LONELINESS AND PERCEIVED SOCIAL SUPPORT AS POTENTIAL MEDIATORS
OF THE LONGITUDINAL RELATIONSHIP BETWEEN ADOLESCENT
SOCIAL ANXIETY SYMPTOMS AND SUICIDAL IDEATION

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ABSTRACT

MICHELLE GALLAGHER: Loneliness and Perceived Social Support as Potential
Mediators of the Longitudinal Relationship between Adolescent
Social Anxiety Symptoms and Suicidal Ideation
(Under the direction of Mitchell Prinstein)

Recent research has shown that social anxiety may be related to increased risk for suicidal ideation in teens. A sample of 144 adolescents 12-15 years old was assessed during psychiatric inpatient hospitalization and followed up at 9 and 18 months postbaseline. Symptoms of social anxiety, depression, suicidal ideation, loneliness, and perceived social support were assessed via structured interviews and self-report instruments. Structural equation modeling revealed a significant direct relationship between baseline social anxiety symptoms and suicidal ideation at 18 months postbaseline, even after controlling for baseline depressive symptoms and ideation. Loneliness at 9 months postbaseline was shown to have a significant indirect effect on the relationship between baseline social anxiety and suicidal ideation at 18 months postbaseline. Perceived social support from parents and close friends did not have a significant indirect effect. Findings suggest that loneliness may be particularly implicated in the relationship between social anxiety and suicidality in teens.

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CHAPTER 1

INTRODUCTION

Adolescent Social Anxiety and Suicidal Thoughts and Behaviors

Adolescence has been identified as a period of increased risk for the onset of suicidal

thoughts and behaviors (Kessler, Borges, & Walters, 1999). In a recent review of 128

population-based studies, Evans, Hawton, Rodham, and Deeks (2005) found that 6.4% of

adolescents (mean age 15.7 years) had made a suicide attempt and 19.3% had thought about

suicide in the previous year. These 12-month prevalence rates are comparable to those found

in the most recent, nationally representative Youth Risk Behavior Survey (Centers for

Disease Control, 2010). Researchers have identified a number of psychosocial risk factors for

suicidal thoughts and behavior in youth, including depression, substance abuse, negative life

events, past physical or sexual abuse, and hopelessness (Goldston et al., 2009; Mazza &

Reynolds, 1998; Waldrop, Hanson, Resnick, Kilpatrick, Naugle, & Saunders, 2007). The

identification of additional risk factors for suicidal thoughts and behaviors represents an

important public health concern: a history of past ideation and attempts are potent predictors

of future suicidality (Lewinsohn, Rohde, & Seeley, 1994), and completed suicide remains the

third leading cause of death among adolescents (Center for Disease Control, 2011). For the

same reason, it is vital to develop more complex models of risk, in order to better understand

how suicidal thoughts and behaviors emerge during this high-risk period. The present study

examines social anxiety symptoms as a longitudinal predictor of suicidal ideation in

adolescents. In addition, it explores potential mediators of this relationship, focusing specifically on feelings of loneliness and low perceived social support.

Anxiety disorders are highly prevalent in adolescence (Costello et al., 1996), and researchers have begun to examine the relationship between anxiety disorders and suicidality in youth. Results have been inconsistent, however, with a number of studies showing associations between anxiety disorders and increased risk of suicidal thoughts and behaviors (e.g., Boden, Fergusson, & Horwood, 2007; Foley, Goldston, Costello, & Angold, 2006; Ghaziuddin, King, Naylor, & Ghaziuddin, 2000; Gould et al., 1998), and other studies finding no such association (e.g., D'Eramo, Prinstein, Freeman, Grapentine, & Spirito, 2004; Palwak, Pascual-Sanchez, Rae, Fischer, & Ladame, 1999). Further complicating research in this area is the high co-morbidity between anxiety and depression in youth (Last, Perrin, Hersen, & Kazdin, 1992). Several studies have shown that the relationship between anxiety disorders and suicidal thoughts and behaviors is no longer significant after accounting for depression and other diagnoses (e.g., Beautrais, Joyce, & Bulder, 1996; Strauss et al., 2000).

Several specific anxiety disorders are linked to adolescent suicidality, including panic disorder, generalized anxiety disorder, and separation anxiety disorder (for a review, see Hill, Castellanos, & Pettit, 2011). Recent research also has begun to examine social anxiety disorder in relation to adolescent suicidality. Characterized by a fear of social situations, social anxiety disorder involves physical symptoms such as blushing and trembling, cognitive symptoms such as worry and negative self-evaluation, and a pattern of behavioral and situational avoidance (Mesa, Nieves, & Beidel, 2011). Social anxiety disorder generally emerges by adolescence, with one study finding that 75% of cases had an age of onset by age 15 (Kessler et al., 2005). The lifetime prevalence of social anxiety disorder is 4.0% in

teenagers, with a 12-month prevalence rate of 3.0%. Furthermore, social anxiety disorder is nearly twice as prevalent in teenage girls as it is in boys (Wittchen, Stein, & Kessler, 1999), perhaps reflecting girls' greater concerns about social acceptance (Rose & Rudolph, 2006).

To date, there is limited research on the relationship between social anxiety and suicidality in adolescents. An epidemiologic study of children and teens found that a number of current diagnoses, including social anxiety disorder, distinguished youth with recent ideation or a lifetime attempt from nonsuicidal controls (Gould et al., 1998). The authors did not test the independent association between social anxiety disorder and suicide-related risk, however, raising questions about whether the relationship could be accounted for by depression. Accounting for comorbidity is crucial given the high co-occurrence (approximately 31%) of social anxiety disorder and depression in youth (Wittchen et al., 1999). In a large-scale study that did control for multiple disorders, researchers found that although adolescent girls with a lifetime social anxiety diagnosis were more likely to report lifetime ideation, plans, and attempts as compared to controls, only ideation risk remained significant after accounting for co-morbid depression (Nelson et al., 2000). Similarly, a study of high-school students found that current social phobia symptoms were positively correlated with current ideation, even after controlling for depression (Valentiner, Gutierrez, & Blacker, 2002). In a recent study of clinical outpatients stratified by age, however, the authors found that individuals with current ideation or past attempts were no more likely to be socially anxious than nonsuicidal patients. These results held for both younger and older youth (Strauss et al., 2000). However, the study's classification of patients reporting "slight ideation" as "nonsuicidal" may have obscured relevant findings related to suicidal ideation.

Although research on this topic has been sparse in adolescent populations, studies in adult populations have consistently evidenced an association between social anxiety and increased risk for suicidality. In community and epidemiological samples, researchers have shown that both current and lifetime social anxiety disorder diagnoses are associated with increased risk for suicidal ideation and attempts, even after controlling for depression and other diagnoses (e.g., Cougle, Keough, Riccardi, & Sachs-Ericsson, 2009; Nock, Hwang, Sampson, & Kessler, 2010; Sareen et al., 2005; Statham et al., 1998). Nearly all of the research in this area has been cross-sectional in nature, however, limiting our understanding of the temporal relationship between social anxiety and suicidality. In the only longitudinal study to date, Sareen and colleagues (2005) found that a social anxiety diagnosis at baseline was independently associated with new-onset suicidal ideation, but not new-onset attempts, at three-year follow-up.

Loneliness and Low Social Support as Potential Mediators of the Social Anxiety–Suicidal Ideation Relationship

Interpersonal models of suicide may provide a framework for understanding the relationship between social anxiety and increased risk for suicidal thoughts and behaviors. According to Joiner's Interpersonal Theory of Suicide, two factors are thought to contribute to the desire for suicide: *thwarted belongingness* and *perceived burdensomeness*. Thwarted belongingness encompasses feelings of isolation and loneliness as well as a perception that one lacks mutually supportive relationships. Perceived burdensomeness, on the other hand, involves a belief that one's life has become a burden to friends, family, and other close relations (Van Orden et al., 2010). A third factor called the *acquired capability for suicide* is implicated in suicidal behavior. According to Joiner's model, repeated exposure to painful or fear-inducing experiences leads to a lowered pain threshold and reduced fear of death, which

in turn increase one's capability for engaging in self-harm. Tests of this model have largely

supported its main hypotheses that thwarted belongingness and perceived burdensome are

associated with increased risk for suicidal ideation, while the acquired capability for suicide

is linked to increased risk for attempts (for a review, see Van Orden et al., 2010).

Recent research indicates that there may be a relationship between social anxiety

symptoms and thwarted belongingness (Davidson, Wingate, Grant, Judah, & Mills, 2011).

Social anxiety involves a pattern of interpersonal difficulties that may contribute to the

loneliness and low social support that is characteristic of thwarted belongingness. Socially

anxious adolescents tend to be less socially skilled (Beidel et al., 2007) and engage in more

social withdrawal (Erath, Flanagan, & Bierman, 2007) as compared to non-anxious peers.

Perhaps as a consequence of these interpersonal difficulties, socially anxious adolescents also

experience less peer support and social acceptance (La Greca & Lopez, 1998), increased peer

victimization (Erath et al., 2007), and less intimacy in their close friendships (Vernberg,

Abwender, Ewell, & Beery, 1992). Given that adolescence is marked by an increased

emphasis on social relationships and acceptance, the pattern of interpersonal problems

described above may be especially difficult for socially anxious teens. In fact, research has

shown that socially anxious adolescents report both lower perceived social support (Calsyn,

Winter, & Burger, 2005; LaGreca & Lopez, 1998) and greater feelings of loneliness (Beidel

et al., 2007). A recent study suggests that peer-related loneliness may be a particular problem

for socially anxious youth (Lasgaard, Goossens, Bramsen, Trillingsgaard, & Elklit, 2011a).

In order to more fully understand the potential link between social anxiety and

suicidality, it is necessary to identify potential mediators of this relationship. Interpersonal

accounts of suicide, together with the interpersonal difficulties experienced by socially

anxious teens, suggest that loneliness and low perceived social support are two possible mediators. Loneliness has been described as an aversive emotional state resulting from a belief that one's social relationships are inadequate (Heinrich & Gullone, 2006), and there is mixed evidence supporting a link between loneliness and suicidality in teens. Studies focused on adolescents have shown that loneliness is associated with increased risk for recent suicidal ideation and behavior (Roberts, Roberts & Chen, 1998; Schinka, Van Dulmen, Bossarte, & Swahn, 2012) and for lifetime attempts in adolescents (Rossow & Wichstrom, 1994). Another study found that loneliness was related to increased risk for lifetime self-harm behavior in a community sample of teens and for suicide attempts in a clinical sample of teens, although the latter finding was no longer significant after controlling for other risk factors (Groholt, Ekeberg, Wichstrom, & Haldorsen, 2000). Finally, after accounting for depressive symptoms, Lasgaard, Goossens and Elklit (2011b) found that loneliness did not predict suicidal ideation either concurrently or prospectively in high-school students.

There is also evidence to suggest a link between low perceived social support and suicidal thoughts and behaviors in youth. Rigby and Slee (1999) showed that recent suicidal ideation in adolescents is negatively associated with overall perceived support across a range of relationships. Studies that have looked at specific sources of support suggest that low perceived support from both family and peers is linked to suicidality in youth. Several studies have shown that adolescent ideation and attempts are negatively associated with perceptions of family-related support (Eskin, Ertekin, Dereboy, & Demirkiran, 2007; Kerr, Preuss, & King, 2006; Yuen et al., 1996), particularly with perceptions of parental support (Babiss & Gangwisch, 2009; de Man, Labrèche-Gauthier, & Leduc, 1993). However, adolescence is a period in which teenagers increasingly look to friends for intimacy and support. Consistent

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with this developmental shift, studies have shown that adolescent suicidal ideation is negatively related to perceived social support from peers and close friends (Rigby & Slee, 1999) and to perceived social acceptance (Babiss & Gangwisch, 2009).

Gender-related differences may play a role in the relationship between perceived social support and adolescent suicidality. Ehrlich (1998) found that recent suicidal ideation was associated with lower perceived support from peers, but only among adolescent girls, while Mazza & Reynolds (1998) showed that lower total perceived social support prospectively predicted suicidal ideation, but only among female high-school students. Meanwhile, Kerr and colleagues (2006) found that perceived family support was negatively related to severity of ideation only among female patients hospitalized for suicidality. In part, these findings may reflect teenage girls' greater emphasis on interpersonal relationships and their greater tendency to seek support in response to stress (Rose & Rudolph, 2006).

The Present Study

Prior research suggests that socially anxious adolescents are at increased risk for suicidal thoughts and behaviors (Nelson et al., 2000; Valentiner et al., 2002). Past work in this area has largely been cross-sectional in nature, however, and the present study extends this literature by examining social anxiety symptoms as a longitudinal predictor of suicidal ideation in adolescents. Furthermore, no studies to date have examined potential mediators of the relationship between social anxiety and suicidal ideation in adolescents. The current study addresses this gap by examining whether two factors that have been linked to both social anxiety and ideation – loneliness and low perceived social support – statistically mediate the longitudinal relationship between social anxiety symptoms and suicidal ideation in adolescents. It is hypothesized that social anxiety symptoms at baseline will prospectively

predict suicidal ideation at follow-up, after controlling for baseline depressive symptoms and ideation. In addition, it is hypothesized that loneliness and low perceived close friend and parental support will each statistically mediate the relationship between baseline social anxiety symptoms and suicidal ideation at follow-up. Given that gender appears to play a role in the relationship between social support and suicidality, it would be ideal to assess gender as a moderator of the social support mediation effect. However, given the disproportionate number of girls in the present sample, it was not possible to perform such an analysis.

CHAPTER 2

METHODS

Participants

Participants were 144 adolescents (72% female) between the ages of 12 and 15 years (*M* = 13.51, *SD* = 0.81) at baseline. Approximately 75% of the participants identified as White/Caucasian, 4% Latino American, 3% African American, and 17% of mixed ethnicity. As regards living situation, approximately 27% of the adolescents lived with both biological parents, 29% lived with their biological mother only, and 15% lived with their biological mother and a stepparent. The remaining 29% of adolescents lived with their biological father or with extended family members, or lived in foster or temporary care. The educational status of participants' mothers was as follows: 19% had not received a high school diploma, 40% had obtained a high school degree, 14% had received a trade degree, 11% had obtained some undergraduate education, and 16% had a college degree or higher.

The participants were recruited from a psychiatric inpatient facility in the northeastern United States. Of those admitted to the inpatient unit during the recruitment period, a total of 246 adolescents met study inclusion criteria (12–15 years old, with no history of mental retardation or prior psychosis). At the time data were collected, around 40% of patients admitted to the inpatient unit were discharged or transferred within 1-2 days of admission, a length of stay that was related to factors such as insurance restrictions and the availability of placements in area facilities. This length of stay was not an indicator of socioeconomic status or of the severity of adolescents' psychiatric symptoms.

Procedures

In accordance with human subjects protocol, clinical personnel initially met with the adolescents' parent or guardian (typically on the second day post-admission) in order to obtain permission for further contact about the study. Adolescents and their parents were then approached about study participation, and assent/consent was requested from 183 of the eligible adolescents/parents. A total of 162 (88.5%) adolescents/parents provided consent. Of these adolescents, a total of 144 participants were available to take part in study procedures.

Adolescents and their parents initially were assessed during the adolescents' hospitalization immediately following consent. This baseline assessment typically took place within 2 to 4 days of admission, and the diagnoses of participants at baseline included major depressive disorder (31.3%), oppositional defiant disorder (25.7%), conduct disorder (17.4%), posttraumatic stress disorder (13.2%), social phobia (12.5%), and generalized anxiety disorder (6.3%; cumulative total exceeds 100% due to comorbidity). Psychiatric diagnoses were obtained using the Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Adolescents and parents also completed follow-up assessments at 9 and 18 months post-baseline.

The recruitment setting and longitudinal nature of this research contributed to the presence of missing data. Inpatient data collection involves a number of practical issues (e.g., discharge of a patient mid-study; competition for a patient's time) that led to missing data on some items or measures within participants. Participant attrition over the 18-month longitudinal period (e.g., due to relocation or dropout) also led to missing data. A variety of strategies was used to enhance retention: frequent phone and mail contact with participants and their family members and friends, public access database searches for updated contact

information, and incentives for completion of follow-up assessments (i.e., $30 at each follow-up for both the adolescent and a parent). Of the 144 adolescents who took part in the baseline assessment, 105 adolescents (73%) took part in the 9-month follow-up while 101 adolescents (70%) took part in the final assessment, a retention rate that is consistent with previous longitudinal studies of adolescent suicide ideators and attempters (see Boergers & Spirito, 2003, for a review). There were no significant differences on age, gender, or other baseline variables among adolescents with and without complete data. In order to avoid biased estimates resulting from listwise deletion or other ad hoc missing data procedures, analyses were conducted with all available data using full information maximum likelihood procedures, a method that has been shown to produce efficient, unbiased estimates under both missing completely at random (MCAR) and the more stringent missing at random (MAR) conditions (Enders & Bandalos, 2001).

Measures

All adolescent questionnaire-based measures were administered during individual meetings with a trained research assistant, who read each questionnaire aloud while adolescents privately recorded their responses. This procedure was chosen because it allowed research assistants to monitor adolescents' attention and compliance, to clarify questionnaire items when needed, and to immediately check for response inconsistencies.

Suicidal ideation. The Suicidal Ideation Questionnaire (SIQ; Reynolds, 1985) was used to measure adolescents' suicidal ideation at baseline and at the 18-month follow-up time point. The SIQ is a 30-item self-report inventory that assesses specific thoughts and cognitions about suicide in adolescents. Items are scored on a 7-point scale ranging from 0 (*I never had this thought*) to 6 (*I had this thought almost every day)*. A total score was

computed as the mean of the 30 items, with higher scores reflecting a greater frequency/severity of suicidal ideation. At baseline, adolescents were asked about suicidal ideation over the previous 12 months. At the 18-month follow-up time point, adolescents were asked about ideation over the prior 3 months. Adequate internal reliability and validity of the SIQ has been established in both nonclinical adolescents (Reynolds & Mazza, 1999) and in adolescent psychiatric inpatients (Pinto, Whisman & McCoy, 1997). In the present sample, the internal consistency of the SIQ was .98 at both the baseline and 18-month follow-up time points.

Psychiatric symptoms and diagnoses at baseline. The Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer et al., 2000) was administered at baseline to assess symptoms of social phobia and major depression. The DISC-IV is a structured diagnostic interview designed to assess symptoms consistent with the diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994). The adolescent self-report version of the DISC-IV is designed to be completed by adolescents ages 6-17. The DISC-IV has been shown to have adequate interrater and test-retest reliability (Shaffer et al., 2000), as well as acceptable diagnostic sensitivity (Fisher et al., 1993). A continuous measure of symptom severity for social phobia and major depressive disorder was created by summing the number of adolescents' clinically significant symptoms for each disorder. Internal consistency at baseline was .90 for major depression symptoms and .85 for social phobia symptoms. Modules for oppositional defiant disorder, conduct disorder, posttraumatic stress disorder, and generalized anxiety disorder were also administered at baseline (for a diagnostic breakdown, see description of

participants). The total number of diagnoses at baseline (excluding social phobia and major depression) was calculated as an indicator of baseline diagnostic status and comorbidity.

The Social Anxiety Scale for Adolescents (SASA; La Greca & Lopez, 1998) was also administered at baseline to assess participants' social anxiety symptoms. The SASA is a 22-item self-report scale that assesses symptoms of anxiety along three dimensions: fear of negative evaluation by peers (e.g., *I worry about what others think of me*), general social avoidance and distress (e.g., *It's hard for me to ask others to do things with me*), and social avoidance and distress in novel social situations (e.g., *I feel shy around people I don't know*). The SASA includes 4 filler items (e.g., *I like to play sports)* and 18 descriptive self-statements that are rated on a 5-point scale ranging from 1 (*not true at all)* to 5 (*always true*). A total score was computed as the mean of the 18 items, with higher scores indicating greater levels of social anxiety symptoms. The SASA has been found to be psychometrically sound, with satisfactory internal reliability and construct validity (La Greca & Lopez, 1998), as well as adequate convergent and divergent validity (Inderbitzen-Nolan & Walters, 2000). In the current sample, the internal consistency of the SASA at baseline was .95.

Loneliness. The Loneliness and Social Dissatisfaction Scale (LSDS; Asher, Hymel, & Renshaw, 1984) was administered at baseline and at the 9-month follow-up time point to assess participants' subjective feelings of loneliness. The LSDS is a 24-item self-report questionnaire that measures the extent to which a child feels lonely and socially dissatisfied. The scale includes 16 declarative items (e.g., *I feel alone)* that are used to calculate the total score, along with 8 filler items (e.g., *I like to draw)* that are not included in the scoring. Children are asked to rate each statement on a 5-point scale ranging from 1 (*not true at all)* to 5 (*always true).* A total score was computed as the mean of the 16 primary items, with 6

items reverse-coded and higher scores reflecting a greater degree of loneliness. The LSDS has been shown to have strong reliability and validity in elementary and middle school students (Asher et al., 1984; Asher & Wheeler, 1985; Parkhurst & Asher, 1992). In the current study, the internal consistency of the LSDS was .92 at both the baseline and 9-month follow-up time points.

Social Support. The Social Support Scale for Children and Adolescents (SSSCA; Harter, 1985) was administered at baseline and at the 9-month follow-up time point to measure adolescents' level of perceived social support. The SSSCA is a 24-item self-report questionnaire assessing perceptions of social support and positive regard from four different sources (6 items per subscale): parents, classmates, teacher, and close friends. The present study included only the 12 items measuring perceived support from parents and close friends. Each of the items on the SSSCA utilizes a forced-choice format, in which adolescents are instructed to first choose which of two statements is more true for them (e.g., *Some kids have a close friend who they can tell their problems to BUT Other kids don't have a close friend who they can tell problems to*). After selecting one of the statements, adolescents are then asked to rate whether the statement is "sort of true" or "really true" for them. This format yields scores from 1 to 4 for each item, in which higher scores indicate greater levels of perceived social support. Several items are reverse-scored, and mean scores were calculated for each subscale. The SSSCA has been found to have strong internal reliability and validity (Dubow & Ullman, 1989; Harter, 1985). In the present study, the internal consistency at baseline was .83 for the Close Friend Support subscale and .92 for the Parent Support subscale. At the 9-month follow-up time point, the Cronbach's alpha was .89 for the Close Friend Support subscale and .88 for the Parent Support subscale.

Data Analytic Plan

Descriptive statistics were used to examine the means and standard deviations for all study variables, and to test for gender differences. In addition, estimated zero-order correlations were examined to assess the bivariate relationships between study variables.

In order to test the direct relationship between baseline social anxiety and 18-month suicidal ideation, as well as potential mediation effects, two hypothesized models were tested using structural equation modeling (SEM). Recent literature suggests that it may not be necessary to show a direct relationship between the independent variable and outcome in order to establish mediation effects (Mackinnon, Fairchild, & Fritz, 2007). However, given that prior research has evidenced only a cross-sectional relationship between adolescent social anxiety and suicidal ideation, the current study was designed to test the longitudinal relationship between social anxiety and ideation in addition to any possible mediation effects. Thus, the first hypothesized model examined this direct relationship. A measurement model was specified to examine adequacy of model fit to the observed data. Social anxiety was modeled as a latent variable with two indicators measuring severity of social anxiety symptoms at baseline, while all other variables were modeled as manifest variables. In addition to baseline social anxiety and 18-month suicidal ideation, the model included several covariates: gender, baseline depression symptoms and number of psychiatric diagnoses, and baseline suicidal ideation. All covariances were freely estimated. Model goodness of fit was evaluated, and a structural model was then specified to evaluate baseline social anxiety as a predictor of 18-month suicidal ideation.

A second hypothesized model tested a multiple mediation model in which 9-month loneliness and 9-month close friend and parental support were simultaneously evaluated as mediators of the relationship between baseline social anxiety and 18-month suicidal ideation.

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A multiple mediation model is recommended in lieu of individual mediation tests due to its ability to: (a) test competing theories within a single model, (b) reduce parameter bias associated with omitted variables, i.e., other possible mediators, and (c) permit the testing of total indirect effects (Preacher & Hayes, 2008). An initial measurement model was specified to examine adequacy of the model fit to the observed data. The model included the primary variables of interest (baseline social anxiety, 9-month loneliness and social support, and 18-month suicidal ideation) as well as covariates potentially related to the outcome variable (gender, baseline depression symptoms, number of psychiatric diagnoses, and baseline suicidal ideation). Each of the 9-month mediators was also adjusted for initial baseline levels, as is recommended for longitudinal tests of mediation (Cole & Maxwell, 2003). All covariances were freely estimated. Model goodness of fit was evaluated, and a structural model was specified to evaluate the interrelationships between baseline social anxiety, the 9-month mediators, and 18-month suicidal ideation. To increase model parsimony, all nonsignificant correlations among baseline variables in the measurement models were trimmed from the structural models.

A number of methods for testing the significance of indirect effects have been proposed in the literature. Several commonly used techniques such as Baron and Kenny's (1986) causal steps approach and the Sobel test have been shown to exhibit problems with statistical power and Type I error rates (MacKinnon et al., 2007). Thus, in order to test mediation effects, the current study used the Monte Carlo method as outlined by Preacher and Selig (2012). This method generates a sampling distribution for the indirect effect (ab) where a represents the unstandardized regression coefficient linking the independent variable and the mediator and b represents the unstandardized regression coefficient linking the

mediator and the outcome. The Monte Carlo method uses model-based point estimates of a and b, along with their standard errors, to repeatedly generate new a and b values. These values are then multiplied and the resulting ab sampling distribution can be used to establish a 95% asymmetric confidence interval testing the null hypothesis that the indirect effect (ab) is equal to zero. Confidence intervals resulting from the Monte Carlo approach have been shown to perform as well as other well-regarded confidence interval methods such as the bias-corrected bootstrap (Preacher & Selig, 2012). In the present study, each of the indirect effects was evaluated using 20,000 estimations of the a and b coefficients. An indirect effect was considered statistically significant if the 95% confidence interval did not contain zero.

All structural equation models in this study were estimated using full-information maximum likelihood estimation in the AMOS 19 program (Arbuckle, 2010). Model goodness of fit was evaluated using multiple fit indices. The χ^2/df ratio is thought to indicate adequate model fit when it is less than or equal to 2.0 (Byrne, 2009). The root mean square error of approximation (RMSEA) is considered to indicate close model fit when values are less than or equal to 0.05 and to indicate adequate model fit when values are less than or equal to 0.08. The comparative fit index (CFI) and the incremental fit index (IFI) both indicate good fit when values are approximately 0.95 or higher (Browne & Cudeck, 1993; Byrne, 2009). All nested models were compared using chi-square difference tests.

CHAPTER 3

RESULTS

Descriptive Statistics

Table 1 contains the means and standard deviations for all study variables, as well as the results of *t*-tests assessing gender differences. Results indicated that female participants scored higher than male participants on all study variables, with the exception of self-reported parental social support. However, gender differences were statistically significant for only three variables: girls reported a greater severity of social phobia and major depressive symptoms at baseline, and higher levels of suicidal ideation at 18 months postbaseline. Given these differences, gender was included as a covariate in all models.

Bivariate Correlations

Estimated correlations between the latent social anxiety variable and all other observed variables can be found in Table 2. Most bivariate correlations were of the expected strength and direction. Baseline suicidal ideation, social anxiety and depression symptoms, and number of other psychiatric diagnoses, were all found to be positively intercorrelated. Social anxiety at baseline was also found to be positively associated with both baseline and 9-month loneliness, although it was not significantly correlated with baseline or 9-month parental/close friend support. Suicidal ideation at 18 months was positively associated with baseline social anxiety, baseline suicidal ideation and 9-month loneliness, and was negatively associated with 9-month parental social support. However, suicidal ideation at 18 months was not significantly associated with 9-month close friend support.

Longitudinal Relationship between Social Anxiety Symptoms and Suicidal Ideation

The first hypothesized model examined the longitudinal relationship between social anxiety and suicidal ideation, adjusting for depression symptoms and other baseline covariates. A measurement model was initially specified in order to evaluate the model's fit to the observed data. The model included five observed variables (gender, baseline depression symptoms and number of psychiatric diagnoses, and baseline and 18-month suicidal ideation) and one latent variable representing baseline social anxiety. Social anxiety was specified by two indicators measuring the severity of social anxiety symptoms at baseline. All covariances were freely estimated in the measurement model. The standardized loadings for the two social anxiety indicators were .80 for symptom severity as measured by the DISC-IV youth interview and .62 for symptom severity as measured by the SASA. The model was a close fit to the observed data: $\chi^2(11, N =144) = 12.41$; $\chi^2/df = 1.13$; CFI = .99; IFI = .99; RMSEA = .03.

A structural model was then specified to test the direct relationship between baseline social anxiety and 18-month suicidal ideation, adjusting for gender and other covariates (baseline depression symptoms, psychiatric diagnoses, and suicidal ideation). In the interest of model parsimony, nonsignificant correlations among predictor variables were trimmed from the structural model. Results of χ^2 difference testing indicated that the more parsimonious model did not lead to a significant decrease in model fit, $\chi^2(4, N =144) = 8.41$, $p = .08$. The trimmed structural model exhibited adequate fit to the data: $\chi^2(8, N =144) = 12.37$; $\chi^2/df = 1.55$; CFI = .97; IFI = .97; RMSEA = .06 (see Figure 1). Consistent with prediction, results indicated that baseline social anxiety significantly predicted suicidal ideation at 18 months postbaseline, adjusting for baseline depressive symptoms and other

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covariates ($B = .22$, $\beta = .30$, $p < .05$). In addition, female gender also significantly predicted

suicidal ideation at 18 months postbaseline ($B = .49$, $\beta = .19$, $p < .05$). The present model

accounted for 21% of the variance in suicidal ideation at 18 months postbaseline.

Loneliness and Perceived Social Support as Mediators of the Social Anxiety–Suicidal Ideation Relationship

The second hypothesized model examined the interrelationships among baseline

social anxiety, potential 9-month mediators (loneliness, parental support, close friend

support), and 18-month suicidal ideation. A measurement model was specified to examine

the model's fit to the observed data. The model included eleven observed variables (gender,

baseline depression symptoms and number of psychiatric diagnoses, baseline and 18-month

suicidal ideation, and baseline and 9-month loneliness and parental/close friend support) and

a latent variable measuring baseline social anxiety. Social anxiety was specified by two

indicators measuring the severity of social anxiety symptoms at baseline. All variables were

allowed to freely intercorrelate. The standardized loadings for the two social anxiety

indicators were .62 for symptom severity as measured by the DISC-IV interview and .81 for

symptom severity as measured by the SASA. The model was a close fit to the observed data:

$\chi^2(23, N = 144) = 25.11$; $\chi^2/df = 1.09$; CFI = .99; IFI = .99; RMSEA = .03.

A structural model was then specified to examine the interrelationships between

baseline social anxiety, the 9-month mediators (loneliness, parental support, close friend

support), and suicidal ideation at 18-months postbaseline. Gender, baseline depression

symptoms and number of psychiatric diagnoses, and baseline suicidal ideation were included

in the model as covariates, and each mediator was adjusted for scores at baseline. In the

interest of model parsimony, nonsignificant correlations among predictor variables were

trimmed from the structural model. Results of χ^2 difference testing indicated that the trimmed

model did not lead to a significant decrement in model fit, χ^2(11, N =144) = 12.98, p = .30. The structural model exhibited adequate fit to the data: χ^2(45, N =144) = 63.68; χ^2/df = 1.42; CFI = .94; IFI = .95; RMSEA = .05 (see Figure 2). Consistent with study hypotheses, the results indicated that baseline social anxiety was a significant predictor of 9-month loneliness (B = .21, β = .36, p < .05) and that 9-month loneliness was a significant predictor of suicidal ideation at 18 months postbaseline (B = .57, β = .32, p < .01). In keeping with a possible mediation effect, baseline social anxiety no longer significantly predicted 18-month suicidal ideation, with a near-zero standardized regression coefficient (B = –.07, β = –.07, p > .05). However, contrary to prediction, baseline social anxiety was not a significant predictor of 9-month social support (parent: B = –.13, β = –.20, p > .05; close friend: B = –.04, β = –.09, p > .05). Similarly, social support at 9 months postbaseline did not significantly predict 18-month suicidal ideation (parent: B = –.21, β = –.13, p > .05; close friend: B = .07, β = .03, p > .05). Results indicated that two other pathways significantly predicted 18-month suicidal ideation: baseline ideation (B = .20, β = .28, p < .05) and female gender (B = .50, β = .19, p < .05). The final model accounted for 25% of the variance in suicidal ideation at 18 months postbaseline.

Indirect effects were examined using 95% Monte Carlo confidence intervals. The 95% confidence interval for the total indirect effect did not contain zero (95% CI: 0.01–0.31), indicating a significant overall indirect effect of baseline social anxiety on 18-month suicidal ideation through the 9-month mediators: loneliness and parental/close friend social support. The 95% confidence interval for the indirect effect of 9-month loneliness also did not contain zero (95% CI: 0.01–0.27), indicating a significant indirect effect of baseline social anxiety on 18-month suicidal ideation through 9-month loneliness. Given that the earlier results showed that baseline social anxiety did not significantly predict 9-month social

support, and that 9-month social support did not significantly predict 18-month suicidal

ideation, it was anticipated that the 95% confidence intervals for these indirect effects would

contain zero. An examination of these confidence intervals confirmed that they did contain

zero, indicating that there was no significant indirect effect of either 9-month parental social

support (95% CI: -0.01–0.09) or close friend social support (95% CI: -0.04–0.03).

CHAPTER 4

DISCUSSION

Suicidal thoughts and behaviors represent an important public health concern, particularly among adolescents, a population for whom completed suicide is the third leading cause of death (CDC, 2011). Significant progress has been made in identifying psychosocial risk factors for suicidality in teenagers, with recent research showing that social phobia and other anxiety disorders may contribute to suicide risk in adolescence. However, although prior research indicates that social anxiety symptoms are related to suicidal ideation in teenagers (Nelson et al., 2000; Valentiner et al., 2002), only one study involving adults has linked social anxiety symptoms to suicidal thoughts and behaviors over time (Sareen et al., 2005). The present study sought to address this gap in the literature by examining the longitudinal relationship between social anxiety symptoms and suicidal ideation in a sample of clinically referred adolescents. Given that no research to date has identified variables that may help to explain the relationship between social anxiety and suicidality, a secondary aim of the study was to develop a more complex model of risk by examining loneliness and perceived social support as potential mediators of this relationship.

An initial goal of the study was to examine the longitudinal relationship between social anxiety symptoms and suicidal ideation in a clinically referred sample of adolescents. Results indicated that social anxiety symptoms, as measured during a baseline assessment, prospectively predicted suicidal ideation at 18 months post-baseline, even after controlling for baseline depression symptoms, number of psychiatric diagnoses, and suicidal ideation.

This finding is in keeping with prior research suggesting that social anxiety symptoms are concurrently related to suicidal ideation in adolescents (Nelson et al., 2000; Valentiner et al., 2002) and are longitudinally associated with suicidal ideation in adults (Sareen et al., 2005). Adolescence is a developmental period in which teenagers become increasingly defined by their social relationships. Given that social anxiety disorder is linked to social withdrawal and social skills deficits (Beidel et al., 2007; Erath et al., 2007), it is possible that social anxiety symptoms may interfere with this critical developmental period, leading to increased feelings of isolation, hopelessness, and suicidal ideation. The current study focused solely on suicidal ideation, however, and more research is needed to examine whether adolescent social anxiety is longitudinally related to suicide attempts or completed suicide.

In order to better understand the longitudinal relationship between social anxiety symptoms and suicidal ideation, the present study investigated loneliness and perceived social support as mediators of this relationship. Results indicated that loneliness (measured at 9 months post-baseline) significantly mediated the relationship between baseline social anxiety symptoms and suicidal ideation at 18-months post-baseline. This indirect effect remained significant even after adjusting for baseline depression symptoms, number of psychiatric diagnoses, and suicidal ideation. This finding is consistent with prior research showing that adolescent loneliness is associated with both social anxiety (Beidel et al., 2007) and with increased risk for suicidality (Roberts et al., 1998; Schinka et al., 2012). It is also consistent with Joiner's Interpersonal Theory of Suicide (Van Orden et al., 2010), which suggests that suicidal ideation stems from feelings of *thwarted belongingness* and *perceived burdensomeness*. The current study indicates that, for socially anxious teens, thwarted belongingness (with its attendant feelings of loneliness and isolation) may play an important

role in the development of suicidal ideation. Recent research has underscored this point, showing that social anxiety is associated with thwarted belongingness but not perceived burdensomeness (Davidson et al., 2011).

The study's findings regarding loneliness as a mediator may reflect the unique developmental concerns of adolescents. Loneliness has been defined as an aversive emotional state stemming from a belief that one's social relationships are inadequate. Given adolescents' focus on social relationships and acceptance, theorists have suggested that loneliness may be particularly prevalent and salient in this age group (Heinrich & Gullone, 2006). Thus, socially anxious adolescents may be especially susceptible to loneliness, which in turn increases their risk for suicidal ideation. Additional research is needed, however, to more fully understand how social anxiety leads to increased loneliness. Social anxiety has been associated with lower social acceptance and friendship intimacy as well as increased peer victimization (Erath et al., 2007; La Greca & Lopez, 1998; Vernberg et al., 1992). It is possible that the negative peer consequences related to social anxiety may increase feelings of loneliness in these teens. In addition, research is needed to delineate which aspects of loneliness increase risk for suicidal ideation in socially anxious youth. Loneliness has been theorized to be a multi-dimensional construct involving psychosocial and affective dimensions (DiTommaso & Spinner, 1993), and there is evidence to suggest that peer-related loneliness may be a particular problem for socially anxious teens (Lasgaard et al., 2011a).

The present study also examined two other potential mediators of the longitudinal relationship between adolescent social anxiety and suicidal ideation: perceived social support from family and perceived social support from close friends. In contrast to the study's findings regarding loneliness, results indicated that neither form of social support mediated

the relationship between social anxiety and suicidal ideation. In fact, the present study found that baseline social anxiety was not significantly correlated with either parental or close friend support at 9 months, and close friend support at 9 months was not significantly correlated with suicidal ideation at 18 months. These results are inconsistent with prior research showing that socially anxious adolescents report lower perceived social support (Calsyn et al., 2005; LaGreca & Lopez, 1998), and that lower peer-related support is associated with suicidal ideation (Rigby & Slee, 1999). However, unlike the present study, which utilized a clinical sample, prior research has focused on community samples, which could explain the discrepant findings. In addition, while the current study provides a strong test of mediation by simultaneously evaluating several mediators, this design may have obscured more complex relationships among these variables. The present study hypothesized that loneliness and perceived social support would operate in parallel to mediate the relationship between social anxiety symptoms and suicidal ideation. It is possible, however, that a more complex pathway exists, such that social anxiety leads to low social support, which in turn leads to increased loneliness and suicidal ideation. It is also possible that feelings of loneliness may interact with low social support to increase risk for suicidal ideation. Future research should examine these alternate pathways to suicide risk.

The lack of findings regarding parental and close friend social support may also reflect methodological constraints. Although a strength of the current study was its use of a longitudinal design with three time points, the lack of additional time points prohibited the examination of indirect effects related to social support and suicidality. In fact, prior research suggests that family-based social support may indirectly increase suicide risk through its effect on hopelessness (Thompson, Mazza, Herting, Randell, & Egert, 2005). Considered to

be a strong indicator of suicide risk in both adolescents and adults (Mazza & Reynolds, 1998; Steer et al., 1993), hopelessness may also be implicated in the current study's finding that loneliness mediates the relationship between social anxiety and suicidal ideation. Feelings of hopelessness have been linked to adolescent loneliness (Page, 1991), and some theorists suggest that there may exist a domain-specific form of hopelessness that is centered on social relationships. This form of *social hopelessness* is characterized by negative expectations regarding one's future interpersonal relations, and has been linked to suicidal ideation in young adults (Bonanno & Hymel, 2010; Heisel, Flett, & Hewitt, 2011). More research is needed to examine how this type of social hopelessness may influence the relationships between social support, loneliness, and suicidality in socially anxious teens.

The present findings have implications for the prevention and treatment of suicidal thoughts and behaviors in teens. The results indicate that feelings of loneliness may be one mechanism through which adolescent social anxiety increases the risk of suicidal thinking over time. Clinicians treating socially anxious adolescents may wish to evaluate these teens for heightened levels of loneliness, the presence of which may indicate a greater risk for eventual suicidality. The present findings also suggest that therapeutic interventions focused on the reduction of loneliness may be particularly useful when working with socially anxious adolescents. Both social skills training and loneliness-focused cognitive behavioral therapy have been shown to reduce feelings of loneliness in adolescents (Adams, Openshaw, Bennion, Mills, & Noble, 1988; McWhirter & Horan, 1996), and practitioners may find it helpful to employ these techniques with socially anxious adolescents who are also experiencing feelings of loneliness. Doing so may actually be of broader psychological benefit to these teens: a recent study of a 12-week social effectiveness intervention found that

reductions in loneliness mediated overall treatment outcome in socially anxious children and teens (Alfano, Pino, Villalta, Beidel, Ammerman, & Crosby, 2009).

As an initial exploration of the relationship between adolescent social anxiety and suicidal ideation over time, the present study had a number of strengths. As is recommended for longitudinal mediation, the study used multiple time lags of equal temporal length (Gollob & Reichardt, 1987) and adjusted for prior levels of both the mediators and the outcome variables (Cole & Maxwell, 2003). The present study also used a latent variable to assess social anxiety and adjusted for initial levels of depressive symptoms, which, given the high comorbidity of depression and social anxiety in youth (Wittchen et al., 1999), allowed for a stronger test of the relationship between adolescent social anxiety and suicidal ideation. Nevertheless, the present study had important limitations. First, the study was correlational in nature, and thus no conclusions can be drawn about causality. Furthermore, the sample was predominately White and was recruited from an inpatient psychiatric unit. Therefore, the results may not generalize to ethnic minority populations or to individuals experiencing a less severe range of psychopathology.

The sample used in the current study was also disproportionately female, and the small sample size did not allow for the examination of gender differences in the relationship between social anxiety, loneliness, social support, and suicidal ideation. Examining such gender differences will be a crucial step for future research, as prior studies have shown that gender is implicated in each of these constructs. Social anxiety disorder has been found to be nearly twice as prevalent in teenage girls as it is in boys (Wittchen et al., 1999), and research indicates that gender may moderate the relationship between perceived social support and suicidal ideation, such that the relationship is present only among teenage girls (Ehrlich,

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1998; Mazza & Reynolds, 1998; Kerr et al., 2006). Finally, a meta-analysis indicated that gender may play a complicated role in the construct of loneliness. This study showed that males tend to report more loneliness when it is indirectly measured via self-report. However, when loneliness is measured via direct self-labeling (i.e., "Are you lonely?"), females more often label themselves as lonely (Borys & Perlman, 1985). Given that gender plays a role in each of the constructs used in the present study, future analyses may wish to include gender as a potential moderator.

Another limitation of the present study was its reliance on self-report for many of the study variables, including loneliness, social support, and suicidal ideation. Due to the use of self-report measures across variables and time points, it is possible that shared method variance could account for the present results. Finally, the specific time lag between the assessment of the baseline variables and the mediators (9 months) and between the mediators and the outcome variable (9 months) may be a study limitation. Although cross-sectional studies point to associations among these variables, it is unclear whether 9 months is the optimal timeframe for assessing these longitudinal relationships. In fact, some research suggests that loneliness may be more stable over shorter periods (several months) as compared to longer periods (a year or more) (for a review, see Heinrich & Gullone, 2006). It is possible that time lags of less than 9 months may more accurately capture the dynamic relationships between social anxiety, loneliness, social support, and suicidal ideation. Future research may wish to follow the recommendations of Cole and Maxwell (2003), who suggest that longitudinal mediation be examined within empirically determined timeframes.

Despite these limitations, the current study contributes to the literature on adolescent social anxiety and suicidal ideation by examining the relationship longitudinally, and by

testing potential mediators of the relationship. The results indicate that social anxiety

symptoms predict suicidal ideation in adolescents over an 18-month follow-up period, and

that feelings of loneliness may help to explain this relationship. These findings add to the

literature on psychosocial risk factors for suicidal ideation in adolescents, and may help to

inform prevention and treatment efforts in this age group.

Table 1. Descriptive Statistics for Primary Study Variables and Tests of Gender Differences

Variable	Total	Boys	Girls	Statistic
Age at baseline, M (SD)	13.52 (0.74)	13.51 (0.81)	13.52 (0.71)	$t(142) = -0.09$
Suicidal Ideation, M (SD)				
Baseline	3.00 (1.73)	2.63 (1.81)	3.15 (1.68)	$t(142) = -1.64$
18 months	1.82 (1.23)	1.31 (0.54)	2.03 (1.37)	$t(99.87)^a = -3.83**$
Baseline symptoms, M (SD) [b]				
Social phobia	1.35 (1.93)	0.85 (1.59)	1.55 (2.02)	$t(90.04)^a = -2.19*$
Major depression	2.44 (3.00)	1.10 (2.23)	2.97 (3.11)	$t(99.43)^a = -3.99**$
Loneliness, M (SD)				
Baseline	2.16 (0.79)	2.11 (0.86)	2.18 (0.77)	$t(126) = -0.47$
9 months	1.85 (0.68)	1.77 (0.72)	1.89 (0.66)	$t(97) = -0.79$
Parent Social Support, M (SD)				
Baseline	3.05 (0.75)	3.14 (0.60)	3.01 (0.80)	$t(77.64)^a = 0.95$
9 months	3.28 (0.73)	3.35 (0.80)	3.25 (0.70)	$t(91) = 0.62$
Friend Social Support, M (SD)				
Baseline	3.49 (0.75)	3.27 (0.85)	3.57 (0.69)	$t(119) = -1.98$
9 months	3.66 (0.52)	3.51 (0.52)	3.73 (0.51)	$t(88) = -1.85$
Other baseline variables, M (SD)				
Social anxiety (SASA)	2.50 (1.04)	2.32 (0.97)	2.58 (1.06)	$t(122) = -1.28$
Baseline diagnoses[c]	0.63 (0.89)	0.48 (0.75)	0.70 (0.93)	$t(140) = -1.34$

Notes. SASA = Social Anxiety Scale for Adolescents. [a] Equal variances not assumed.

[b] Symptoms measured with the Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer et al., 2000). [c] Number of baseline DISC-IV psychiatric diagnoses (excludes social phobia and major depression). * $p < .05$. ** $p < .01$

Table 2. Estimated Correlation Matrix for Latent and Observed Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
Suicidal Ideation											
1. Baseline	--										
2. 18 months	.32**	--									
Symptoms											
3. Major depression[a]	.52**	.19	--								
4. Social anxiety[b]	.40**	.32*	.30**	--							
Loneliness											
5. Baseline	.34**	.12	.36**	.71**	--						
6. 9 months	.11	.35**	.09	.38**	.35**	--					
Parent Social Support											
7. Baseline	-.21*	-.28**	-.23*	-.09	-.30**	-.20	--				
8. 9 months	-.12	-.23*	-.09	-.16	-.23*	-.24*	.38**	--			
Close Friend Support											
9. Baseline	.00	.07	.03	-.21	-.47**	.06	.23*	-.03	--		
10. 9 months	.02	-.02	.07	-.12	-.18	-.32**	-.01	.17	.33**	--	
Other variables											
11. Number of diagnoses	.35**	.18	.33**	.21*	.11	-.05	-.20*	-.10	.05	.00	--

Notes. [a] Symptoms were measured with the Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer et al., 2000). [b] Latent variable, with one indicator representing social phobia symptoms as measured by the DISC-IV and one indicator representing mean score on the Social Anxiety Scale for Adolescents. $* p < .05$. $** p < .01$.

Figure 1. Model Depicting Direct Relationship between Baseline Social Anxiety and Suicidal Ideation at 18 Months
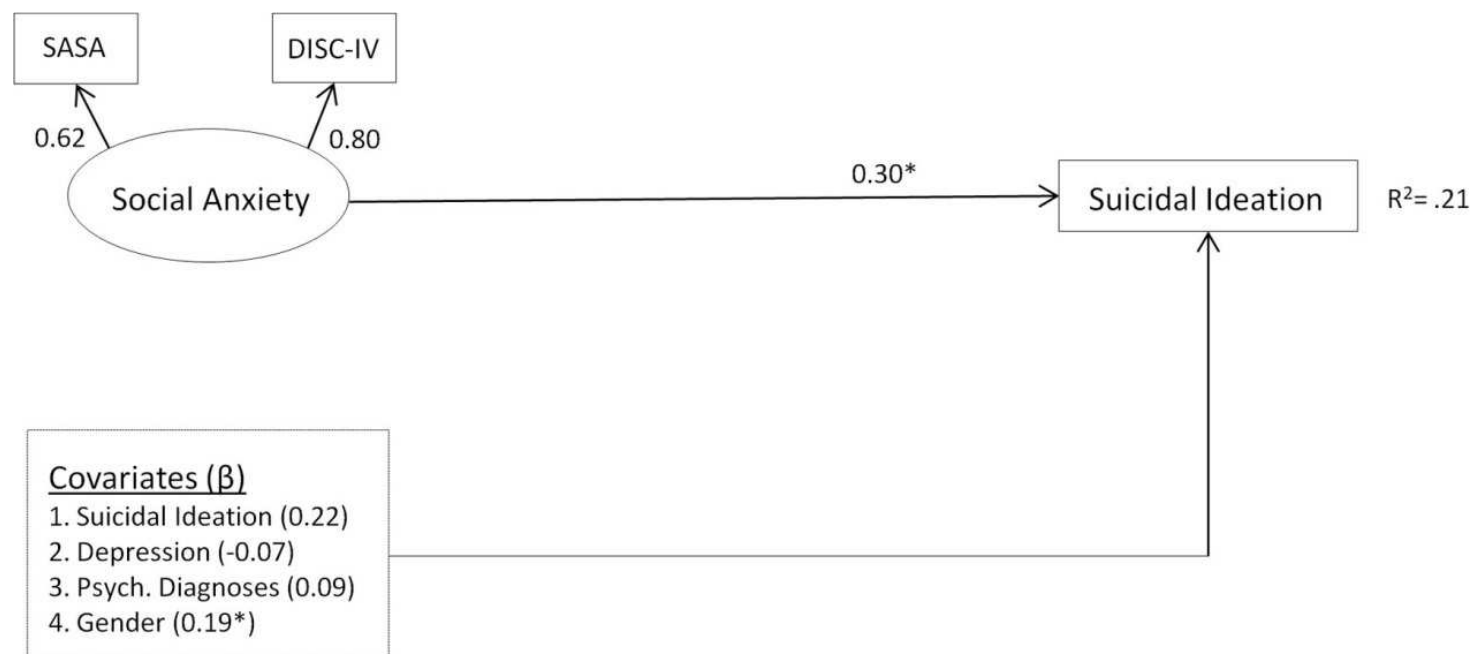
Figure 1. Structural equation model depicting the direct relationship between social anxiety symptoms at baseline and suicidal ideation at 18 months postbaseline. Values shown are standardized regression coefficients. DISC-IV = social phobia symptoms as measured by the Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer et al., 2000). SASA = social anxiety symptoms as measured by the Social Anxiety Scale for Adolescents. Covariance estimates have been omitted for ease of comprehension. * p < .05.

Figure 2. Multiple Mediation Model including Loneliness and Social Support as Mediators at 9 Months
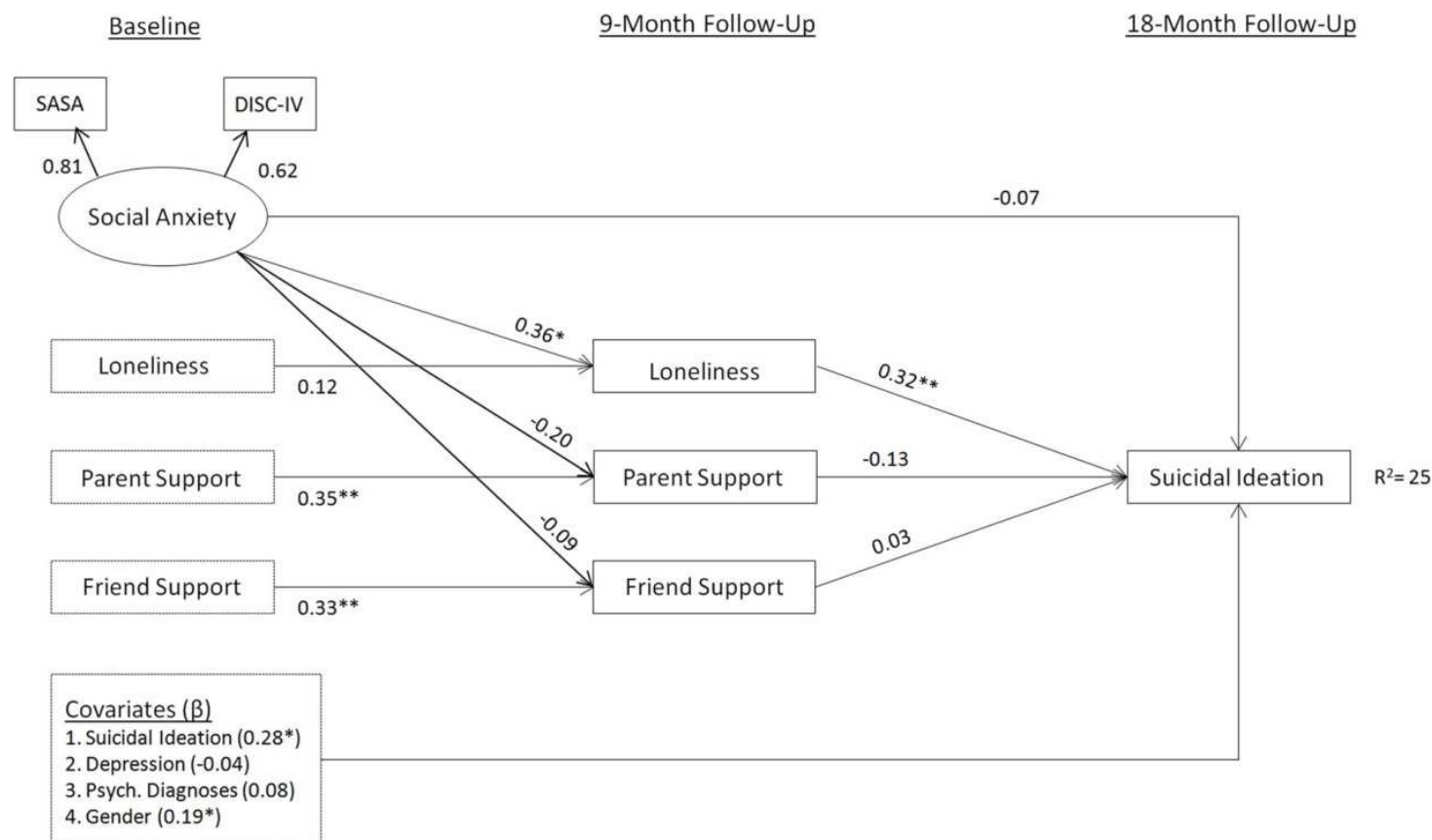

Figure 2. Structural equation model with baseline social anxiety as the independent variable, multiple mediators at 9 months postbaseline (loneliness; parent and close friend social support), and 18-month suicidal ideation as the outcome variable. Values shown are standardized regression coefficients. DISC-IV = social phobia symptoms as measured by the Diagnostic Interview Schedule for Children (DISC-IV-Adolescent Report; Shaffer et al., 2000). SASA = social anxiety symptoms as measured by the Social Anxiety Scale for Adolescents. Covariance estimates have been omitted for ease of comprehension. * p < .05. ** p < .01.

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