (e.g., Hawkins et al., 1992). Raising Healthy Children (RHC; Catalano et al., 2003; 2004; Brown et al., 2005), which was developed as an enhancement of the SSDP, was primarily an elementary school program, but also incorporated components extending to middle and high school levels. The Gatehouse Project (Bond et al., 2004), meanwhile, was developed specifically for high schools and students, while the Going Places program was designed for middle schools (Simons-Morton et al., 2005). Programs targeting older adolescents as opposed to elementary school students focused on changes in attachment to school, family and peers during adolescence and the importance of connectedness during this developmental period when risk behavior is beginning to increase (e.g., Patton et al., 2003).

Theoretical Development

Effective behavior change and school-based intervention programs are those that are developed from an appropriate and comprehensive theory, as this provides a clear understanding of targets for change and the environmental context in which this can occur (Rimer & Glanz, 2005; Wentzel & Wigfield, 2007). An appropriate theory also provides structure and consistency for implementation. The programs identified in the current review were each, importantly, described as having been developed on the basis of recognized theories, with each paper including an overview of theoretical concepts as they related to program design. Programs built on elements from a variety of theories including social

control theory, attachment theory, and social learning theory, with several integrating elements of different theories in their design process. Additionally, papers overlapped in terms of their use of various theories; for example the principles of social control theory (Hirschi, 1969) were utilized in the CDP as well as the SSDP and Raising Healthy Children, while the latter two programs also made use of social learning principles, along with Going Places and the Positive Action program.

Common theoretical elements across programs included a focus on positive youth development and social skill enhancement, and the internalization of attachment to school and connected relationships with teachers and peers as a means of reducing problem behavior. For example, the Gatehouse Project and the CDP were based on theoretical models suggesting that strong and secure emotional connections and caring relationships would provide an important base for positive psychological, social and socio-moral development (Patton et al., 2003; Battistich et al., 2000; 2004). Similarly, components of the Information + Psychosocial Competence = Protection (IPSY) program focused on enrichment of the school context through increased student-teacher communication and contact, which was hypothesized to impact on behavior through bonding (Wenzel et al., 2009). Program components were designed to map onto these theorized processes; for example, cooperative learning was incorporated into the CDP as a means of building interpersonal bonds and developing social skills (Battistich et al., 2000).

Social learning theory and the importance of social skill development for increased connectedness was also utilized in the development of the Going Places program (Simons-Morton et al., 2005) and the Positive Action program (Flay et al., 2001; Li et al., 2011). Going Places drew upon the importance of efficacy and outcome expectations, which are influenced by perceptions of behavior, normative expectations, actual experience and also relevant skills (Bandura, 1986). As such, this program focused on the importance of social

skills development through curriculum activities designed for this purpose, as interventions that increase social skills are seen to also enhance commitment and engagement, thereby reducing participation in problem behaviors (Simons-Morton et al., 2005). As well as incorporating similar principles from social learning theory, the Positive Action program drew upon the theory of self-concept, whereby actions, more than cognitions or emotions, determine self-concept. According to this theory, positive behavior results in feelings of self worth; and when programs teach adolescents which behaviors are positive, and teachers reinforce these positive behaviors, bonding is enhanced and positive actions are continued (Flay et al., 2001). An example intervention strategy mapping onto this theory included teacher training on active modeling of positive actions, and encouragement and reinforcement of positive behavior (Flay et al., 2001).

Along with positive youth development, resilience and social skill enhancement, several programs incorporated elements targeting students' commitment to and belief in the school rules and norms, an element of social control theory and the social development model. For example, the CDP, SSDP and RHC each theorized that caring and connected relationships in the school would meet students' needs to belong, which in turn would promote commitment to and belief in pro-social norms and values. Internalization of pro-social school values, such as those against violence and substance use, was expected to lead to behavior consistent with these beliefs (Battistich et al., 2000; 2004; Brown et al., 2005; Hawkins et al., 1992). The CDP, for example, incorporated elements relating to developmental discipline, whereby a pro-active, teaching approach to discipline enabled student caring, responsibility, and internalization of pro-social values (Battistich et al., 2000).

Establishing a theoretical basis was therefore a common practice for the development of intervention strategies across each of these school-based programs. Importantly, there were a number of commonalities across theoretical principles utilized, with programs emphasizing

positive youth development and the development of social skills, involvement and feelings of belonging and emotional connection to reduce problem behavior. Programs also largely emphasized the importance of internalization of and commitment to pro-social school norms and values, which was frequently expressed as an important element in reducing risk behavior.

Program Effectiveness

School connectedness

Evaluations conducted for four of the seven programs included in this review demonstrated significant increases in students' connectedness, although this was variably measured. Programs that showed such a positive change included the CDP (Battistich et al., 2000; 2004), the SSDP (Hawkins et al., 1992; 1999; 2001; Catalano et al., 2004), RHC (Catalano et al., 2003), and IPSY (Wenzel et al., 2009). Interestingly, while the CDP, SSDP and RHC were interventions involving widespread school system and social change, IPSY was primarily a curriculum-based social skills program with an incorporated element of teacher training in classroom interaction. The fact that the IPSY program was also shown to impact on students' connectedness is notable, however, further research is necessary to determine the extent, type and nature of intervention required to increase students' connectedness to school.

Risk taking behavior

The programs included in this review also demonstrated a number of positive effects on students' participation in risk taking behavior. A broad range of risk behaviors were assessed, including alcohol and other drug use, violence and delinquent behaviors. While some evaluations focused on a narrow range of risk behaviors (e.g. IPSY, which focused on alcohol use), many included measures across a variety of risky and delinquent student behaviors. Positive changes, for example, were reported for students' alcohol use (e.g. CDP,

Gatehouse Project, SSDP, RHC, and IPSY), other drug use (e.g. CDP, SSDP, and RHC), and violent behavior (e.g. CDP, SSDP, and the Positive Action program). Effect sizes were reported as ranging from small (e.g. CDP, Effect Size = .18 for change in alcohol use; Battistich et al., 2000) to substantial (e.g. RHC, Effect Size = .91 for alcohol use trajectories; Brown et al., 2005). In discussing the small effect sizes found in the evaluation of the CDP, Battistich and colleagues (2000) indicated that participants were elementary school students, many of whom would not have yet initiated problem behaviors. These authors also suggested that effect sizes observed for alcohol and marijuana use were comparable to other effective prevention programs targeting older adolescents. Larger effect sizes were found, for example, in evaluations of the RHC and the IPSY program. Effect sizes for alcohol use outcomes measured for the IPSY program ranged from 0.27 to 0.41, and the authors discussed these as being high compared to other similar prevention programs (Wenzel et al., 2009).

Despite many of the promising changes showing increases in school connectedness and reductions in risk taking behavior, a number of studies reported a mix of significant and nonsignificant results in student risk behavior change. For example, Simons-Morton et al. (2005), in their evaluation of the Going Places program, showed positive treatment effects for smoking behavior (outside of the scope of the current review) but not for alcohol use or antisocial behaviors. Additionally, in a long-term evaluation of the RHC program, Brown et al. (2005) reported a positive impact of the program on growth trajectories for frequency of alcohol and marijuana use, but not for use versus nonuse.

While the RHC program has been shown to have positive impact on school-related variables, including school commitment (e.g. Catalano et al., 2003), the evaluation of Going Places did not demonstrate any effect on students' connectedness to school (Simons-Morton et al., 2005). The nonsignificant results reported for the Going Places program on alcohol use and antisocial behaviors may therefore reflect a lack of program effectiveness in altering this

critical school-based factor. The inconsistency of findings between alcohol use and frequency of use reported in the RHC evaluation, meanwhile, does not reflect a lack of effectiveness in changing important school factors, but was rather described in theoretical terms by Brown and colleagues (2005). The authors suggested that while frequent use may threaten social relationships in the school and family, experimentation, which may carry a low risk of detection or be more socially acceptable, might not carry such a risk to school and family bonds.

Long-term effectiveness

Several studies demonstrated longer-term program effects through longitudinal designs, some of which extended into late high school. For example, evaluation of the elementary school-targeted SSDP showed that the programs' impact on school connectedness was sustained throughout high school. Reports of connectedness among full intervention group students decreased to age 16 and then increased again to age 18, while school connectedness among both late intervention and no intervention control group students declined from ages 13 to 18 (Hawkins et al., 2001). This same study also showed that increased school connectedness was related to less school misbehavior and risk taking behaviors at 18 years of age.

For some programs, however, longitudinal evaluations showed mixed results. In their initial evaluation of the CDP, Battistich and colleagues (2000) reported a positive impact on reducing alcohol and marijuana use, as well as some delinquency measures. A later evaluation however, which assessed students followed up in middle school, revealed that there was no impact of the program on use of alcohol and other drugs (Battistich et al., 2004). The authors did however indicate that the follow-up sample was of lower risk than those not followed up, meaning that longer term effects may not have been able to be reliably observed. Additionally, other measures included within evaluation of the CDP showed that

while changes in alcohol and drug use were not sustained, students participating in the program in elementary school were engaged in fewer delinquent acts when assessed later in middle school (Battistich et al., 2004).

While several included longitudinal methods for follow-up, each of the programs differed in their target school level or age group. The majority of programs were for elementary schools and students, and while several programs demonstrated an effect on connectedness that persisted into middle or high school; others showed no change, or did not include connectedness as an outcome measure in evaluation. Participation in risk taking behaviors increases dramatically from early to mid-adolescence (Australian Institute of Health and Welfare, 2008), at a time when connectedness to school is decreasing (Monahan, Oesterle & Hawkins, 2010; Whitlock, 2004). There is likely a need for greater support during this period of rapid change, making connectedness interventions targeting this group particularly important.

Theoretical pathway

Many of the positive changes reported in students' risk taking behaviors were discussed as being attributed to increases in school connectedness or bonding as brought about by comprehensive and systematic approaches to schooling targeted through intervention processes (e.g., Battistich et al., 2000). Based on the common theoretical approaches, increasing feelings on belongingness in school was discussed as resulting in increased commitment to the school's pro-social norms and values, including reduced involvement in risk behaviors (e.g., Battistich et al., 2000).

Despite the theoretical bases of these programs, which overall proposed that an increase in school connectedness resulting from the intervention methods would lead to reduced involvement in risk taking behaviors, the majority of the reviewed studies did not include mediation analyses to test this assumption. Primarily, analyses focused on impact of

group allocation (i.e. intervention or control condition) on changes in school connectedness and risk taking behaviors. Reports of intervention impact on school connectedness and risk behavior as two separate variables do not however enable insight into the pathways of risk prevention as theorized within these studies. Greater insight would be provided by mediation analyses, using school connectedness, engagement or bonding as relevant to that study as the mediating variable between group allocation (i.e. intervention or control condition) and risk taking behaviors post-intervention.

Two of the 14 included studies did incorporate mediation analyses to assess the theoretical pathway of prevention. The first, reported by Wenzel and colleagues (2009), tested the mediation effect of school bonding on alcohol use by group, and another, reported by Simons-Morton et al. (2005), looked at the mediating effects of school engagement as well as other variables such as friends' risk behavior and parent expectations. While Wenzel et al. (2009) showed that the impact of the IPSY program on students' alcohol use was mediated by levels of school bonding; Simons-Morton et al. (2005) did not report such mediation effects, due to the overall nonsignificant findings on the school engagement measure.

Implementation fidelity

A number of the reviewed studies revealed that comprehensive program implementation is important for the demonstration of program effects. For example, evaluations of the CDP showed that students in 'high implementation' groups, in which teachers' implementation scores revealed widespread use of the program within schools, showed more positive changes than students in lower implementation groups (Battistich et al., 2000; 2004). This finding supports previous research on program effectiveness, regarding fidelity of implementation. As this research suggests, high-fidelity program implementation is more likely to result in positive participant outcomes, while poor implementation fidelity may lead to wasted financial and personnel resource investment, along with a lower likelihood of

desired participant effects (Fagan, Hanson, Hawkins & Arthur, 2008). Few studies report on fidelity of program implementation; however, the variation in students' results according to teachers' use of the CDP reveals the importance of including a measure of program implementation in process evaluation planning.

Directions for Future Research

Examination of the papers included in this review suggests that there are a number of avenues for future research. For example, the definition of connectedness varied widely across the included studies. This was reflected in the terminology used, which included, for example, caring school communities, school bonding and school engagement. The descriptions of measures also varied across papers. There were, however, some commonalities in subscales, including elements of attachment and commitment to school. Perceptions of a supportive school environment and a liking for school were also elements that were reported and measured across a number of studies (e.g., Battistich et al., 2000; Bond et al., 2004; Hawkins et al., 2001; Wenzel et al., 2009). Some papers also reported the use of items relating to opportunities for involvement in decision making in school (e.g., Battistich et al., 2000; Hawkins et al., 2001). The variety of measurement scales used means we are unable to directly compare the effectiveness of programs on students' connectedness across studies. Additionally, the lack of change found in school connectedness in some studies may have been due to either ineffective intervention programs or measurement issues relating to items used to capture the construct.

Previous review papers reporting on the variability in definitions of connectedness and related measurement have commented on overlaps and confusion regarding the construct, and the need for consensus in both defining and measuring connectedness (Libbey et al., 2004; O'Farrell & Morrison, 2003). For example, while some authors use the same terminology, they may measure the construct differently (O'Farrell & Morrison, 2003). This

lack of consistency leads to issues with interpretation of previous findings and use of these in the development of effective programs, and suggests the need for increased collaboration across disciplines in order to develop and use consistent terminology and item measures.

Some studies were also unable to demonstrate positive program effects on students' school connectedness; for example, the Gatehouse Project (Bond et al., 2004) and Going Places (Simons-Morton et al., 2005). Flay et al. (2001) and Li et al. (2011), in their evaluations of the Positive Action program meanwhile, did not incorporate any measures of school connectedness, despite the fact that enhanced school bonding was theorized to be an important factor in the development of risk behavior.

Within these studies therefore, we are unable to determine the impact of the programs on school connectedness, and in the case of the Gatehouse project, we are unable to determine the factors that led to demonstrated change in students' alcohol use. Additionally, the fact that the majority of studies did not include mediation analysis means that in most cases we are unable to draw conclusions as to the theorized mediating effects of school connectedness on risk behavior change resulting from the programs. Future program evaluations should incorporate such analyses in order to understand the pathway to prevention and the theorized relationships between school factors, connectedness and risk taking behavior.

In many cases, intervention programs also involved widespread whole-of-school system change and multiple components, including parent, teacher and curriculum-based elements, and analyses of program effects did not tease out the impact of different elements on either connectedness or participation in risk behaviors. While we are able to state that, in many cases, multi-component programs had positive impacts on school connectedness and reduced risk taking behavior, we are unable to draw conclusions regarding which of these components were most effective, or whether all components are needed in combination in

order to affect change. Future research may therefore focus on assessing the differential impact of various program components on connectedness and risk behavior, in order to determine the extent and complexity of intervention required to result in positive change.

While the majority of the studies included in this review involved whole-of-school system change strategies, one program, IPSY, involved the implementation of a curriculum-based life skills program along with teacher training in classroom interaction. Evaluation of this program showed a significant impact on school connectedness, as well as on student alcohol use (Wenzel et al., 2009). This research shows that widespread school change as required by other programs may not be necessary in order to impact on connectedness and risk behavior. Future research should also look at the impact of teacher training in connectedness strategies, along with curriculum-based programs for students, on students' connectedness and risk taking, in an attempt to replicate these results and to determine whether these promising findings extend to additional risk behaviors.

This is a particularly important direction for future research, as the implementation of multi-component, whole-of-school system interventions is complex and often difficult. Such implementation requires a long term commitment on behalf of the school and all of its staff, as well as continued dedication to changes in curriculum, program implementation and teaching practices among teachers, who may already feel pressure from various time constraints in their current work. Additionally, to be effective, such programs need active support for widespread school change from the school's administration, as well as integration of all features of the program with the school's stated goals (Fagan & Mihalic, 2003). Maintaining a climate of increased school connectedness may also be increasingly difficult in the context of teacher and administration mobility. Program developers need to find a balance between the comprehensiveness required for a program to be effective, as well as the likelihood of school and staff acceptance of that program, its longer term sustainability, and

its resulting implementation fidelity. There may therefore be future scope for the trial of programs incorporating teacher training in connectedness strategies that is more easily and readily implemented as part of curriculum-based programs.

Conclusions

This review has shown that interventions targeting the school social context can be effective in reducing adolescent risk taking behavior, however that this can be a complex process. Fourteen papers describing seven different programs were found using a systematic search strategy, which evaluated interventions targeting increases in students' connectedness and reductions in student risk behavior. Strategies used in these interventions included widespread school system changes as well as teacher training to alter the classroom level environment through classroom management and interactivity. By taking into account this body of research, it is evident that schools are in a position to make changes and adopt strategies that foster school connectedness among their students and that this can result in reduced risk taking behavior. There were, however, inconsistent results within and between interventions relating to both school connectedness and risk behavior change. Future research needs to ensure consistency across studies in definitions and measurement of connectedness, as well as to understand the elements of comprehensive school programs that lead to adolescent change. There is also scope for research to examine the extent of intervention complexity required to result in change. The results of these studies, however, along with those of previous reviews showing the importance of connectedness in adolescent development (e.g., Maddox & Prinz, 2003; O'Farrell & Morrison, 2003; Jimerson et al., 2003) and in particular, its impact on student risk behavior, show that this is an important area for continued research.

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