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Negative cognitive style and perceived social support mediate the relationship between aggression and NSSI in hospitalized adolescents

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ABSTRACT

Despite the well-documented association between aggression and NSSI among adolescents, relatively little research has been conducted on the mechanisms underlying this relationship. The purpose of this study was to investigate potential socio-cognitive mechanisms through which aggression and NSSI are related. Participants were 186 adolescents (ages 13–18) recruited from a psychiatric inpatient facility in the northeastern United States. According to teen report, 57.5% of the sample endorsed NSSI in the previous year. Mediation was tested using the modern bootstrapping technique described by Hayes, using 5000 resamples with replacement, including sex and depression diagnosis as covariates. Results demonstrated that greater negative self-talk, a more negative cognitive style, and lower perceived family support were all significant mediators of the relationship between aggression and greater frequency of NSSI, whereas perceived social support from friends was not a significant mediator. Limitations, clinical implications, and future research directions of the current research are discussed.

Non-suicidal self-injury (NSSI) is defined as the deliberate and intentional act of harming oneself without lethal intent (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Adolescent NSSI is a major public health concern requiring models of risk, targeted prevention, and treatment planning, yet relatively little research has been devoted to understanding the relationship between NSSI and its significant correlates (Fliege, Lee, Grimm, & Klapp, 2009). In particular, while the association between aggression and NSSI is well documented, there is a paucity of research to explain this relationship. Thus, this paper aims to examine mediating factors that may account for the relationship between aggression and NSSI.

Aggression and NSSI

Current evidence suggests a significant relationship between aggression and NSSI in both humans and animals (Tiefenbacher, Novak, Lutz, & Meyer, 2005). Some have suggested that NSSI and aggression are two forms of violence (self- and other-directed aggression) with shared etiologic factors (Vivona et al., 1995). In a large community sample of 5759 adolescents, elevated aggressive behavior was positively correlated with deliberate self-harm without suicidal intent (Brunner et al., 2007). Similar findings

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linking aggression and self-harm have been documented in several studies that included youth inpatient samples. In one study of 89 children and adolescents, 94% of self-injurers engaged in physical and/or verbal assaults (Vivona et al., 1995). In a second study of psychiatrically hospitalized adolescents, the majority of adolescents reported histories of both deliberate self-harm and physical aggression (Boxer, 2010). Furthermore, in an adolescent longitudinal study of a representative birth cohort ($N = 839$), increased parent-reported aggression at age 12 predicted deliberate self-harm (with and without intent to die) at age 15 (Sourander et al., 2006). Based on a systematic review of 54 cross-sectional and 5 prospective studies of socio-demographic and psychological correlates of deliberate self-harm behavior, Fliege et al. (2009) concluded that aggressiveness is one of the strongest proximal risk factors for NSSI among adolescents and adults. However, there remains a dearth of evidence to explain the association between aggression and NSSI, specifically, analyses of mediators of this relationship are lacking.

Several studies show that rates of NSSI are high among adolescents with depression (Asarnow et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011) and conduct disorder (Darche, 1990; Nock et al., 2006). The dual failure model linking conduct problems to the development of depression may help to explain the relationship between aggression and NSSI. This evidence-based model suggests that early emergence of aggression and conduct problems can spur a series of developmentally challenging social and academic failures, which lead to a high susceptibility for depression (Capaldi, 1991, 1992; Capaldi & Stoolmiller, 1999; Patterson & Capaldi, 1990). In line with the dual failure theory, aggression and conduct problem disorders have been shown to predict peer rejection, peer victimization (Coie, Dodge, Terry, & Wright, 1991; Little & Garber, 1995; Pope & Bierman, 1999; Price & Dodge, 1989; Ray, Cohen, Secrist, & Duncan, 1997), problems in the parent–child relationship (Capaldi, 1991), early school withdrawal, and school dropout (Kupersmidt & Coie, 1990). Furthermore, peer rejection, poor peer relations, and low peer and parent support are correlated with both depression and NSSI (Hilt, Cha, & Nolan-Hoeksema, 2008; Panak & Garber, 1992; Swahn et al., 2012; Sweeting, Young, West, & Der, 2010).

Consistent with the dual failure model, it is plausible that as aggressive youth experience increasingly negative social interactions, they begin to experience deficits in important socio-cognitive factors such as perceived social support and cognitive processes (Bandura, 1969). For instance, aggressive youth who receive negative social feedback may begin to perceive their family and friends as offering less social support. Furthermore, negative social cues may cause aggressive youth to begin to alter their cognitive schemas and develop increasingly negative cognitive biases. Evidence suggests that lower perceived social support and negative cognitive styles may, in turn, increase adolescents' risk of depression and NSSI. For example, Guerry and Prinstein (2009) found that a cognitive-vulnerability stress interaction model linking negative interpersonal events and negative cognitions served as a significant predictor for future NSSI in a prospective longitudinal study of NSSI with adolescents. Thus, the dual failure model points to socio-cognitive variables as potential mediators of the relationship between aggression and NSSI. The following sections review evidence linking aggression and socio-cognitive variables, and then evidence linking socio-cognitive variables and NSSI.

Relationship between aggression & social-cognitive variables

The dual failure hypothesis suggests that when adolescents engage in aggressive behaviors, they may further alienate others leading to increased peer rejection and decreased social support. Along these lines, numerous studies have established a relationship between increased aggression and decreased social support in adolescents. For example, Bennett and Bates (1995) found that self-reported and mother-reported aggressive behaviors were negatively correlated with perceived social support, such that greater aggression was linked with lower perceived social support from mother, father, best friend, and sibling in a study of 95 community adolescents. Similarly, Kashani and Shepperd (1990) found that both verbal and physical aggression were associated with less social support in a sample of 100 adolescent inpatients.

Previous research has also documented an association between adolescent aggression and an array of negative cognitive processing biases, particularly within interpersonal contexts. For instance, Bennett and Bates (1995) found that self-rated and mother-rated aggressive behaviors were positively correlated with a maladaptive cognitive attributional style among community adolescents. Another study using a community sample found that teacher-rated increases in aggression were correlated with increased attention to negative information, interpretation of ambiguous situations as negative, and preferential recall of negative words in 8–14 year olds (Reid, Salmon, & Lovibond, 2006). The relationship between aggression and negative cognitive patterns has also been found among adolescents in clinical settings. Barriga, Landau, Stinson, Liau, and Gibbs (2000) found that among incarcerated adolescents, higher levels of fighting, truancy, and noncompliance were associated with higher rates of self-serving and self-debasing cognitive distortions. Thus, we predicted that higher levels of aggression would significantly predict lower levels of perceived social support and higher levels of cognitive processing biases.

Relationship between socio-cognitive variables & NSSI

Socio-cognitive variables have also served as significant correlates and predictors of NSSI in adolescents. For example, in a cross-sectional study of community sampled adolescents, Swahn et al. (2012) found that those who reported less overall social support in family, friend, and school contexts were most likely to have engaged in NSSI. Further, higher levels of parental support were found to predict lower levels of NSSI (Swahn et al., 2012). The association between social support and NSSI has also been well documented in longitudinal studies. In a study of 103 adolescents age 11–14 years, low social support predicted the prospective onset of NSSI (Hankin & Abela, 2011). Likewise, in a study of predictors of NSSI and attempted suicide in high school students ($n = 2924$), satisfaction with social support acted as a protective factor for NSSI (Wichstrom,

2009). For those individuals who perceive low social support, engaging in NSSI may be used as a tool to communicate a need for greater emotional support and/or attention from friends and family. Indeed, social communication and interpersonal influence have been commonly endorsed functions of NSSI among adolescents (Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Muehlenkamp, Brausch, Quigley, & Whitlock, 2013; Nock & Prinstein, 2004).

Cognitive variables such as negative self-statements and a negative cognitive style have also been linked to NSSI. Research suggests that adolescents who engage in NSSI are highly self-critical (Glassman, Weierich, Hooley, Deliberto, & Nock, 2007). In particular, self-injuring adolescents report a lower global self-esteem and rate themselves as less academically intelligent, less physically attractive, less socially skillful, and less emotionally stable than those who have not engaged in NSSI (Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010). Additionally, Weismoore and Esposito-Smythers (2010) found that negative cognitive errors moderated the relationship between history of physical or sexual assault and NSSI, indicating that cognitive factors may be important in both the onset and maintenance of NSSI in adolescents. Support for the relationship between negative cognitive style and NSSI has recently been documented in two longitudinal studies. Hankin and Abela (2011) found that negative cognitive style served as a predictor of the onset of NSSI over a 2½ year follow-up period among adolescents. An additional longitudinal study found that an interaction between an elevated negative attributional style and stressful life events predicted increases in NSSI among adolescents at 9 and 18 months after initial assessment (Guerry & Prinstein, 2009). Building upon this prior research, we hypothesized that lower levels of perceived social support and higher levels of cognitive biases would predict increased rates of NSSI among adolescents.

Current study

In this paper, we extend prior research documenting an association between aggression and NSSI by testing whether proximal socio-cognitive factors may help to explain the underlying relationship. We hypothesized four socio-cognitive variables (perceived family support, perceived friend support, negative self-talk, and a negative cognitive style) would each mediate the relationship between aggression and NSSI. Consistent with common interpretations of causal step mediation models (Baron & Kenny, 1986), we had three hypotheses relating aggression, socio-cognitive variables, and NSSI. First, we expected that aggression would significantly predict NSSI. Second, we expected that aggression would significantly predict each of the socio-cognitive variables and that each of the socio-cognitive variables would, in turn, predict NSSI. Finally, we predicted that when accounting for the socio-cognitive variables, the association between aggression and NSSI would be reduced (partial mediation) or no longer significant (full mediation). Following methodology of modern bootstrapping mediation analyses (Hayes, 2009), we hypothesized that each proposed mediation model would show indirect effects significantly different from zero as interpreted from a percentile-based bootstrap 95% confidence interval.

Methods

The methods used in this study have been described in prior publications (reference masked for blinding). Participants were 186 adolescents (ages 13–18) recruited from a psychiatric inpatient facility in the northeastern United States. All adolescents admitted to the unit were eligible for study participation, provided that they spoke English, were in their parents' custody, and had sufficient cognitive functioning to complete the study (i.e. no active psychosis and a Verbal IQ estimate $\geq$ 70 as per the Kaufman Brief Intelligence Test).

The mean age was 15.03 (SD = 1.31) and 72.0% were female. Approximately 84.4% of adolescents identified themselves as Caucasian, 2.7% African American, 2.2% Asian, 3.2% Native American, and 7.5% other racial background. Approximately 10% of the sample identified themselves as Hispanic/Latino ethnicity. Family income varied widely from less than $10,000 to greater than $100,000 per year with a mean income range of $50,000–$60,000. Approximately 58% of the sample reported NSSI in the past year. Of those who endorsed NSSI, 22.4% reported infrequent acts (1–3 times per year), 21.5% reported frequent acts (4–11 times per year), and 56.1% reported very frequent acts (12 or more times per year). The average length of stay for participants in the hospital was 4–5 days.

Consistent with institutional review board approved procedures, adolescents and their parents were invited to participate in this study shortly after admission to the unit and then were administered a comprehensive assessment battery after providing written consent and assent. A bachelor's level research assistant administered the battery, with the exception of the diagnostic interview that was conducted by trained master's and doctoral level clinicians. Adolescents and parents were interviewed separately by trained evaluators, and a best-estimate clinical consensus procedure was used to resolve discrepancies between adolescent and parent report for psychiatric diagnoses. The parent version of the diagnostic interview and assessment measures were administered in a 120 min session, whereas the adolescent diagnostic interview and assessment measures were given in two separate 60–120 min sessions. As compensation for participation, parents were given $50 and adolescents were given four movie tickets.

Measures

Non-suicidal self-injury and depression

NSSI and psychiatric disorders were assessed using the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS-PL; Kaufman et al., 1997). The K-SADS-PL is a semi-structured diagnostic interview that provides a reliable

and valid measurement of mental health diagnoses in children and adolescents in accordance with the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV, American Psychiatric Association, 2000). K-SADS-PL interviews were conducted and scored by one of six trained masters or post-doctoral level clinical psychology trainees. Based on independent ratings of 37 randomly selected audiotapes, inter-rater reliability reflected fair to strong agreement (kappas = 0.65–1.0). A best-estimate clinical consensus procedure was used to resolve discrepancies in parent–child ratings of DSM-IV diagnoses; this procedure is commonly used to reconcile discrepancies (Cantwell et al., 1999; Klein, Lewinsohn, Seeley, & Rohde, 2001; Klein, Ouimette, Kelly, Ferro, & Riso, 1994) and yields good to excellent reliability (Klein et al., 1994, 2001).

In addition, the K-SADS-PL evaluates suicidal and non-suicidal self-injurious behaviors. NSSI is defined by the K-SADS-PL as self-mutilation or other physical acts done *without* the intent of killing oneself over the past 12 months. Participants were asked to indicate whether they ever tried to hurt themselves, such as burned self with matches or candles, scratched self with needles or knife or nails, put hot pennies on the skin, or another method of self-injury. They were then asked when and how often they engaged in this type of behavior. Behaviors performed in the absence of suicidal intent that occurred one or more times were coded as NSSI. Frequency of NSSI ranged from No-NSSI, infrequent acts (1–3 times per year), frequent acts (4–11 times per year), and very frequent acts (12 or more times per year). Discrepancies in teen and parent report of NSSI occurred in 45 cases. There were 11 cases for which parent endorsed NSSI and the teen did not, and 34 cases for which the teen endorsed NSSI and the parent did not. Because of the secretive nature of these behaviors and evidence that teen reports of self-injury are reliable (e.g., Nock & Prinstein, 2004, 2005), the current analysis used teen reports of NSSI frequency.

Aggression

The *Aggression Questionnaire* (AQ; Buss & Warren, 2000) is a widely used self-report measure of trait aggression. This 34-item instrument consists of the five dispositional subtraits of aggression, including psychological (anger, hostility) and behavioral (physical, verbal, indirect) aggression. Sample items include "I have threatened people I know" and "At times I feel like a bomb ready to explode". Responses are given on a 5-point Likert scale, ranging from 1 ("Not at all Like Me") to 5 ("Completely Like Me"). Buss and Warren (2000) report good to moderate reliability. The total aggression score was used as the predictor in the current mediation analyses to provide a broad indicator of aggression. Internal consistency of the total scale was excellent ($\alpha = 0.95$) in this sample.

Social support

The Survey of Children's Social Support (SOCSS; Dubow & Ullman, 1989) is a 9-item self-report measure of peer, family, and teacher support. The measure assesses the adolescent's perception of how he or she is valued and esteemed by others. Example items include, "Some kids can count on their family for help or advice when they have problems, but other kids cannot. Can you count on your family for help or advice when you have problems?" Each item is rated on a 5-point scale (1 = always, 5 = never). The family and peer subscales were used to measure peer and family social support, respectively. Internal consistency scores for the peer ($\alpha = 0.77$) and family ($\alpha = 0.88$) subscales were acceptable in the present sample.

Negative self-talk

The frequency of anxious and depressive self-statements experienced by children and adolescents within the past week were assessed using the Negative Affect Self-Statement Questionnaire (NASSQ; Ronan, Kendall, & Rowe, 1994). The NASSQ is a self-report questionnaire with items such as "I can't do anything right" and "I don't deserve to have good things happen to me". Each item is rated on a 5-point Likert scale ranging from 0 (not at all) to 5 (all the time). Higher scores reflect more frequent negative self-talk. Adequate internal consistency, test–retest reliability, and convergent/divergent/construct validity have been demonstrated in child and adolescent populations (Lerner et al., 1999; Ronan et al., 1994). Internal consistency in the present sample was high at 0.96.

Negative cognitive attributional style

The *Cognitive Triad Inventory for Children (CTI-C; Kaslow, Stark, Printz, Livingston, & Tsai, 1992)* is a 36-item self-report measure that assesses depressogenic thinking in children and adolescents. It is comprised of three 12-item subscales, including View of Self, View of World, and View of Future. Participants respond along a three-point Likert scale ("yes", "maybe", and "no") to items such as "the world is a very mean place" and "my future is too bad to think about". Responses are given on a three-point Likert scale that includes yes, maybe, or no. A total score can be calculated by summing the three domain scores, with total scores as high as 72. Higher scores reflect more positive views. Strong reliability, concurrent and discriminant validity have been demonstrated for the CTI-C (Kaslow et al., 1992). The overall score demonstrated high internal consistency ($\alpha = 0.96$) in the present sample.

Data analysis

Preliminary analyses consisted of examination of demographic and diagnostic information across NSSI and No-NSSI groups as well as the total sample, and calculation of means and standard deviations for each measure (see Table 1).

Based on theorized methods by which aggression and NSSI may be linked, a series of four separate mediation models were tested. Because this is the first study to examine mediators of the relationship between NSSI and aggression, we examined the effects of the mediators in four separate models rather than in one simultaneous model in order to elucidate the individual contribution of each mediator on NSSI. Each model tested aggression (AQ) as the predictor variable and current NSSI frequency as the outcome variable. Two models tested perceived social support (family support and peer support), and two models tested cognitive variables (negative self-statements and a negative cognitive style) as mediators.

Mediation was tested using Preacher and Hayes's (2008) bootstrapping method with 5000 resamples with replacement. Bootstrapping was used instead of Sobel testing or the Baron and Kenny (1986) mediation technique since bootstrapping provides a more reliable estimate of indirect effects, does not assume normality, and evaluates total, direct, and indirect effects (Preacher & Hayes, 2008). Bootstrapping also has higher power and better Type I error control than other mediation analyses. It tests the intervening variable indirect effect as a whole model and does not require the interpretation of each path. Instead, significance was determined by examining the 95% confidence interval produced by bootstrapping mediation analyses. In order for the mediation model to attain significance, the confidence interval must not include zero.

Results

Preliminary analyses

Preliminary comparisons of those with and without NSSI in the past year revealed a few significant differences. With regard to demographic variables, the only difference found was for sex, such that there were significantly more females in the NSSI group than the No-NSSI group. For diagnoses, there were four differences found: rates of major depression, generalized anxiety disorder, post-traumatic stress disorder, and the overall number of diagnoses were all significantly higher in the NSSI group relative to the No-NSSI group. Finally, differences were found across all of the key socio-cognitive and aggression

Table 1
Demographics, diagnoses, and measures of aggression, non-suicidal self-injury, and socio-cognitive variables across groups.

Characteristic	Total ($N = 186$) M (SD) or % (n)	No-NSSI ($N = 79$) M (SD) or % (n)	NSSI ($N = 107$) M (SD) or % (n)	t or χ^2	p-Value
Age	15.03 (1.31)	15.04 (1.34)	15.02 (1.30)	0.097	0.923
Sex				19.102	<0.001
Female	72.0% (134)	55.0% (44)	84.1% (90)		
Race				1.095	0.895
Caucasian	84.4% (157)	83.5% (66)	85.0% (91)		
Ethnicity				1.902	0.168
Hispanic	9.7% (18)	6.3% (5)	12.1% (13)		
K-SADS diagnoses					
MDD	65.1% (121)	51.9% (41)	74.8% (80)	9.579	0.002
Dysthymia	3.8% (7)	3.8% (3)	3.7% (4)	0.000	0.990
Bipolar I	5.9% (11)	8.9% (7)	3.7% (4)	2.012	0.156
GAD	23.7% (44)	12.7% (10)	31.8% (34)	7.176	0.007
Social phobia	35.5% (66)	29.1% (23)	40.2% (43)	1.735	0.188
PTSD	27.4% (51)	15.2% (12)	36.4% (39)	10.914	0.001
ADHD	34.4% (64)	32.9% (26)	35.5% (38)	0.097	0.756
Conduct	27.4% (51)	27.8% (22)	27.1% (29)	0.000	0.993
ODD	18.8% (35)	22.8% (18)	15.9% (17)	1.221	0.269
Alcohol abuse	14.0% (26)	15.2% (12)	13.1% (14)	0.116	0.734
Alcohol dependence	8.6% (16)	6.3% (5)	10.3% (11)	0.999	0.318
Substance abuse	11.3% (21)	7.6% (6)	14.0% (15)	2.031	0.154
Substance dependence	18.3% (34)	17.7% (14)	18.7% (20)	0.062	0.804
Number of diagnoses	3.44 (1.76)	2.91 (1.63)	3.84 (1.74)	−3.721	<0.001
Measures					
Aggression	51.17 (12.07)	47.59 (11.56)	53.95 (11.70)	−3.692	<0.001
NSSI	2.94 (1.75)	1.01 (0.25)	4.34 (0.82)	−39.428	<0.001
Perceived family support	3.75 (1.01)	4.03 (0.85)	3.56 (1.06)	3.174	0.002
Perceived friend support	4.06 (0.82)	4.23 (0.79)	3.92 (0.82)	2.526	0.012
Negative self-talk	93.71 (38.46)	74.61 (29.31)	107.67 (38.43)	−6.638	<0.001
Cognitive style	48.44 (16.56)	56.29 (10.45)	42.69 (17.83)	6.499	<0.001

K-SADS = schedule for affective disorders and schizophrenia for school age children; MDD = major depressive disorder; GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder; ADHD = attention deficit hyperactivity disorder; ODD = oppositional defiant disorder; NSSI = non-suicidal self-injury.

variables, with those in the NSSI group reporting higher levels of aggression and lower levels of perceived social support than those in the No-NSSI group.

Analyses of potential covariates indicated that age did not significantly correlate with NSSI ($r = -0.041$, $p = 0.581$). However, females and those diagnosed with major depressive disorder (MDD) reported significantly higher rates of NSSI ($r = 0.285$, $p < 0.001$ and $r = 0.182$, $p = 0.012$ respectively). Thus, sex and major depressive disorder were included in each model as covariates.

Mediational analyses

Results of the mediation analyses controlling for sex and MDD can be found in Table 2.

Social factors

Two social factors were examined as potential mediators of the relationship between aggression and NSSI: perceived social support from family and perceived social support from friends, as measured by the respective SOCSS subscales. When perceived family support was evaluated as the mediator, it was associated with more aggression and more frequent NSSI. Higher perceived family support was also significantly related to less frequent NSSI when the effects of aggression were partialled out. In addition, the relationship between aggression and NSSI decreased but remained significant after accounting for perceived family support, suggesting partial mediation. Bootstrapping revealed that the relationship between aggression and NSSI was mediated by perceived family support $M_B = 0.005$, S.E. $= 0.003$, 95% CI $= 0.001$–0.013. Examination of covariates indicated that females reported a higher frequency of NSSI ($B = 1.000$, $p < 0.001$) but sex was not significantly related to perceived family support ($B = 0.028$, $p = 0.860$). Teens diagnosed with MDD reported significantly lower perceived family support ($B = -0.434$, $p = 0.005$), but there was no significant effect of MDD on NSSI ($B = 0.452$, $p = 0.076$).

Analyses examining perceived friend support as a mediator revealed that higher aggression was associated with significantly lower perceived friend support and more frequent NSSI. Perceived friend support did not have a significant effect on NSSI after controlling for the effects of aggression. While the strength of the relationship between aggression and NSSI decreased after accounting for this variable, bootstrapping analyses showed perceived friend support did not mediate the relationship between aggression and NSSI, $M_B = 0.003$, S.E. $= 0.003$, 95% CI $= -0.001$ to 0.009. Regarding covariates, sex did not have a significant effect on perceived friend support ($B = 0.087$, $p = 0.502$), but females reported higher rates of NSSI ($B = 1.000$, $p < 0.001$). Those with MDD reported significantly less perceived friend support ($B = -0.326$, $p = 0.009$), but MDD did not have a significant effect on NSSI ($B = 0.452$, $p = 0.076$).

Cognitive factors

Two cognitive factors were examined as potential mediators of the relationship between aggression and NSSI: negative self-talk (measured by the NASSQ) and a negative cognitive style (measured by the CTIC). When negative self-talk was tested as the mediator, higher aggression was associated with more negative self-talk and more frequent NSSI. More negative self-talk remained significantly related to more frequent NSSI when the effects of aggression were partialled out. Additionally, the relationship between aggression and NSSI was no longer significant after accounting for negative self-talk, suggesting full mediation. This mediation result was confirmed as bootstrapping analyses showed negative self-talk mediated the relationship between aggression and frequency of NSSI, $M_B = 0.024$, S.E. $= 0.006$, 95% CI $= 0.013$–0.036. Lastly, examination of

Table 2
Total, direct, and indirect effects of cognitive and social mediation models.

Effects	Unstandardized coefficient	S.E.	*t*	*p*
Effect of aggression on perceived family support (path a)	−0.014	0.006	−2.251	0.026
Effect of perceived family support on NSSI (path b)	−0.350	0.121	−2.892	0.004
Total effect of aggression on NSSI (path c)	0.041	0.010	3.902	<0.001
Direct effect of aggression on NSSI controlling for perceived family support (path c′)	0.036	0.010	3.446	0.001
Effect of aggression on perceived friend support (path a)	−0.014	0.005	−2.753	0.007
Effect of perceived friend support on NSSI (path b)	−0.194	0.152	−1.270	0.206
Total effect of aggression on NSSI (path c)	0.041	0.010	3.902	<0.001
Direct effect of aggression on NSSI controlling for perceived friend support (path c′)	0.038	0.011	3.572	0.001
Effect of aggression on negative self-talk (path a)	1.350	0.196	6.896	<0.001
Effect of negative self-talk on NSSI (path b)	0.017	0.004	4.856	<0.001
Total effect of aggression on NSSI (path c)	0.039	0.010	3.929	<0.001
Direct effect of aggression on NSSI controlling for negative self-talk (path c′)	0.016	0.011	1.493	0.137
Effect of aggression on cognitive distortion (path a)	−0.486	0.089	−5.490	<0.001
Effect of negative cognitive style on NSSI (path b)	−0.041	0.008	−5.254	<0.001
Total effect of aggression on NSSI (path c)	0.039	0.010	3.929	<0.001
Direct effect of aggression on NSSI controlling for negative cognitive style (path c′)	0.019	0.010	1.910	0.058

covariates indicated that females had significantly higher rates of NSSI ($B = 1.042$, $p < 0.001$) and negative self-talk ($B = 15.305$, $p = 0.003$). Those with depression reported significantly more negative self-talk ($B = 21.780$, $p < 0.001$) but there was no significant effect of MDD on NSSI ($B = 0.422$, $p = 0.097$).

Analyses utilizing negative cognitive style as the mediator revealed that higher aggression was significantly associated with a more negative cognitive style and higher frequency of NSSI. The relationship between a more negative cognitive style and greater frequency of NSSI was maintained after controlling for the effects of aggression. The relationship between aggression and NSSI was no longer significant after accounting for negative cognitive style, suggesting full mediation. In addition, a more negative cognitive style mediated the relationship between aggression and NSSI when examined using bootstrapping methodology, $M_B = 0.020$, S.E. = 0.005, 95% CI = 0.012–0.031. With regard to the covariates, females had significantly more NSSI ($B = 1.042$, $p < 0.001$) but there was no significant effect on negative cognitive style ($B = -2.758$, $p = 0.234$). Those with MDD had a significantly more negative cognitive style ($B = -10.762$, $p < 0.001$) but there was no significant effect on NSSI ($B = 0.422$, $p = 0.097$).

Discussion

The current investigation aimed to explore potential mechanisms that explain the well-documented relationship between aggression and NSSI. Mediation analyses examining social and cognitive factors revealed that both perceived social support and negative cognitions play a role in the association between aggression and NSSI. Specifically, these results suggest that three of the hypothesized socio-cognitive variables: perceived family support, cognitive errors, and negative cognitive style each represent potential mechanisms through which aggression leads to NSSI. By contrast, perceived social support from friends was not a significant mediator of the relationship between aggression and NSSI in the current analyses.

Within the theoretical framework of the dual failure hypothesis, the results of the current study suggest that the social and cognitive deficits associated with aggressive behavior in adolescents may help to explain the relationship between aggression and NSSI. While a large body of evidence suggests that socio-cognitive deficits contribute to the onset of aggression (Dodge, 1993; Kashani, Canfield, Boduin, Soltys, & Reid, 1994; Kashani & Shepperd, 1990), the dual-failure hypothesis also suggests that socio-cognitive deficits are a product of aggressive acts. As the dual-failure hypothesis implies time-varying, reciprocal relationships between social factors and cognitive schema over the course of development, future research in this area should employ longitudinal designs to adequately examine these complex inter-relationships.

Another notable finding from the present study was that perceived peer support did not predict or mediate the relationship between aggression and NSSI. This pattern is consistent with prior research which found that, perceived support from parents had a comparatively stronger effect on NSSI than did support from friends (Swahn et al., 2012). These results may also reflect the possibility that peer support may serve to reinforce maladaptive behavior among adolescents under certain conditions. For example, Kerr, Preuss, and King (2006) found that among suicidal adolescents, perceived peer support was positively related to externalizing behavior issues, and among males in particular, higher depressive symptoms and suicidal ideation. Additionally, Deliberto and Nock (2008) found that 38.3% of adolescents with a history of NSSI, who were recruited from community and outpatient settings, reported that they learned about NSSI from a peer. One potential explanation for the lack of a significant meditational relationship could be that the effects of peer social support vary among adolescents; for some, peer social support might reduce the prevalence of NSSI, whereas for others, peer social support might increase the propensity toward NSSI. Future research should explore whether the effect of perceived peer social support on NSSI varies as a function of psychosocial and demographic factors.

In the current study, significantly more females engaged in NSSI than males. Based on previous research suggesting that females engage in more relational aggression than males, it might be hypothesized that sex would moderate the effects of the social variables in this study. However, exploratory analyses of moderated mediation revealed sex was not a significant moderator of the current mediation models.

When interpreting the current results, it is important to note several limitations. First, this study relies primarily on self-report measures for the assessment of NSSI, aggression, social support, and cognitive variables. Although parents provided information on some symptoms (e.g., depression), future studies should better utilize multiple informants to increase confidence in the results. In particular, verbal and physical aggression should be informed by parent, teacher, and behavioral measures to provide for more objective measurement. Second, although the models tested predictive relationships, the use of cross-sectional data precludes the ability to draw causal conclusions. Prospective studies are warranted in order to confirm directional relationships among the variables examined in our theoretical model. Third, due to our focus on socio-cognitive variables, we did not consider other potential mediators of the relationship between NSSI and aggression. It is possible that one or more unmeasured variables could account for the relationship between NSSI and aggression to a stronger degree. For example, emotion dysregulation, a widely supported psychosocial risk factor for NSSI and self-reported motivation for NSSI (Nock & Prinstein, 2004), may serve as a significant mediator of the relationship between aggression and NSSI. Fourth, this study did not take into account frequency of acts of aggression. Forthcoming studies would benefit from a more in-depth assessment of these behaviors and possibly utilizing real-time sampling technology, such as Ecological Momentary Assessment, to assess the frequency and temporal ordering of the variables within our model, while circumventing memory issues and recall bias related to retrospective reporting. Fifth, the current study does not rule out the possibility that an additional etiological factors may account for the relationship between aggression and NSSI. Other factors to consider may include history of trauma, impulsivity, the family environment, or peer victimization. Finally, the study is limited by the

characteristics of the sample, which consists of predominantly Caucasian adolescents who were hospitalized on a psychiatric inpatient unit.

Despite the above limitations, to our knowledge, the findings represent the first analysis of potential mediators of the well-documented relationship between aggression and NSSI among adolescents. Building upon the dual failure hypothesis, we constructed a preliminary mediation model that allowed us to test four socio-cognitive variables as potential mediators. Our results lend support to the meditational model and raise two primary implications for clinical research and practice. First, interventions targeting aggression and NSSI might benefit from the addition of cognitive restructuring and interpersonal skills coaching. In particular, skills to address low perceived family support and common cognitive errors could potentially help to reduce adolescent aggression, and the likelihood that aggression will be associated with increased risk of NSSI. Second, our results suggest that researchers and clinicians addressing NSSI among adolescents should consider both the individual and combined influence of aggression and socio-cognitive deficits in predicting this high risk behavior and possibly employ cognitive behavioral techniques, that address these mechanisms, to decrease NSSI.

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