ORIGINAL PAPER

Attachment & School Connectedness: Associations with Substance Use, Depression, & Suicidality Among at-Risk Adolescents

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Abstract

Background Research has demonstrated that parent–child attachment security and school connectedness (SC) are protective factors against substance use, depression, and suicidality during adolescence. However, past research has examined these factors independently, and little is known about how attachment security and SC work in conjunction to reduce risk.

Objective The present study examined the moderating role of SC on the relations between parent-adolescent attachment (security, anxiety, and avoidance) and substance use, depression, and suicidality among at-risk adolescents.

Method Using a cross-sectional design, 480 community-based adolescents (60.5% female; $M_{age} = 14.86$) aged 12–18 years self-reported parent-adolescent attachment, adolescent substance use, depression, and suicidality.

Results High levels of attachment security in conjunction with high SC predicted the lowest risk for adolescent substance use. Several sex differences were found: SC significantly moderated the relation between attachment security and depressive symptoms in female adolescents and suicidality in male adolescents. Results also revealed that the moderating of role of SC differed in relation to attachment anxiety versus attachment avoidance for female versus male adolescents.

Conclusion Findings point to the importance of testing associations between multiple dimensions of attachment and SC on several well-established mental health outcomes in a sample of high-risk adolescents.

Keywords Attachment · School connectedness · Substance use · Depression · Suicidality

Introduction

Attachment is the biologically based bond between a caregiver and a child designed to promote survival (Ainsworth, 1973; Bowlby, 1982, 1969). In the presence of this bond, the caregiver provides a secure base for the child, allowing them to take risks, develop,

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and explore. In addition, attachment security provides a sense of safety (i.e., safe haven) that buffers children against overwhelming distress. Still fulfilling its function as a safe haven and secure base, attachment continues to be relevant beyond childhood and into adolescence. Most research on attachment and its relations with healthy development has focused on infants and young children; however, there is a growing body of evidence pointing to the importance of parent–child attachment security for promoting adolescent health (Barone et al., 2021). Adolescents face unique developmental challenges, including rapid biological changes associated with pubertal maturation, onset of sexuality, increased social and academic demands, and consolidation of identity (Kanwar, 2020; Kerpelman & Pittman, 2018). During this developmental period, adolescents also spend increasingly more time away from their parents, seeking proximity to friends and romantic partners in a range of social contexts including school. Despite these changes, relationships with parents continue to play a significant role in adolescents' development by remaining available and responsive and providing a safe and secure environment. The quality of these relationships has been reliably associated with a reduced vulnerability for adolescent mental health problems and risky behavior (O'Connor et al., 2019; Sierra Hernandez & Moretti, 2019). By contrast, attachment insecurity results from unavailable, insensitive, and/or inconsistent parenting, with attachment anxiety emerging from inconsistent and unpredictable parenting behaviors and attachment avoidance emerging from unavailable or unresponsive parenting. Attachment insecurity is associated with poorer behavioral and socio-emotional functioning during adolescence (Brumariu & Kerns, 2010; Kens & Brumariu, 2014).

There is a robust association of attachment security with a lower risk for substance use among adolescents (Hayre et al., 2019; McLaughlin et al., 2016) and insecure attachment is associated with an increased risk for substance use (Lindberg & Zeid, 2017; Schindler & Bröning, 2015). Recently, Cornellà-Font et al. (2020) found that attachment security was related to lower rates of substance use and addiction in a sample of 668 high-school students (13–19 years). Consistent with previous research (e.g., Pierrehumbert et al., 2002; Thorberg & Lyvers, 2010), the authors also found that attachment insecurity was linked to difficulties in emotion regulation, which has been implicated in adolescent substance use. There is strong evidence that attachment problems predate the onset and increased use of substances. Fairbairn et al.'s (2018) meta-analysis of 665 effect sizes, representing 56,721 participants from 34 samples, revealed a pattern of "temporal precedence" of attachment, where the presence of attachment insecurity preceded later increases in substance use. Importantly, some studies have pointed to a differential association between anxious versus avoidant attachment and substance use, where attachment avoidance but not attachment anxiety has been linked to adolescent substance use (Fairbairn et al., 2018; Hayre et al., 2019).

Attachment security has also been associated with lower rates of depressive symptoms among adolescents (Agerup et al., 2015; Al-Yagon et al., 2016), while attachment insecurity is linked to higher levels of depression (Keresteš et al., 2019; Madigan et al., 2016; Moretti et al., 2015). In a longitudinal study of typically developing high-school teens, Agerup et al. (2015) found that parent–child attachment insecurity was associated with an increased risk for depression in adolescence and adulthood. Unlike the unique association of attachment avoidance but not attachment anxiety with substance use, both aspects of attachment insecurity have been associated with depression from infancy to adolescence (Khan et al., 2020; Zheng et al., 2020).

Consistent with the literature on the association between attachment insecurity and adolescent depression, research also shows that attachment insecurity is associated with the presence of suicidal thoughts and behaviors in adolescents (Falgares et al., 2017; Zortea

et al., 2019). Evidence also suggests that both attachment anxiety and avoidance play a role in suicidality. For instance, Sheftall and colleagues (2014) compared a clinical sample who had attempted suicide and typically developing adolescents who had not done so. Those who had attempted suicide had higher attachment avoidance and attachment anxiety with their parents than those who had never been suicidal.

Beyond the role of parent–child attachment in buffering risk for adolescent mental health problems, school connectedness (SC) has significantly impacted adolescent health and wellbeing (Lester et al., 2013). SC has been operationalized as having three distinct components – interpersonal relationships, relationship to the school, and attitudes towards school importance (Barber & Schluterman, 2008; García-Moya et al., 2019). When teased further, SC includes social affiliations, school belonging, attitudes toward school importance, and a supportive learning environment (Barber & Schluterman, 2008; García-Moya et al., 2019; Marraccini & Brier, 2017). Social affiliations are best described as feeling cared for and respected by the adults in the school; attitudes about school importance include caring about and trying to excel within the classroom; and supportive learning environments believing one is treated fairly, with appropriate expectations and clear instructions. Adolescents who feel connected to their school are more likely to earn high grades, feel supported, engage in more prosocial behaviors, and complete more years of schooling (Oldfield et al., 2016; Pate et al., 2017). Furthermore, if adolescents feel connected to their school, emotional distress is less likely to affect their educational attainment and school performance (Pate et al., 2017). For example, a research study by Oldfield et al. (2018) found that SC was a significant predictor of mental health resilience and an increased sense of belonging, self-identity, prosocial skills, and academic success.

In contrast, adolescents who feel disconnected from school are less likely to do well academically, feel less supported by teachers and peers, feel less capable of connecting with others through prosocial behaviors, are at risk of developing mental health problems, and are more likely to skip school and potentially drop-out (Hancock et al., 2018; Keppens & Spruyt, 2019). One seminal longitudinal study found that adolescents who endorsed low SC were more likely to experience interpersonal conflicts in the early years of schooling and were at greater risk for mental health problems and substance use in the later years (Bond et al., 2007). In contrast, high SC was linked with good mental health outcomes and prosocial connectedness. More specifically, higher SC was associated with lower substance use (Weatherson et al., 2018), and fewer depressive symptoms (Joyce & Early, 2014). In addition, higher SC provided direct and indirect protective effects in reducing suicidal thoughts and behaviors among adolescents (Langille et al., 2015).

Few studies have examined the moderating role of SC on the relations between attachment and depression (Shochet et al., 2008), or attachment and mental health outcomes in general (Oldfield et al., 2016). Both studies found that SC did not moderate these relations. Oldfield et al., (2016) concluded that adolescent attachment deficiencies cannot be overcome or compensated by school connectedness.

Research has shown that adolescents who report low attachment security with their parents are more likely to use substances, and experience depression and suicidality. While SC is an established protective factor against academic, social, emotional, and behavioral difficulties in adolescence, its absence can be a risk factor for substance use, depressive symptoms, and suicidality. Despite the availability of research highlighting the importance of parent–child attachment and SC as determinants of adolescent socio-emotional health, there is limited research on how attachment and SC may operate in conjunction to influence adolescents' experience of substance use, depressive symptoms, and suicidality. Overall, researchers have suggested that attachment

security and SC may each work to promote positive mental health outcomes (e.g., Old-field et al., 2016). It might be possible that SC moderates the impact of attachment insecurity, making up for deficits in care and support which adolescents experience in their relationships with their parents. Some early evidence exists supporting this claim. Engh et al. (2018) compared children and adolescents in foster care to those in the care of their birth parents concerning the association between school attachment and school achievement. Those youth in foster care had poorer school achievement than those residing with birth parents when their connection to school was weak. However, there was virtually no difference in achievement between those in foster care versus those with birth parents when their school connection was strong. In other words, SC appeared to compensate for the negative effects of placement in foster care on school achievement.

Current Study

Few studies have examined the role that attachment plays in conjunction with SC on adolescent development. Thus, the current study places an extra emphasis on the parent-adolescent attachment relationship because attachment is an essential requirement between parents and their teens for the benefits of SC to exist. Based on this preliminary evidence, the present study examined the direct relations between attachment (security, anxiety, avoidance) and SC with adolescent substance use, depression, and suicidality, as well as the moderating role of SC on the associations between attachment and these outcomes. Therefore, we predicted that attachment security would be negatively related to the number of substances used, depression, and suicidality. We also hypothesized that higher SC would be negatively associated with these outcomes. In addition to examining the role of attachment security in these predicted relations, we also examined each hypothesis in relation to each dimension of attachment insecurity, namely attachment avoidance and attachment anxiety. This is especially important given previous research has shown that attachment avoidance is particularly important in risk for adolescent substance use (Fairbairn et al., 2018; Hayre et al., 2019), whereas both attachment anxiety and avoidance are important in risk for adolescent depression and suicidality (Khan et al., 2020; Zheng et al., 2020; Zortea et al., 2019). As part of these analyses, we anticipated that high SC would mitigate the association between these two aspects of attachment insecurity and the adolescent functioning. For example, if parent-adolescent insecurity is high, this raises risk of maladaptive behaviors and difficulty adjusting to struggles associated with adolescence, but strong SC can act as a buffer against this risk by introducing the possibility of adult mentors such as teachers, counsellors, positive peer groups, and a sense of self-work and social connectedness (Goldstine-Cole, 2020; Law et al., 2013). Finally, primary analyses were completed with the full sample, and secondary analyses were completed separately for female and male adolescents (using terminology consistent with our protocol) to examine any sex differences. Past research regarding sex differences have been mixed and equivocal, particularly for SC throughout adolescence. For example, some studies suggest that SC decreases similarly across boys and girls (Loukas et al., 2016; Wang & Dishion, 2012). Others indicated that decreases are more prevalent for girls than boys (Bolland et al., 2016; Simons-Mortons & Chen, 2009). Thus, we had no directional a priori hypotheses for sex differences and these analyses were exploratory.

Methods

Participants and Procedure

Caregivers were referred for services by community mental health agencies, schools, or hospitals due to concerns about serious mental health and behavioral problems in their child. Pre-treatment data was used from parents ($N=814$; 86.1% birth parents; 85.3% maternal figures [e.g., biological mother, adoptive mother, stepmother, foster mother, female relative, and other]; age 23–73, $M_{age}=43.86$, $SD=8.13$) who enrolled in a parenting program (Connect; Moretti et al., 2018) and consented to participation in the study. Exclusion criteria included the presence of severe mental health disorders (psychosis; schizophrenia) and low intellectual functioning (IQ < 70). Adolescents of participating parents who wished to participate in the study provided assent ($N=608$; 56.6% female; age 7–19, $M_{age}=13.98$, $SD=2.36$). Although all caregivers from a family were invited to participate in the intervention, mothers vastly outnumbered fathers; thus, we selected maternal over paternal figures for analyses to increase generalizability to other research on parenting programs that typically rely on maternal reports. Parent education was reported by 753 participants and ranged from partial (8.8%) or full high school completion (17.8%), partial (16.2%) or full college/university completion (45.9%), and postgraduate education ($n=28$). In the present study, only youth self-report data were used. Given the low base rate of substance use for children under the age of 12 (Boak et al., 2020), only youth ages of 12 and 18 were included in the sample for this study ($N=480$; 60.5% female; $M_{age}=14.86$, $SD=1.59$). Of youth participating in the study, most lived in one caregiver (41.8%) or two caregiver households (44.7%), with a smaller proportion living in blended caregiver homes (13.5%; e.g., various combinations of caregivers). Most participants (89%) reported currently attending school or on summer break. Youth ethnicity, as reported by parents, was predominantly white (63.9%), Indigenous (14.4% inclusive of First Nations, Métis, Inuit), Asian (5.4%), and 8.0% were categorized as mixed ethnicity and other infrequent responses. No ethnicity information was reported for 8.4% of the sample. All research protocols and procedures received approval from Simon Fraser University Office of Research Ethics [#2011s0284]. Parents and youth each received a $25 honorarium for completing the questionnaire. Given pre-treatment data were used, this study is of correlational design. The authors report no conflicts of interest. Data are available by contacting the last author.

Measures

Attachment

The Adolescent Attachment Anxiety and Avoidance Inventory (AAAAI; Moretti et al., 2015) is a 36-item measure of adolescent parent attachment adapted from the Experiences in Close Relationships Scale (ECR; Brennan et al., 1998). Consistent with the ECR, superordinate factors tapping attachment security, attachment anxiety, and attachment avoidance have been supported (Moretti & Obsuth, 2009; Moretti et al., 2015). The present study adopted a previously modified version of the AAAAI, which includes 16 items with the highest factor loadings from the original scale, such as "I prefer not to show my parent how I feel deep down" and "I need a lot of reassurance that I am loved by my parent". Items were rated using a 7-point scale ranging from 1 "*Strongly Disagree*" to 7 "*Strongly Agree*".

Past research has demonstrated excellent factor structure and convergent validity of this modified scale (Craig et al., 2020; Goulter et al., 2019; Moretti & Obsuth, 2009; Moretti et al., 2015; Pasalich et al., 2021). Internal consistency was good to excellent in the present sample for total attachment security ($\alpha = 0.86$), attachment avoidance ($\alpha = 0.90$), and anxiety ($\alpha = 0.84$).

School Connectedness

The School Connectedness Scale (SCS; McNeely et a., 2002; Resnick et al., 1997) was originally part of the National Longitudinal Study of Adolescent Health Study (Add Health; McNeely et al., 2002; Resnick et al., 1997). This scale assesses various aspects of children's school experiences, which is measured using five items scored on a 5-point Likert scale. Items include "you feel close to people at school", "you feel part of the school", and "the teachers at school treat you fairly". Responses are summed to create a scale ranging from 5 to 25. This scoring scheme resembles previously scoring of this measure used in previously published work (e.g., McNeely & Falci, 2004; McNeely et al., 2002; Pate et al., 2017). In the present study, the SCS showed good internal consistency ($\alpha = 0.71$).

Substance Use

Substance use was assessed with four selected items from the Tobacco, Alcohol, and Drugs Survey-Version 3 (Bureau of Labor Statistics, US Department of Labor, 2002), a 57-item instrument based on measures from the National Longitudinal Study of Adolescent Health (Bureau of Labor Statistics, US Department of Labor, 2002). Items tapped frequency of cigarette smoking, alcohol consumption, cannabis smoking, and use of other substances (e.g., cocaine, heroin, ecstasy) over the past 30 days. Youth reported the number of days in the past month they each substance through a 7-point scale (0 = '0 days'; 1 = '1–2 days'; 2 = '3–5 days'; 3 = '6–9 days'; 4 = '10–19 days'; 5 = '20–29 days'; 6 = 'all 30 days'). For this study, items were re-coded (0 = 'no use'; 1 = 'use') for each substance and then summed across all four substances to assess the total number of different substances used during the past 30 days (0 = 'no use'; 1 = '1 substance used'; 2 = '2 substances used'; 3 = 3 substances used'; 4 = 'all substances used' in the past 30 days). Internal consistency was estimated at 0.72 in this study.

Depression and Suicidality

The Brief Child and Family Phone Interview (BCFPI; Cunningham et al., 2000) is a standardized assessment that measures children's functioning in six domains: regulation of attention, cooperativeness, conduct problems, separation anxiety, anxiety/depression, and dysthymia (Cunningham et al., 2009). In the present study, depression was assessed with 6-items (e.g., "feel hopeless" and "have no interest in usual activities") and suicidality with 3 items (e.g., "expressed thoughts of wanting to end your life" and "made plans to end your life"). Previous studies have shown estimates of internal-consistency reliability that exceed 0.80 for all BCFPI subscales (Boyle et al., 2009; Goulter et al., 2021). In this sample, internal reliability for the depression and suicidality subscales were 0.90 and 0.86, respectively. Age and sex-based *T*-scores are available for this measure to detect clinical (t-score > 70) and subclinical (t-score > 65 and < 70) symptom levels. In the current study, 32.7% ($N = 157$) reported clinically significant depression,

and a further 9.0% ($N = 43$) of youth reported subclinical depression. Statistical analyses in the present study relied on raw score data given the scoring of both depression and suicidality.

Analytic Approach

Descriptive statistics were conducted in SPSS version 24; all other analyses were conducted using M*plus* 8.0 (Muthén & Muthén, 2017). Missing data were handled using full information maximum likelihood (FIML) estimation (Little & Rubin, 1987). There was low missingness across the study variables (full sample: 4.0–5.9%; male subsample: 2.8–5.3%; female subsample: 3.1–5.2%). Analyses were conducted using 10,000 bootstrapped samples, and statistical significance was determined by 95% bias-corrected bootstrapped confidence intervals (CI) that do not contain zero. For each dependent variable (i.e., substance use, depression, and suicidality), a direct effect model and a moderation model were conducted separately. Attachment security and SC were first modelled as predictors in the direct and moderation models for each dependent variable. These analyses were then followed by models in which attachment avoidance and attachment anxiety were used in place of attachment security. Models were conducted for the full sample and separately for male and female adolescents. The predictor variables were mean-centred, and the interaction term was created from the product of each of the centered attachment variables with the centred SC variable. Significant interaction effects were assessed using a post-hoc simple slope analysis to examine the relations between the predictor (attachment) and outcome variables at lower (-1*SD*), moderate (mean), and higher levels (+1*SD*) of the moderating variable (SC).

Results

Descriptive Statistics

Bivariate correlations and descriptive statistics of study variables are shown for the full sample and male and female subsamples in Tables 1 and 2, respectively. Based on the full sample, most youth (87.1%) reported experiencing at least some degree of depressive symptoms in the previous 6 months; 54.8% of youth reported experiencing at least some degree of suicidality in the previous 6 months, and 38.7% of youth reported using at least some substances within the past 30 days. Specifically, 23% of youth reported cigarette use; 25% reported alcohol use; 26% reported cannabis use; and 6% reported 'other substance' use within the past 30 days (see Table 3).

To contextualize the mental health concerns of this sample, we also examined elevated (as defined as > 60 BCFPI *T*-scores), subclinical (> 65 BCFPI *T*-scores), and clinical (> 70 BCFPI *T*-scores) levels of externalizing and internalizing psychopathology. 52.7% of participants reported elevated levels of externalizing psychopathology, and 46.0% reported elevated internalizing psychopathology. 35.4% participants endorsed subclinical externalizing psychopathology, and 33.1% endorsed subclinical internalizing psychopathology. Finally, 23.3% reached the clinically significant range for externalizing psychopathology, and 20.8% for internalizing psychopathology.

Table 1 Descriptive statistics and correlations between study variables for full sample

Variable	1	2	3	4	5	6	7	M	SD	Range
1. Attachment security	1							4.57	1.08	1.19–7.00
2. Attachment avoidance	–86***	1						3.97	1.47	1.00–6.89
3. Attachment anxiety	–.67***	.20***	1					2.73	1.28	1.00–7.00
4. School connectedness	.33***	–.30***	–.20***	1				16.49	4.61	3.00–25.00
5. Substance use	–.19**	.23***	.05	–.13**	1			.83	1.23	.00–4.00
6. Depression	–.45***	.37***	.33***	–.47***	.22***	1		5.40	3.61	.00–12.00
7. Suicidality	–.36***	.31***	.25***	–.29***	.26***	.70***	1	1.52	1.82	.00–6.00

Note. $* p < .05$, $** p < .01$, $*** p < .001$

Table 2 Descriptive statistics and correlations between study variables for male and female samples

Variable	1	2	3	4	5	6	7	Male Sample			Female Sample		
								M	SD	Range	M	SD	Range
1. Attachment security	1	−.85***	−.63***	.42***	−.13	−.42***	−.31***	4.73	.96	2.06–7.00	4.47	1.14	1.19–7.00
2. Attachment avoidance	−.87***	1	.13	−.36***	.19*	.30***	.25**	3.86	1.34	1.00–6.67	4.04	1.54	1.00–6.89
3. Attachment anxiety	−.68***	.23***	1	−.28***	−.03	.35***	.22**	2.51	1.17	1.00–6.14	2.88	1.32	1.00–7.00
4. School connectedness	.27***	−.26***	−.14*	1	.14	−.47***	−.29***	16.97	4.51	3.00–25.00	16.22	4.61	4.00–25.00
5. Substance use	−.21**	.24**	.06	−.11	1	.22*	.27*	.63	1.11	.00–4.00	.97	1.30	.00–4.00
6. Depression	−.45***	.40***	.30***	−.47***	.18***	1	.65***	4.04	3.26	.00–12.00	6.24	3.55	.00–12.00
7. Suicidality	−.36***	.33**	.23*	−.27***	.23***	.68***	1	.77	1.36	.00–6.00	1.97	1.90	.00–6.00

Note. Correlation coefficients for male youth above the diagonal and for female youth below the diagonal. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3 Frequency of adolescent substance use in the past 30 days

Days	Cigarette Use		Alcohol use		Cannabis use		Other substance use	
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent
0	350	72.9	337	70.2	335	69.8	425	88.5
1–2	22	4.6	53	11.0	32	6.7	16	3.3
3–5	15	3.1	36	7.5	16	3.3	7	1.5
6–9	8	1.7	23	4.8	16	3.3	4	0.8
10–19	16	3.3	5	1.0	14	2.9	1	0.2
20–29	12	2.5	3	0.6	18	3.8	0	0
All 30	36	7.5	1	0.2	27	5.6	3	0.3
Missing	21	4.4	22	4.6	22	4.6	24	5.0
Total	480	100	480	100	480	100	480	100
Mean	.91		.51		.92		.14	
Std. Dev	1.89		1.02		1.81		.65	

Structural Models

All models were 'just identified' meaning the number of observed parameters was equal to the number of estimated parameters with degrees of freedom $=0$.[1]

Substance Use

Attachment security was significantly and negatively associated with substance use in the full sample ($\beta=-0.17$), and among female adolescents ($\beta=-0.19$). While also negative, this association was not significant among male adolescents (see Table 4). SC was not associated with substance use in the full sample nor in the male and female subsamples. Testing moderation effects, the interaction between attachment security and SC was not significant in the full sample or across male and female youth. Examining attachment dimensions revealed that attachment avoidance was associated with greater number of substances used in the full sample ($\beta=0.21$) and for both the male ($\beta=0.16$) and female subsamples ($\beta=0.22$); however, the interaction between attachment avoidance and SC was not significant across the full sample or the male and female subsamples. Finally, attachment anxiety was not associated with number of substances used across the full sample or the male and female subsamples. Testing the moderation effect also determined that no interaction effect was present.

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[1] 3-way interaction models [sex * attachment security/insecurity (attachment avoidance or attachment anxiety) * SC] were examined and the results closely mirrored our findings. Specifically, results were significant for sex * attachment security * SC and suicidality ($\beta=-.08$, small effect), but not for depression and substance use. Furthermore, results were significant for sex * attachment avoidance * SC and suicidality ($\beta=.04$, small effect), but not for sex * attachment anxiety * SC and suicidality.

Table 4 Direct and moderation effects of attachment and school connectedness on substance use

Model	Full Sample			Male Sample			Female update		
	B (SE)	β	95% CI	B (SE)	β	95% CI	B (SE)	β	95% CI
Direct Effects (Covaried)									
Attachment security	−.192(.053)	−.168	−.278, −.104*	−.092(.100)	−.079	−.259, .070	−.214(.065)	−.189	−.321, −.108*
School connectedness	−.019(.013)	−.072	−.042, .003	−.025(.023)	−.102	−.063, .013	−.018(.018)	−.064	−.047, .011
Attachment avoidance	.173(.043)	.205	.100, .243*	.128(.066)	.155	.022, .243*	.189(.056)	.224	.096, .281*
Attachment anxiety	−.009(.050)	−.009	−.090, .075	−.089(.084)	−.093	−.225, .050	−.001(.062)	−.001	−.102, .102
School connectedness	−.018(.014)	−.067	−.040, .004	−.026(.024)	−.106	−.064, .013	−.016(.018)	−.057	−.045, .014
Moderation Effects									
Attachment security	−.191(.053)	−.169	−.280, −.106*	−.101(.104)	−.089	−.274, .069	−.180(.056)	−.158	−.308, −.096*
School connectedness	−.020(.013)	−.076	−.042, .001	−.027(.023)	−.115	−.066, .009	−.054(.062)	−.012	−.043, .015
Interaction	.002(.011)	.009	−.016, .022	−.007(.019)	−.032	−.038, .025	.010(.016)	.041	−.014, .039
Attachment avoidance	.169(.041)	.202	.101, .236	.147(.068)	.182	.039, .264*	.178(.052)	.212	.091, .262*
School connectedness	−.020(.013)	−.074	−.041, .002	−.025(.021)	−.105	−.059, .009	−.016(.018)	−.063	−.044, .014
Interaction	−.001(.009)	−.006	−.016, .013	−.007(.014)	−.043	−.032, .015	−.001(.011)	−.006	−.021, .017
Attachment anxiety	.022(.047)	.023	−.055, .101	−.088(.087)	−.076	−.212, .062	.033(.060)	.034	−.067, .130
School connectedness	−.035(.013)	−.131	−.057, −.014*	−.148(.095)	−.033	−.079, −.001*	−.028(.018)	−.098	−.056, .003
Interaction	.003(.010)	.014	−.015, .020	.137(.105)	.024	−.008, .060	−.012(.014)	−.054	−.036, .012

Lines indicate a separation of models; * indicates significance

Depression

Attachment security and SC were negatively associated with symptoms of depression in the full sample ($\beta=-0.33$ and -0.37, respectively) and in both male ($\beta=-0.27$ and -0.35, respectively) and female ($\beta=-0.35$ and -0.38, respectively; see Table 5) samples. Testing moderation effects, the interaction between attachment security and SC was not significant in the full sample or the male subsample; however, there was a significant interaction in the female subsample ($\beta=-0.11$; see Fig. 1). Post-hoc simple slope analysis determined the simple slope was significant at all three levels (i.e., -1SD, low; mean, moderate; $+1SD$, high) of SC (see Table 7). This indicates that the association between attachment security and depression became increasingly negative with increasing levels of SC in the female subsample.

Examining attachment dimensions revealed that attachment avoidance and attachment anxiety were positively associated with symptoms of depression in the full sample ($\beta=0.21$ and 0.22, respectively), and in both male ($\beta=0.15$ and 0.23, respectively) and female ($\beta=0.26$ and 0.19, respectively) subsamples. The interaction between attachment avoidance and SC was not significant in the full sample nor in male and female subsamples. In contrast, there was a significant interaction between attachment anxiety and SC for the full sample ($\beta=0.08$; see Fig. 2) and the female subsample ($\beta=0.07$; see Fig. 3). Post-hoc simple slope analysis determined the simple slope was significant at all three levels of SC (see Table 7). This indicates that the association between attachment anxiety and depression became increasingly positive with increasing levels of SC in the full sample and the female subsample. This moderation effect was not found for the male subsample.

Suicidality

Attachment security and SC were negatively associated with suicidality in the full sample ($\beta=-0.30$ and -0.19, respectively) and in both male ($\beta=-0.22$ and -0.19, respectively) and female ($\beta=-0.32$ and -0.11, respectively) subsamples (see Table 6). Testing moderation effects, the interaction between attachment security and SC was not significant in the full sample or the female subsample. However, there was a significant interaction in male subsample ($\beta=0.24$; see Fig. 4). The post-hoc simple slope analysis determined the simple slope was significant at the low and moderate levels of SC, but not at the high level (see Table 7). This indicates that the association between attachment security and suicidality became increasingly negative across low and moderate levels of SC in the male subsample, but not at high levels of SC.

Finally, examining attachment dimensions revealed that attachment avoidance and attachment anxiety were positively associated with suicidality in the full sample ($\beta=0.22$ and 0.17, respectively), and both male ($\beta=0.16$ and 0.15, respectively) and female ($\beta=0.25$ and 0.15, respectively) subsamples. There was a significant interaction between attachment avoidance and SC among male youth ($\beta=-0.18$; see Fig. 5), but not in the full sample nor the female subsample. Post-hoc simple slope analysis determined the simple slope was significant at the low and moderate levels of SC, but not at the high level (see Table 7). This indicates that the association between attachment avoidance and suicidality became increasingly positive across low and moderate levels of SC in the male subsample, but not at high levels of SC. In contrast, interaction between attachment anxiety and SC was not significant across samples.

Table 5 Direct and moderation effects of attachment and school connectedness on depression

Model	Full Sample			Male Sample			Female update		
	B (SE)	β	95% CI	B (SE)	β	95% CI	B (SE)	β	95% CI
Direct Effects (Covaried)									
Attachment security	−1.091(.145)	−.327	−.396, −.255*	−.907(.236)	−.267	−1.274, −.498*	−1.083(.175)	−.349	−1.361, −.785*
School connectedness	−.288(.032)	−.368	−.433, −.301*	−.253(.048)	−.350	−.330, −.253*	−.288(.043)	−.376	−.358, −.218*
Attachment avoidance	.523(.107)	.212	.342, .697*	.353(.160)	.145	.084, .613*	.596(.130)	.258	.378, .809*
Attachment anxiety	.616(.114)	.217	.424, .802*	.644(.191)	.232	.328, .955*	.502(.142)	.187	.266, .732*
School connectedness	−.288(.033)	−.367	−.340, −.234*	−.247(.049)	−.343	−.326, −.166*	−.289(.043)	−.376	−.358, −.218*
Moderation Effects									
Attachment security	−1.080(.144)	−.324	−1.318, −.844*	−.981(.265)	−.288	−1.404, −.535*	−1.042(.172)	−.336	−1.317, −.750*
School connectedness	−.287(.031)	−.371	−.337, −.233*	−.259(.049)	−.361	−.342, −.178*	−.302(.043)	−.398	−.368, −.302*
Interaction	−.033(.027)	−.048	−.076, .011	.028(.042)	.042	−.047, .092	−.071(.038)	−.106	−.131, −.071*
Attachment avoidance	.597(.109)	.243	.413, .772*	.410(.178)	.167	.113, .704*	.655(.130)	.285	.435, .655*
School connectedness	−.316(.033)	−.407	−.370, −.262*	−.297(.050)	−.409	−.379, −.297*	−.310(.043)	−.408	−.378, −.236*
Interaction	.025(.020)	.050	−.008, .058	−.003(.027)	−.007	−.048, .043	.047(.028)	.094	−.002, .092
Attachment anxiety	.713(.117)	.252	.521, .904*	.648(.195)	.231	.329, .969*	.245(.054)	.654	.410, .889*
School connectedness	−.329(.031)	−.423	−.380, −.329*	−.289(.054)	−.398	−.377, −.202*	−.451(.050)	−.342	−.409, −.270*
Interaction	.050(.023)	.081	.011, .087*	.009(.041)	.015	−.050, .084	.116(.055)	.068	.016, .120*

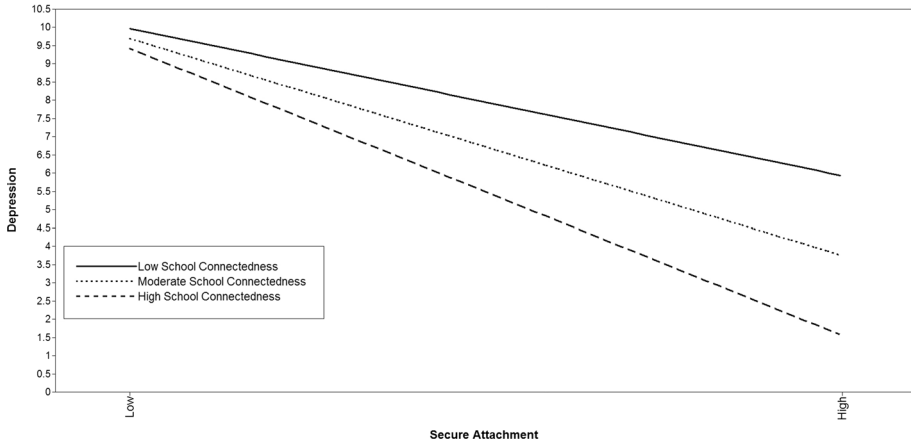*Note.* Lines indicate a separation of models; * indicates significance

Fig. 1 Interaction Effect between Attachment Security and School Connectedness on Depression in the Female Sample.Note. Simple slopes for 1SD below the mean of SC, the mean of SC, and 1SD above the mean of SC; the X-axis "low" refers to the "min", and the "high" refers to the "max" of attachment security
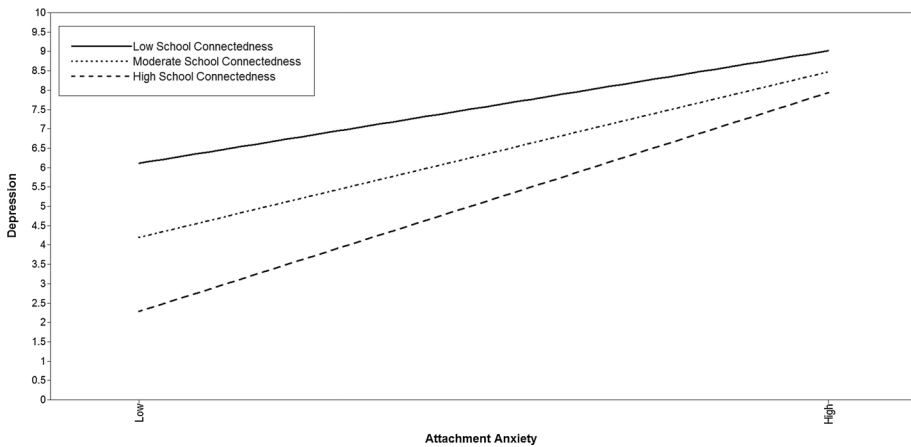

Fig. 2 Interaction effect between attachment anxiety and school connectedness on depression in the full sample. *Note*. Simple slopes for 1SD below the mean of SC, the mean of SC, and 1SD above the mean of SC; the X-axis "low" refers to the "min", and the "high" refers to the "max" of attachment anxiety

Discussion

The purpose of the present study was to examine the relations between adolescent attachment (security, avoidance, and anxiety), SC, and substance use, symptoms of depression, and suicidality. In addition, we aimed to determine whether SC moderates the association between attachment and these outcomes. We also explored sex differences in these associations. Overall, our findings showed that attachment security and higher SC predicted lower levels of substance use, symptoms of depression, and
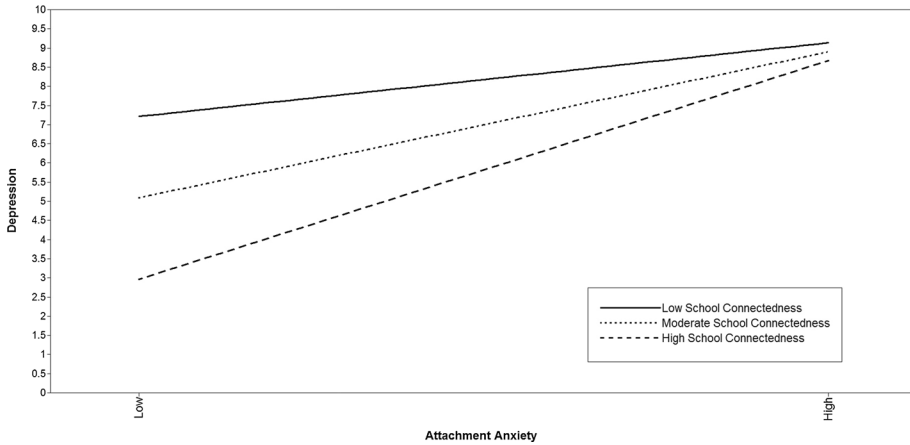
Fig. 3 Interaction effect between attachment anxiety and school connectedness on depression in the female samplenote. Simple slopes of for 1SD below the mean of SC, the mean of SC, and 1SD above the mean of SC; the X-axis "low" refers to the "min", and the "high" refers to the "max" of attachment anxiety

suicidality among teens. We also found distinct associations with attachment avoidance and anxiety, and across male and female subsamples.

Regarding substance use, we did not identify any significant interaction between attachment security, attachment avoidance or anxiety, and SC. However, consistent with prior research (e.g., Fairbairn et al., 2018; Hayre et al., 2019), we found that attachment avoidance, but not attachment anxiety, was significantly associated with higher levels of substance use for the full sample and the male and female subsamples. Previous research has shown that adolescent attachment avoidance is associated with externalizing problems, including impulsivity and conduct disorder symptoms, potentially increasing exposure to contexts in which adolescents use substances (Schindler & Bröning, 2015). Adolescent attachment avoidance has also been linked with a lack of trust in parents and hesitance to seek out and rely on parents for support and guidance, thus reducing opportunities for parental monitoring. In contrast, adolescents with high levels of attachment anxiety worry more about their parents' approval and acceptance (Falgares et al., 2017) and tend to seek parental support and guidance. As a result, they may be less likely to participate in externalizing behaviors such as substance use. Contrary to predictions, SC did not moderate the association between attachment security, attachment avoidance or anxiety, and the number of substances used in this sample of high-risk adolescents. It is possible that insecure parent–child attachment plays a unique role in adolescent vulnerability to substance use, perhaps setting off a cascade of social interactions with at-risk youth which are not mitigated by SC.

As predicted, we found that attachment security and SC were each negatively associated with depression symptoms, and these relations were significant in the full sample and for the male and female subsamples. However, SC did not moderate the relations between attachment security and depression symptoms among male youth, but moderation was found for the female subsample (small effect). Specifically, attachment security negatively predicted depression symptoms at all levels of SC among female adolescents. Similarly, attachment anxiety positively predicted depression symptoms at all levels of SC in the full sample and among female adolescents. Collectively, these novel

Table 6 Direct and moderation effects of attachment and school connectedness on suicidality

Model	Full Sample			Male Sample			Female Sample		
	B (SE)	β	95% CI	B (SE)	β	95% CI	B (SE)	β	95% CI
Direct Effects (Covaried)									
Attachment security	−.497(.078)	−.296	−.626, −.368*	−.317(.097)	−.224	−.481, −.162*	−.524(.096)	−.316	−.682, −.364*
School connectedness	−.075(.019)	−.191	−.106, −.043*	−.058(.029)	−.191	−.107, −.010*	−.077(.024)	−.186	−.114, −.037*
Attachment avoidance	.266(.060)	.215	.168, .364*	.164(.068)	.162	.052, .274*	.306(.076)	.248	.181, .431*
Attachment anxiety	.240(.067)	.169	.129, .348*	.170(.097)	.147	.014, .328*	.215(.085)	.150	.076, .355*
School connectedness	−.075(.019)	−.190	−.105, −.043*	−.055(.030)	−.184	−.107, −.055*	−.076(.023)	−.186	−.114, −.037*
Moderation Effects									
Attachment security	−.528(.079)	−.316	−.661, −.401*	−.461(.104)	−.324	−.638, −.295*	−.515(.096)	−.310	−.666, −.350*
School connectedness	−.071(.018)	−.182	−.099, −.038*	−.063(.029)	−.210	−.113, −.016*	−.078(.023)	−.191	−.115, −.038*
Interaction	.017(.016)	.049	−.008, .044	.065(.022)	.235	.026, .097*	−.010(.023)	−.027	−.044, .030
Attachment avoidance	.308(.061)	.250	.209, .411*	.241(.078)	.235	.105, .362*	.330(.076)	.268	.202, .452*
School connectedness	−.082(.018)	−.210	−.111, −.051*	−.064(.030)	−.211	−.116, −.018*	−.083(.023)	−.204	−.118, −.044*
Interaction	−.010(.012)	−.039	−.030, .010	−.036(.017)	−.180	−.063, −.007*	.006(.018)	.023	−.023, .034
Attachment anxiety	.302(.069)	.213	.188, .415	.198(.101)	.169	.030, .317*	.297(.086)	.207	.152, .438*
School connectedness	−.096(.019)	−.248	−.128, −.065	−.083(.035)	−.273	−.438, −.091*	−.102(.024)	−.251	−.140, −.061*
Interaction	.006(.015)	.019	−.019, .030	−.024(.030)	−.102	−.288, .137	.020(.019)	.063	−.012, .050

Lines indicate a separation of models; * indicates significance
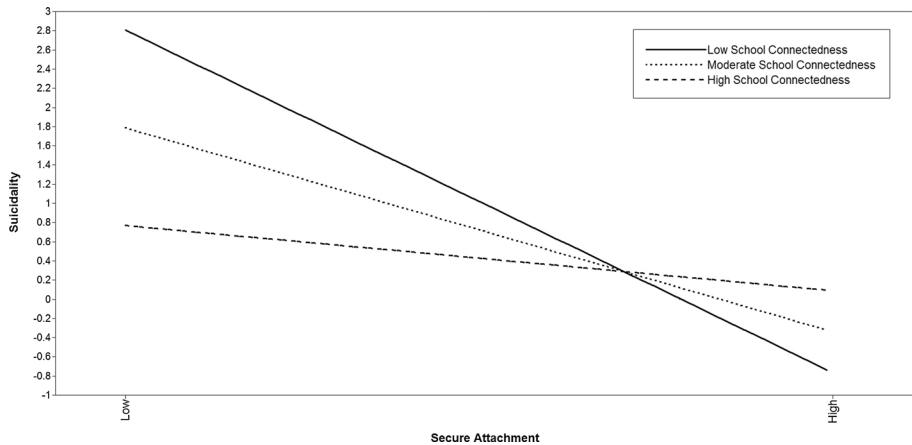
Fig. 4 Interaction effect between attachment security and school connectedness on suicidality in the male sample. *Note*. Simple slopes of for 1SD below the mean of SC, the mean of SC, and 1SD above the mean of SC; the X-axis "low" refers to the "min", and the "high" refers to the "max" of attachment security

findings offer more clarity compared to previous studies (e.g., Oldfield et al., 2016; Shochet et al., 2008), that found that SC did not moderate the relations between attachment and depression (Shochet et al., 2008) or mental health outcomes in general (Oldfield et al., 2016). One reason for these discrepancies is that these studies (e.g., Oldfield et al., 2016; Shochet et al., 2008) were comprised of normative samples of adolescents, whereas the current study utilized a high-risk clinical adolescent sample. In a clinical sample, the association examined might differ from those in a normative sample, given the likely higher degree of severity among the outcomes studied within a clinical sample. Regardless, this may be an important avenue of research to consider where researchers could examine normative versus clinical samples of adolescents across the study variables to determine if significant differences in symptom severity of depression exist. In addition, the measures used in these respective studies differed from those used in our study. For instance, the attachment measure used in the Shochet et al. (2008) study emphasized the affective quality of the relationship with parents, and the parents' role as facilitators of independence, whereas our study focused more on the attachment security dimensions. Nonetheless, our findings also suggest that as much as attachment security alone is vital for adolescent development, SC may help amplify the positive effects of attachment security while protecting against the impact of attachment anxiety.

Attachment security, and attachment avoidance and anxiety, and SC were each related to suicidality for the full sample, and male and female subsamples. However, SC did not moderate the relations between attachment security and suicidality among female adolescents, suggesting that SC did not mitigate the effects of lower attachment security on suicidality among female youth. Yet, for males with lower attachment security, SC mitigated the impact of lower attachment security on suicidality symptoms (small effect). Similarly, SC mitigated the impact of attachment avoidance and suicidality among male adolescents (small effect). One potential reason for these findings is that girls are more socialized from a young age to regulate their behaviors, especially in close relationships (Miller-Slough & Dunsmore, 2020). As a result, they may suffer more from attachment

Table 7 Simple slope analysis of moderator school connectedness for attachment, and depression and suicidality

Depression

Predictor	Full sample			Male sample			Female sample		
	M Level	B	95% CI	M Level	B	95% CI	M Level	B	95% CI
Attachment security	–	–	–	–	–	–	-1SD	-.694	-1.077, -.316*
							Mean	-1.023	-1.297, -.734*
							+1SD	-1.352	-1.739, -.893*
Attachment anxiety	-1SD	.484	.252, .702*	–	–	–	-1SD	.320	.046, .591*
	Mean	.713	.521, .904*	–	–	–	Mean	.635	.391, .866*
	+1SD	.942	.647, 1.223*	–	–	–	+1SD	.951	.557, 1.325*

Suicidality

Predictor	Full sample			Male sample			Female sample		
Attachment security	–	–	–	-1SD	-.723	-.982, -.440*	–	–	–
	–	–	–	Mean	-.430	-.600, -.269*	–	–	–
	–	–	–	+1SD	-.138	-.316, .044	–	–	–
Attachment avoidance	–	–	–	-1SD	.384	.150, .587*	–	–	–
	–	–	–	Mean	.223	.099, .339*	–	–	–
	–	–	–	+1SD	.063	-.048, .179	–	–	–

Only simple slopes of significant interaction effects are presented above; M Level = levels of school connectedness moderator

1 standard deviation below the mean, the mean, 1 standard deviation above the mean); * indicates significance
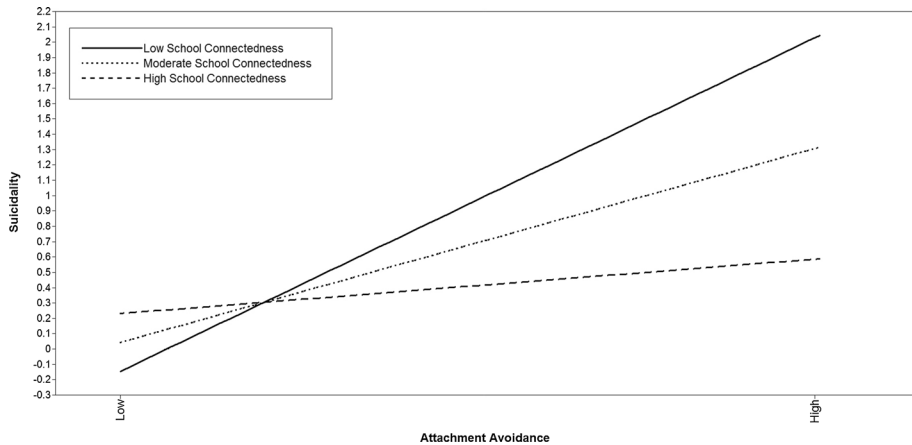
Fig. 5 Interaction effect between attachment avoidance and school connectedness on suicidality in the male sample. *Note*. Simple slopes for 1SD below the mean of SC, the mean of SC, and 1SD above the mean of SC; the X-axis "low" refers to the "min", and the "high" refers to the "max" of attachment avoidance

disruptions at home and benefit less from SC than boys. Nevertheless, more research examining sex differences and SC is needed.

Implications

The present research highlights two possible avenues to promote mental health among at-risk youth. First, our results suggest that evidence-based interventions that promote adolescent attachment security may reduce risk for substance use, depression, and suicidality. Empirical evidence demonstrates that an attachment-based intervention can reduce emotional and behavioral difficulties in adolescents (Barone et al., 2021; Gregory et al., 2020; Moretti et al., 2018; Pasalich et al., 2021). Increasing the accessibility of such interventions for parents and other caregivers of at-risk youth is an important priority in reducing risk for serious adolescent mental health problems.

Second, school-based interventions that promote SC may mitigate risk for mental health problems among adolescents with insecure attachment, albeit differently for male versus female youth. Promoting SC is also a priority; however, findings have been mixed and the mechanisms through which SC mitigates risk are unclear. In a systematic review of seven SC-based interventions designed to reduce risk-taking behavior (such as substance use) in adolescents, Chapman et al. (2013) found that only four SC interventions reduced risk-taking behaviors. The study also could not conclusively point to the SC mechanisms responsible for risk reduction. Despite the number of studies on this topic, limited research has specifically examined SC-based interventions for mental health outcomes. Indeed, one meta-analytic study that investigated SC and suicidality found a lack of intervention-based research despite the abundance of research available (Marraccini & Brier, 2017). Thus, future intervention studies may want to test whether SC is the central mechanism of change for reducing mental health outcomes in adolescents.

Finally, it is imperative that researchers engage in reflection and action in working toward a diverse perspective in the field. The current study aimed to incorporate diversity in the sample. The authors are aware of the impact of structural inequalities and historical

injustices on health disparities and how they may have affected the recruitment and representation of participants in the study. Nevertheless, it is important to highlight the need for better representation in research studies in general, but also those that focus on attachment relationships between parents and their children (see Stern et al., 2022).

Strengths, Limitations, and Future Directions

Strengths of the present study include testing associations between multiple dimensions of attachment and SC on several well-established mental health outcomes in a sample of high-risk adolescents. In addition, we explored whether these relations were distinct among male versus female adolescents. Despite these strengths, a few limitations are noteworthy in interpreting these findings. First, this study was cross-sectional and as such, cause-and-effect relations cannot be ascertained. Second, we relied on adolescent self-report information. There is ample empirical support for the use of self-reports in children and adolescent samples as they are in an advantageous position to report on many domains of their behavior, including substance use, depression, and suicidality (see Hayre et al., 2019; Long et al., 2020; Pegg et al., 2020). While adolescents are in a unique position to reflect on and report their level of mental health symptoms, in addition to the quality of their relationships with parents and their sense of SC, future studies should consider supplementary multi-informant (e.g., mothers and fathers), observational measures (i.e., for SC), and interview-based assessments. In addition, although our sample included some representation of diverse populations, more research is needed to examine attachment and SC among culturally diverse adolescents. Generalizability has been emphasized in recent calls by the scientific community (Duncan et al., 2014). Third, the current method of scoring for the substance use outcome variable does not address differences between adolescents who frequently vs. infrequently used substances and their relations to attachment and SC, which may have contributed to the lack of findings for substance use. Future research should be undertaken to examine attachment and SC concerning infrequent vs. daily use of specific types of substance, as this fine-grained analysis will potentially shed light on the role of each of these factors in determining adolescence substance use. Fourth, we did not have information on the general characteristics of schools (e.g., resources, public vs. private, urban vs. rural). Given the centrality of this information for our main study variables, it would also be important for future research to test the role of such specifics. Fifth, as mentioned, future studies need to emphasize creating a central theory-driven SC-based intervention given the research available on this topic.

In sum, the current findings underscore the importance of parent-adolescent attachment security and SC for adolescent development. Our findings suggested that attachment is foundational for the protective effects of SC to reduce adolescent externalizing and internalizing behaviors, specifically female depression and male suicidality. Thus, recently developed attachment-based interventions for parents of at-risk adolescents hold promise in reducing risk for substance use, depression, and suicidality among adolescents (Barone et al., 2021; Moretti et al., 2018; Pasalich et al., 2021).

Data Availability Upon request to Marlene Moretti (moretti@sfu.ca).

Declarations

Conflicts of interest The authors report no conflicts of interest.

Ethics approval All research protocols and procedures received approval from Simon Fraser University Office of Research Ethics [#2011s0284].

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