

Peer Influence and Nonsuicidal Self Injury: Longitudinal Results in Community and Clinically-Referred Adolescent Samples

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Abstract Research suggests that adolescents' engagement in nonsuicidal self-injurious (NSSI) behaviors may be increasing over time, yet little is known regarding distal longitudinal factors that may promote engagement in these behaviors. Data from two longitudinal studies are presented to examine whether NSSI may be associated with peer influence processes. Study 1 included 377 adolescents from a community-based sample; Study 2 included 140 clinically-referred adolescents recruited from a psychiatric inpatient facility. In Study 1, adolescents' NSSI was examined at baseline and one year later. Adolescents' nominated best friend reported their own levels of NSSI. In Study 2, adolescents' NSSI was examined at baseline as well as 9 and 18-months post-baseline. Adolescents' perceptions of their friends' engagement in self-injurious behavior (including suicidality) and depressed mood also were examined at all three time points. Baseline depressive symptoms were measured in both studies; gender and age

were examined as moderators of peer influence effects. Results from both studies supported longitudinal peer socialization effects of friends' self-injurious behavior on adolescents' own NSSI for girls, but not for boys, even after controlling for depressive symptoms as a predictor. Study 1 suggested socialization effects mostly for younger youth. Results from Study 2 also suggested longitudinal socialization effects, as well as peer selection effects; adolescents' NSSI was associated with increasing perceptions of their friends' engagement in depressive/self-injurious thoughts and behavior. Findings contribute to the nascent literature on longitudinal predictors of NSSI and to work on peer influence.

Keywords Nonsuicidal self-injury · Self-harm · Peer influence · Friendship

In recent years, clinicians and investigators have developed a heightened interest in a group of self-injurious behaviors that do not appear to include suicidal intent. These nonsuicidal self-injurious behaviors (NSSI) also have captured the attention of the popular media, with highly visible profiles in news outlets (e.g., Time Magazine; Kluger 2005) and active discussion groups online (Whitlock et al. 2006b). The rapidly expanding dialogue on NSSI has led many to wonder whether these behaviors may be increasing in frequency in recent years, and how these behaviors seem to have become highly prevalent. Indeed, NSSI is a common phenomenon among adults (prevalence estimates are 1–4% within community-based samples; e.g., Klonsky et al. 2003; 21% in clinically-referred samples; Briere and Gil 1998), and perhaps especially among adolescents (12–21%; Favazza et al. 1989; Ross and Heath 2002; Whitlock et al. 2006a; Zoroglu et al. 2003; 21–61% in clinically-referred samples;

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Darche 1990; DiClemente et al. 1991). The transition to adolescence may represent a critical vulnerability period for the acquisition of NSSI behavior (Lloyd-Richardson et al. 2008).

In the last five years, research has offered marked contributions towards understanding the phenomenon of NSSI. In addition to detailed information on its prevalence, and accumulating data on demographic and distal psychological correlates (e.g., affective disorder symptoms, trauma history; e.g., Prinstein 2008; Yates 2004), several theoretical models have emerged to explain how NSSI may serve specific psychological functions that maintain and reinforce these behaviors (Chapman et al. 2006; Klonsky 2007; Nock and Prinstein 2004; 2005). For instance, recent data indicate that NSSI commonly serves emotional regulation and social functions (e.g., Nock and Prinstein 2004, 2005). Yet, there remains little information on factors that lead to NSSI onset. Specifically, it is unclear why individuals with specific risk factors select NSSI as a behavioral strategy as opposed to many other possible adaptive or maladaptive behaviors that may serve similar functions. This research examines the hypothesis that among adolescents NSSI may be a behavior that is susceptible to peer influence.

Substantial research not only in psychology, but also in sociology, public health, political science, criminology, and marketing has suggested that adolescent peer influence is a remarkably powerful phenomenon (Prinstein and Dodge 2008). Engagement in risk behaviors by a close friend (or at least adolescents' perceptions of their friends' behavior) is a potent longitudinal predictor of adolescents' own engagement in risk behaviors, including substance use, deviance, and even sexual risk behaviors (e.g., Bosari and Carey 2001; Urberg et al. 1997; Andrews et al. 2002; Vitaro et al. 1997; Billy and Udry 1985; Prinstein et al. 2003).

This similarity between adolescents' and their friends' behaviors has been explained theoretically in several literatures. Sociologists initially articulated two mechanisms that underlie such similarities: 1) *selection effects* refer to the tendency for adolescents to befriend peers who share similar interests and activity preferences; 2) *socialization effects* refer to influence processes that occur between peers that make some more likely to emulate others' behavior or to conform to social norms (Kandel 1978). Developmental psychologists have elucidated unique maturational tasks in adolescence (e.g., a reliance on peer feedback for identity formation, e.g., Harter et al. 1996; the use of social comparison processes to navigate the social milieu; Harter et al. 1996; Hergovich et al. 2002) that may render teenagers especially susceptible to conformity pressures. Data have suggested that susceptibility to peer influences may peak at the

adolescent transition (Berndt 1979; Steinberg and Silverberg 1986), the same period associated with increases in NSSI prevalence. Very recent research has tested theoretical models to explain specifically how adolescents are socialized by peers, and which adolescents may be especially resilient to peer influence (see Prinstein and Dodge 2008 for a review).

Yet, the applicability of peer influence theories to adolescents' self-injury has been understudied. Indeed, although it is plausible to imagine that adolescents might emulate their peers' decisions to experiment with illegal substances, or may join a group of friends to engage in delinquent behaviors, it is somewhat more difficult to imagine how or why peer influence processes might be relevant to personal decisions to engage in self-injurious behavior.

Preliminary data suggest that peer influence may account for at least some individuals' engagement in self-injury. For instance, numerous clinical reports have suggested a "contagion effect" of NSSI within psychiatric inpatient treatment settings (e.g., Taiminen et al. 1992). Specifically, an individual's engagement in NSSI appears to be associated with others' later engagement in NSSI, even among patients with no prior history of NSSI (Ghaziuddin et al. 1992; Rada and James 1982; Raine 1982; Rosen and Walsh 1989; Taiminen et al. 1998; Walsh and Rosen 1985). Within nonclinical settings, Berman and colleagues also have demonstrated that "self-aggressive" behavior among young adults may be influenced by social processes (e.g., Berman and Walley 2003). Participants in an experimental paradigm tend to increase the intensity of self-administered electrical shocks when presented with bogus feedback suggesting a peer 'opponent' similarly is increasing their own shock intensity (see Sloan et al. 2006). It is intriguing that perceptions of anonymous peers' behavior might promote conformity in an experimental context. It is unclear whether similar processes might apply to adolescents who engage in NSSI concomitant to psychological distress, or to those who are exposed to information regarding the self-injurious behavior of their close friends.

In addition to past research suggesting the possibility of peer contagion of NSSI, a substantial body of literature has discussed peer influence processes that may be related to suicidality. Although research clearly has documented important conceptual and possibly etiological differences between NSSI and suicidality (e.g., Brown et al. 2002; Nock et al. 2006; Nock and Kazdin 2002), this past work offers important implications for the role of peer conformity in adolescents' decisions to engage in serious self-harm behavior. In particular, past work has documented the presence of *suicide clusters* (Gould 1990; Gould et al. 1990). Suicide clusters refer to the tendency for a suicide attempt or completed suicide to be associated with an

increased incidence of attempts by others in a relatively short period of time. Joiner (1999) describes both “point clusters,” such as the suicidal behavior on an inpatient unit or within a school or community following an individual adolescents’ suicide (e.g., Brent et al. 1989), as well as the less-supported phenomenon of “mass clusters” that follow media coverage of the suicide of a nationally-known fictional or non-fictional character (e.g., Phillips and Carstensen 1986).

Although the presence of point clusters (and perhaps mass clusters) has been documented, Joiner (1999) notes a remarkable absence of studies that have examined *contagion* of self-harm, specifically. In other words, evidence of co-occurring self-injurious behavior among several individuals does not in itself suggest an active influence mechanism between individuals’ acts of self-injury, as opposed to possible “third variables” (e.g., common stressors) that may predict self-injury among many. In the case of potential contagion among friends, Joiner (1999) argues that friendships based on assortative relating (resulting in similar predisposing risk factors among each friend) may conflate the apparent presence of contagion effects; however, studies that differentiate such selection effects from socialization effects are quite rare (Joiner 2003). Indeed, within both the self-injury contagion literature and the peer influence literature more generally, investigators have urged prospective, longitudinal investigations to help rigorously examine socialization effects. However, remarkably few prior studies have examined adolescent suicidality longitudinally, no prior studies have examined NSSI contagion using a prospective longitudinal design, and to date, virtually no longitudinal data on NSSI risk factors have been published at all.

This study offered a unique opportunity to examine peer influence of adolescent NSSI using procedures that have been established in the developmental literature. In addition to the use of a prospective, longitudinal design, this study addressed several limitations of past work. An initial concern in past work pertains to the distinction between *perceptions* of friends’ behaviors vs. friends’ *actual reported* behaviors as predictors of adolescents’ own behavior over time. While both of these constructs are relevant for understanding peer influence processes, it is important to clearly differentiate between these two distinct constructs. Peer influence research has demonstrated that perceptions of friends’ behaviors appear to be more proximal predictors of adolescents’ own behavior; however, these findings are somewhat limited by perceptual biases that affect the accuracy of adolescents’ perceptions of their friends’ behaviors and by method-variance issues that may inflate associations between adolescents’ perceptions and their own behavior (Prinstein and Wang 2005). In contrast, the examination of friend

influence using friends’ independent reports of their engagement in NSSI as a predictor of adolescent NSSI offers a stringent test of socialization effects that rarely is available within this literature.

A second limitation in past work pertains to understudied “third” variables that require consideration to appropriately examine peer influence effects. Few studies examining associations between adolescents’ and their friends’ behavior consider 1) whether peers’ behavior predicts adolescents’ own behavior beyond other known risk factors for NSSI, such as an adolescents’ depressive symptoms; or 2) whether such third variables might be shared among friends via selection effects, thus accounting for the apparent effects of friends’ behavior (i.e., suggesting that friends’ NSSI may be proxy for adolescents’ own depressive symptoms). By examining peer socialization effects after controlling for adolescents’ own depressive symptoms as a longitudinal predictor of NSSI, both of these issues were partially addressed.

Last, prior peer influence research rarely has considered moderators of peer socialization effects. Both gender and grade were explored as potential moderators in this study. Data regarding gender differences in the frequency of adolescent NSSI are mixed (Bhugra et al. 2003; DiClemente et al. 1991; Garrison et al. 1993; Gratz et al. 2002; Hilt et al. 2008; Ross and Heath 2002); however, girls’ increased reliance on friendship support as a source of esteem (Rose and Rudolph 2006) and greater intimacy within dyadic friendships as compared to boys’ (Buhrmester and Furman 1987; Furman and Buhrmester 1992) suggests that girls may be especially susceptible to peer influence, particularly for covert behaviors such as NSSI, that likely are discussed only within intimate friendships. It also is possible that NSSI socialization will be especially relevant for younger participants. As a risk behavior that is identified with older adolescents, younger preadolescents may especially be likely to emulate the NSSI behavior of their peers perhaps due to a belief that conformity will help them achieve an older (i.e., more mature and thus, higher status) identity.

The focus of two studies presented below was on peer influence as a potential risk factor for adolescent NSSI. Participants at the adolescent transition period were selected for both studies given the developmental salience of issues that increase susceptibility to peer influence, and past work that suggests this is a unique risk period for the acquisition of NSSI behaviors. It was hypothesized that adolescents’ friends’ engagement in NSSI would be associated longitudinally with adolescents’ own engagement in NSSI. Additionally, it was hypothesized that this effect would be stronger for adolescent girls as compared to boys, and for younger as compared to older participants.

Study 1

Methods

Participants

Participants included 377 youth (50% female) enrolled in grades 6 (35%), 7 (29%) and 8 (36%) at study outset. The ethnic composition of the sample included 86% White/Caucasian, 4% Asian-American, 2% Latino/a-American, 1% African-American, and 6% mixed ethnicity students. Participants were enrolled in a single public middle school within a city of fairly homogeneous middle-class socioeconomic status. According to school records, 11% of children were eligible for free/reduced-price lunch.

At Time 1, all sixth through eighth grade students were mailed and hand-distributed consent forms for study recruitment with strong encouragement and incentives (e.g., raffles) for consent form return. Consent forms were returned by 92% of families ($n=784$); of these, 80% of parents gave consent for their child's participation ($n=627$; 74% of the total population). Students who were absent on one of the days of testing ($n=10$) or refused to participate ($n=4$), were excluded from analyses, yielding a final sample of 613 participants at Time 1. A total of 567 (92%) of these participants were available for testing eleven months later (i.e., Time 2), when students were in grades seven through nine. Attrition was due to participants moving away from the area ($n=36$), absenteeism ($n=7$), and three participants who refused to continue participation. No significant differences were revealed for any of the constructs measured in this study between adolescents who participated at both time points and those who only participated at one time point.

Hypotheses examined in this study primarily pertained to the prediction of youths' NSSI behavior from friends' NSSI, as reported by friends themselves. Thus, analyses were limited only to participants who met two criteria. First, participants were included only if they had selected a best friend who also was a participant in the study (i.e., only those participants for whom best friends' actual reported behavior could be determined). Of the 567 youth who completed measures for this study, 519 (92%) selected a best friend who also was a study participant. Second, to eliminate concerns regarding duplication of data and resulting inflated associations, each participant was included as a best friend only once within the dataset. Of the 519 participants who met the first criteria, 142 participants selected a best friend who had been selected by at least one other participant. In each instance, one participant was selected at random for inclusion in the dataset, and the other (s) who selected the same best friend were omitted from

analyses. This procedure was conducted twice to ensure that observed effects were not specific to the selected random sample. Each "reduced" dataset included 377 participants who met both of the criteria above. All analyses below were repeated in each of these two datasets, yielding an identical pattern of results to those presented below. Analyses also were conducted to examine differences in demographic variables, depressive symptoms, and NSSI frequency between participants who did/not select a participating best friend and those who selected a best friend who was/not already selected by another participant. No significant differences were revealed for any study variables in these analyses.

Measures were administered at an initial time point and again 11 months later (i.e., Time 2) when all adolescents were in grades 7 through 9. All measures were administered in youths' classrooms as part of a study on peer relationships and psychological adjustment.

Measures

Friendship Selection A peer nomination procedure was used to identify adolescents' closest friends at Time 1 (Parker and Asher 1993). Participants were asked to select an unlimited number of their "closest friends" from a roster of all grademates alphabetized by first name (or nickname, e.g., Bill/William, as indicated in focus groups), and from this list to select a "very best friend." Grade-wide rosters each included approximately 300 classmates to select from. Participants were permitted to select a very best friend of either gender. A total of 98% of children selected a same-gender very best friend.

NSSI Participants were asked to indicate the frequency within the past year that they "harmed or hurt your body on purpose (for example, cutting or burning your skin, hitting yourself, or pulling out your hair) without wanting to die" on a six point scale (0=Never; 1=Once; 2=A few times; 3=Once a month; 4=Once a week; 5=Once a day). In past research this single item was significantly correlated, $r=0.69$, $p<0.001$, with results from a longer measure assessing multiple methods of NSSI (Prinstein et al. 2008), and thus serves as an adequate screening item of NSSI frequency.

Depressive Symptoms The Children's Depression Inventory (CDI; Kovacs 1992) is a 27-item measure designed to assess cognitive and behavioral depressive symptoms in children and adolescents. For each item, respondents selected from one of three statements, scored 0 through 2, that best described their level of depressive symptoms in the previous two weeks. A mean score was computed across all items, with higher scores reflecting more depressive symptoms. Good psychometric properties have

been reported for the CDI as a reliable and valid index of depressive symptoms. Scores on the CDI successfully discriminate between youth independently diagnosed as depressed versus nondepressed (Saylor et al. 1984). It can be used with youth between the ages of 7 and 18 years of age (Kazdin 1990). In the current sample, internal consistency was high ($\alpha > 0.86$). Test-retest reliability in past work has been satisfactory (Kovacs 1992).

Data Analyses

First, means and standard deviations were computed for all study variables; potential gender and grade differences in the variables were evaluated. Bivariate correlations also were computed among all continuous study variables. Primary study hypotheses were examined using hierarchical multiple regression procedures. Using NSSI frequency at Time 2 as a dependent measure, regressions included baseline NSSI frequency on an initial block, depressive symptoms on a second block (i.e., controlling for a known risk factor of NSSI), followed by participants' gender (dummy-coded; 1 = female), grade (6–8, centered), and best friends' reported Time 1 NSSI frequency (centered) on a third block. On a fourth block of the analysis, product terms between youths' gender and friends' NSSI behavior and between youths' grade and friends' NSSI behavior was entered to examine gender and grade as moderators of socialization effects. Significant moderator effects were probed using standard simple slope procedures (Holmbeck 2002). Given relatively limited variability in NSSI within this preadolescent sample, a three way interaction was not explored.

Note that because participants and their very best friends both were included in this dataset, there was a risk of data redundancy among those in reciprocated very best friendships. A total of 41 reciprocated best friend dyads were identified in the dataset; in each case, participants' data was used in the dataset twice—once as the target adolescent and once as a very best friend. A separate set of analyses was conducted in a reduced dataset to determine whether data redundancy influenced results. This reduced dataset was created by randomly deleting one participant's data in all 41 cases of very best friend reciprocity (i.e., 41 cases deleted). Analyses conducted with this reduced dataset yielded an identical pattern of results to those reported below.

Results

Descriptive Analyses

Means and standard deviations were computed for all study variables, as well as the results of a 2 (gender) × 3

(grade) MANOVA conducted to examine gender and grade differences in NSSI. Approximately 7.4% of these middle-school participants reported engagement in NSSI at Time 1; 3.2% reported NSSI at Time 2. No significant gender differences emerged in the frequency of NSSI or depressive symptoms at Time 1; however, girls reported significantly greater frequencies of NSSI, $M = 0.11$; $SD = 0.56$, than did boys, $M = 0.02$; $SD = 0.16$, at Time 2, $F(1, 371) = 5.95$, $p < 0.05$. No significant grade differences in NSSI frequency were revealed. Due to significant skewness, measures of NSSI frequency were log transformed for all remaining analyses.

Correlation analyses revealed a significant association between NSSI frequency at Time 1 and Time 2, $r = 0.20$, $p < 0.0001$, as well as significant associations between baseline depressive symptoms and NSSI at each time point: Time 1, $r = 0.45$, $p < 0.0001$; Time 2, $r = 0.20$, $p < 0.0001$. Best friends' baseline NSSI frequency was significantly associated with adolescents' own Time 1 NSSI, $r = 0.13$, $p < 0.05$, Time 2 NSSI, $r = 0.20$, $p < 0.01$, and adolescents' depressive symptoms, $r = 0.19$, $p < 0.01$.

Examination of NSSI Socialization Effects

A regression analysis examined the longitudinal prediction of Time 2 NSSI frequency from best friends' Time 1 NSSI frequency, as reported by friends. Gender and grade were examined as moderators of this effect, and analyses considered the role of best friends' NSSI frequency as a predictor after accounting for the longitudinal effects of depression. Results are presented in Table 1. Significant effects suggested that females had higher NSSI frequencies at Time 2, after controlling for initial levels of NSSI frequency. In addition, best friends' reported engagement in NSSI initially was a significant predictor of youths' Time 2 NSSI. This socialization effect was qualified by two interaction effects, however. A significant gender × friends' Time 1 NSSI frequency interaction suggested that gender moderated a friend socialization effect. A marginal effect also was revealed for a grade × friends' Time 1 NSSI frequency interaction.

Given multicollinearity between these two interaction terms, each subsequently was examined separately in reduced models. An initial regression examined only gender as a moderator, revealing a significant interaction effect, $\Delta R^2 = 0.02$, $b = 0.02$ (se $b = 0.01$), $\beta = 0.18$, $p < 0.05$. Subsequent analyses revealed that for girls only, best friends' NSSI frequency as reported at Time 1 was longitudinally associated with youths' own NSSI at Time 2, after controlling for youths' Time 1 NSSI frequency, $\Delta R^2 = 0.04$, $b = 0.03$ (se $b = 0.01$); $\beta = 0.21$, $p < 0.05$. No significant longitudinal association between best friends'

Table 1 Hierarchical Multiple Regression Analysis Examining Depressive Symptoms, Best Friends' NSSI Frequency, and Gender As Predictors of Adolescents' NSSI Frequency

	NSSI Frequency, Time 2	
	At block	Final
Block 1 (R^2)	0.03***	
NSSI Frequency, Time 1 (β)	0.17***	0.11*
Block 2. (ΔR^2)	0.01**	
Depressive Symptoms (β)	0.12**	0.08
Block 3. Main Effects (ΔR^2)	0.04*	
Gender (β)	0.12**	0.11**
Grade (β)	-0.08	-0.04
Best Friend's NSSI Frequency	0.13**	-0.02
Block 3. Interaction (ΔR^2)	0.03**	
Gender \times Friend's NSSI (β)		0.16**
Grade \times Friend's NSSI (β)		-0.12*

* $p < 0.08$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.001$

NSSI frequency and adolescents' own NSSI frequency was revealed for boys, $\Delta R^2 = 0.00$, $b = 0.00$ (se $b = 0.00$); $\beta = 0.06$, NS.

A second regression examined only grade as a potential moderator. Again, a significant grade \times friends' Time 1 NSSI frequency interaction effect was revealed, $\Delta R^2 = 0.02$, $b = -0.12$ (se.05); $\beta = -0.14$, $p < 0.05$. Subsequent analyses revealed a significant association between best friends' Time 1 NSSI frequency and youths' own Time 2 NSSI frequency among sixth grade students, $\Delta R^2 = 0.08$, $b = 0.18$ (se.06); $\beta = 0.29$, $p < 0.01$, but not seventh, $\Delta R^2 = 0.00$, $b = -0.04$ (se.12); $\beta = -0.04$, NS, or eighth grade students, $\Delta R^2 = 0.00$, $b = -0.01$ (se.03); $\beta = -0.03$, NS students.

Discussion

To date, little to no longitudinal data have been reported on NSSI; this study offers an important contribution towards understanding peer influence as one mechanism that may be associated with adolescents' engagement in NSSI over time. Results suggested that even after accounting for depressive symptoms as a longitudinal predictor of NSSI, adolescents' best friends' independent reports of NSSI engagement was a significant longitudinal predictor. This effect, however, was revealed only for adolescent girls and for sixth grade students. These results are consistent with a large body of research suggesting that best friends' behaviors are especially important predictors of adolescents' own engagement in health risk behaviors. However,

it is particularly notable that these results were significant for a particularly severe risk behavior (i.e., NSSI), and that a socialization effect was revealed within this very stringent analysis that addressed limitations of past research.

Although some research has suggested that adolescent females may be at heightened risk for engagement in NSSI (e.g., Bhugra et al. 2003; Ross and Heath 2002), and our findings suggested that female gender was a longitudinal predictor of NSSI, it is especially interesting that these results suggested that gender served as a moderator of friend socialization effects. Results suggest that girls may be uniquely susceptible to the influence of their best friends' engagement in NSSI. These results suggest several intriguing possibilities that deserve attention in future research. For instance, it may be that adolescent girls' NSSI is less covert than NSSI among boys, suggesting increased opportunities for discussing NSSI or perhaps reflecting a greater acceptance of this behavioral strategy among female friends. Girls also are more likely to disclose emotional distress, particularly to a best friend (Furman and Buhrmester 1992). NSSI that is discussed in the context of emotion regulation strategies therefore may be shared more frequently and in a more salient manner among girls, as compared to boys. Girls also have higher levels of friendship quality with same-gender best friends than do boys (Furman and Buhrmester 1992). These high quality relationships may be especially potent contexts for peer influence more generally. Continued work examining peer influence effects for NSSI will be critical to further understand unique prospective predictors of NSSI.

Grade also was explored as a moderator; results suggested that NSSI socialization effects were especially evident for younger middle-school students (i.e., sixth grade students) as opposed to older students (i.e., 7–8th grade students). Note that the current study examined NSSI among a younger sample of youth (i.e., preadolescents) than in prior studies; consequently, there was less variability in outcome and effect sizes were small. Findings may be best understood through a developmental framework. NSSI may be increasing in prevalence, and certainly seems to be discussed with increasing frequency within the news media as a common behavior among adolescents. Preadolescents who strive to establish an identity of a mature teen and/or a person who engages in risk behaviors may be especially susceptible towards peer conformity for this particularly high risk behavior. Several theoretical models suggest that conformity may be especially likely for behaviors that are associated with an ideal "role model" or prototype that is associated with high social status (e.g., Gibbons and Gerrard 1997). Recent work suggests that NSSI may indeed be associated with high levels of peer status among

preadolescents (Heilbron and Prinstein 2009), perhaps because of its association with older youth who have eschewed adult-prescribed norms for more peer sanctioned attitudes and behaviors. It will be important for future work to more thoroughly examine whether engagement in NSSI indeed serves to increase preadolescents status, and thus explain why conformity may be heightened among younger participants.

It is important to note that although this investigation offers rare data that allowed for a stringent test of hypotheses, several shortcomings limit the contributions offered by this work. Perhaps most notably, the rate of NSSI in this preadolescent community-based sample was somewhat low, yielding relatively little variability in study outcomes. Given the remarkably high prevalence of NSSI in clinically-referred samples, it is especially important to examine hypotheses in a sample at greater general risk for NSSI. In addition, it should be noted that NSSI was examined at each time point using only a single item. Although available data suggest that this item offers a valid screening of NSSI, a more thorough assessment of NSSI is needed to appropriately measure this construct.

In Study 2, both of these limitations have been addressed. Data were available from a longitudinal study of adolescents admitted to a psychiatric inpatient unit for acute psychological distress. Information on NSSI was collected at three time points, including during hospital admission, and at 9 and 18 months post-baseline. Data also were available on adolescents' friends' depressed affect, suicide ideation, and engagement in self-harm behavior at each time point. However, it is important to note that data on friends' behaviors were based on adolescents' own report. Thus, these data allow for an examination of whether adolescents' *perceptions* of their friends' behaviors may be associated with engagement in NSSI.

It was hypothesized that adolescents' perceptions of their friends' depressive/self-injurious thoughts and behaviors would be associated longitudinally with increases in adolescents' own engagement in NSSI. With data available at three time points, it was possible to examine this socialization effect as well as possible selection effects. Specifically, it was hypothesized that adolescents' engagement in NSSI would statistically predict adolescents' increased perceptions of their friends' depressive/self-injurious thoughts and behaviors. Path analyses were conducted to examine selection and socialization effects simultaneously. As in Study 1, peer influence effects were examined while controlling for the association between adolescents' baseline depressive symptoms and later NSSI. Gender again was examined as a moderator of hypothesized associations. Main and moderating effects of child age also were explored.

Study 2

Methods

Participants

Participants included 140 adolescents (72% female) between the ages of 12 and 15 years ($M=13.51$; $SD=0.75$) and in grades 7 (21%), 8 (39%) or 9 (40%) at baseline. Approximately 74% of participants were White/Caucasian, 3% African-American, 4% Latino/a-American, and 18% mixed ethnicity. Based on maternal report, 19% of mothers reported that they had not obtained a high school diploma, 40% of mothers' highest education was a high school degree, 14% a trade degree, 11% some undergraduate college, and 16% had obtained a college degree or higher.

Procedure

All participants were recruited from a psychiatric inpatient facility in the U.S. Northeast. During the period of recruitment, a total of 246 adolescents matching study inclusion criteria (i.e., 12–15 years of age; no history of prior psychosis or mental retardation) were admitted to the inpatient unit. At the time of this data collection, approximately 40% of all admissions onto this unit were discharged or transferred within 1–2 days of admission. This length of stay was associated with a variety of factors (e.g., insurance carrier, vacancies at local facilities) and did not serve as a marker for the severity of adolescents' psychological symptoms or adolescents' socioeconomic status. Consistent with human subjects regulations, adolescents and their parents were approached for study participation after clinical personnel had met with adolescents' parent/guardian and gained permission to be approached about this investigation (i.e., typically on the second day following admission). Consent for study participation therefore was requested from 183 of these eligible adolescents. A total of 162 (89%) provided consent and 140 (86%) of these were available to be assessed on study measures (i.e., 22 participants were discharged after being consented but before data collection).

Adolescents were assessed during hospitalization (baseline) immediately following consent, typically within 2 to 4 days of admission. Adolescents completed additional assessments at 9 and 18 months post-baseline.

Data were missing for two potential reasons common to research of this type. First, logistical challenges with inpatient data collection (e.g., competing demands for patients' time, unexpected discharge or transfer) yielded missing data on some items or measures within participants.

Second, data sometimes were missing due to attrition over the longitudinal interval (e.g., adolescents' relocation, study drop-out, etc.). Many retention strategies were utilized, including frequent phone and mail contact with participants and their immediate and extended family members and friends, searches within public access databases for current contact information, and participant incentives for completion of follow-up assessments (i.e., \$30 at each follow-up time point for both a parent and the adolescent). Of the 140 adolescents who completed baseline assessments, a total of 100 (71%) and 102 (73%) adolescents participated in the 9- and 18-month post-baseline assessments, respectively. This retention rate is comparable to prior research. Boergers and Spirito (2003) reviewed 31 longitudinal follow-up studies of adolescent self-injurers; only 4 conducted in the U.S. collected follow-up data for over a year. Retention rates for these four studies ranged from 52%–83% (weighted mean=71%).

Analyses were conducted to compare adolescents with/out complete longitudinal data on all baseline study variables. No significant effects were revealed on any study variables, suggesting no evidence for attrition biases. Missing data analyses indicated that data were missing at random, Little's MCAR $\chi^2(71)=61.30$, NS. Because listwise deletion would unnecessarily omit valuable data, all analyses were conducted with all available data (see Data Analyses below). Analyses using only available data revealed an identical pattern of results.

Measures

All adolescent questionnaire-based measures were read aloud by a trained research assistant during individual meetings while adolescents privately recorded responses. This procedure allowed for adequate probing and explanation of study items when necessary, monitoring of adolescents' attention and conscientiousness while completing measures, and immediate checking for response inconsistencies.

Non-suicidal Self-Injury (NSSI) Non-suicidal self-injury was assessed at baseline using a five item scale allowing adolescents to report the frequency of engagement in several types of non-suicidal self-injurious behaviors (i.e., cut/carved skin, hit self, pulled hair out, burned skin, or other) without suicide intent, in the past year (Prinstein et al. 2008). The frequency of engagement in each item was reported on a five-point scale (1=Never; 5=Almost every day). A mean score across all five items was computed ($\alpha=0.70, 0.66, 0.73$ at baseline, 9-, and 18-months post-baseline, respectively).

Perceptions of Friends' Depressive/Self-Injurious Thoughts and Behaviors Items from the Peer Behavior Inventory

(PBI; Prinstein et al. 2001) were used to measure adolescents' perceptions of their friends' depressive/self-injurious thoughts and behaviors. The PBI was based on prior measures of peer behaviors (e.g., Dishion et al. 1991; Fergusson and Horwood 1996) that assess close friends' engagement in specific adaptive or maladaptive behaviors. At each time point, adolescents first are asked to list the initials and gender of each of their "closest friends." This procedure ensures that adolescents are thinking of specific individuals, and is thought to reduce estimation biases. Adolescents in this sample reported an average of 5.48 close friends ($SD=4.18$). Next, adolescents are asked to indicate the number of these close friends who engage in a variety of health-risk behaviors.

Most pertinent to this investigation, adolescents were asked to list the number of their close friends 1) "who have attempted to kill themselves"; 2) "who have talked about wanting to hurt themselves or about suicide"; and 3) "who seem down about themselves most of the time." A ratio score (between 0 and 1.0) was computed for each item reflecting the number of friends who engage in each behavior divided by the total number of friends. A mean score across ratio scores for all three items was computed to reflect perceptions of friends' self-injurious behaviors ($\alpha=0.69, 0.79, 0.71$ at Times 1, 2, 3, respectively). Note that these three items individually assess perceptions of 1) friends' suicidal behavior, 2) self-injury ideation, and 3) depressed affect, respectively. To examine whether results may be specific to one of these individual constructs, analyses below were repeated using each individual item as predictors/outcomes in three separate path analyses. The pattern of results from these analyses was identical to those reported below when substituting the composite variable with items numbered 1 or 3 above. For ease of presentation, this measure is referred to as "perceptions of friends' self-injury" below.

Depressive Symptoms The CDI (Kovacs 1992) again was used as a measure of depressive symptoms at baseline.

Data Analysis

Hypotheses were examined with a multiple group (by gender) path analysis (Bollen and Curran 2006) using full information maximum likelihood as implemented in Amos version 16.0. Means and intercepts were estimated using full information direct maximum likelihood when data were missing. Cross-lagged associations were examined between the measures of adolescents' NSSI (at baseline, 9- and 18-months post baseline) and three measures of perceptions of friends' self-injury (also at baseline, 9- and 18-months post baseline). Auto-correlations between each of the three

measures of NSSI and between each of the measures of perceptions of friends' self-injury were estimated. The path analysis also examined the association between baseline depressive symptoms and NSSI at each time point, thus allowing for a stringent test of potential friend influence, after controlling for associations with depressive symptoms. In addition, main effects of age on NSSI at each time point and on perceptions of friends' self-injury were estimated.

Gender interactions were examined by comparing models with paths either fixed or free to vary between groups, and the significance of chi-squared difference tests between nested models was used to examine statistically significant gender differences in the magnitude of estimated paths. As a continuous variable with four possible values (ages 12, 13, 14, and 15 years), it was not possible to examine age in a multiple group analysis (i.e., low cell sizes). Moderation by age therefore was examined by computing product terms for age \times each predictor and paths were estimated between these product terms and each outcome (i.e., NSSI at 9 and 18 months post-baseline, and perceptions of friends' self-injury at 9 and 18 months post-baseline). No significant effects for any age interactions were revealed, however. The models presented below therefore only include main effects for age.

Results

Preliminary Analysis

Table 2 lists correlations among all primary study variables in Study 2, as well as means and standard deviations for all variables. As in Study 1, baseline depressive symptoms were associated significantly with NSSI at each time point. Associations between NSSI at each time point ranged from low to moderate in magnitude. *T*-test analyses examining gender differences for all variables revealed that as compared to boys, girls reported higher mean levels of depressive symptoms, friends' engagement in self-injury at all three time points, and NSSI at baseline, all *t*'s (138) > 1.98, $p < 0.05$. Age was associated with depressive symptoms only among girls; no other significant effects for age were revealed.

Path Analysis

Results from the examination of an initial model, with all paths, covariances, and error terms varying freely across gender suggested an excellent fit to the data, $\chi^2(20) = 18.95$, NS; $\chi^2/df = 0.95$; CFI = 1.00; RMSEA = 0.00. Chi-square difference tests suggested that all but three paths could be fixed across gender without significant detrimental effects on model fit. Results suggested gender moderation

for 1) the association between adolescents' NSSI at baseline and their friends' self-injury at 9 months post-baseline, $\chi^2(1) = 5.28$, $p < 0.05$; 2) the association between friends' self-injury at 9 months post-baseline and adolescents' own NSSI at 18 months post-baseline, $\chi^2(1) = 6.19$, $p < 0.05$; and 3) the association between age and NSSI at 9 months post-baseline, $\chi^2(1) = 5.00$, $p < 0.05$. After fixing all other paths across gender, the model remained an excellent fit to the data, $\chi^2(34) = 34.93$, NS; $\chi^2/df = 1.03$; CFI = 0.99; RMSEA = 0.01.

All path coefficients are listed in Fig. 1. Results suggested that after accounting for significant associations between depressive symptoms at baseline and later NSSI (at 9 and 18 months post-baseline), and autocorrelations between NSSI at each time point, significant reciprocal associations with perceptions of friends' self-injury were revealed. Consistent with selection effects, adolescents' NSSI was associated longitudinally with higher levels of perceptions of friends' self-injury nine months later. Consistent with socialization effects, perceptions of friends' self-injury were associated longitudinally with adolescents' own engagement in NSSI by 18 months post-baseline. However, results suggested that both selection and socialization effects were moderated by gender; significant associations were revealed only for girls.

Discussion

The examination of associations between adolescents' and their perceptions of friends' depressive/self-injurious thoughts and behaviors within a clinically-referred sample offered an opportunity to address some of the limitations of Study 1. Specifically, Study 2 examined NSSI within a sample that exhibited a much higher prevalence of these behaviors; Study 2 also utilized a longer instrument to assess NSSI behaviors. Like Study 1, Study 2 offered a rare opportunity to examine NSSI longitudinally.

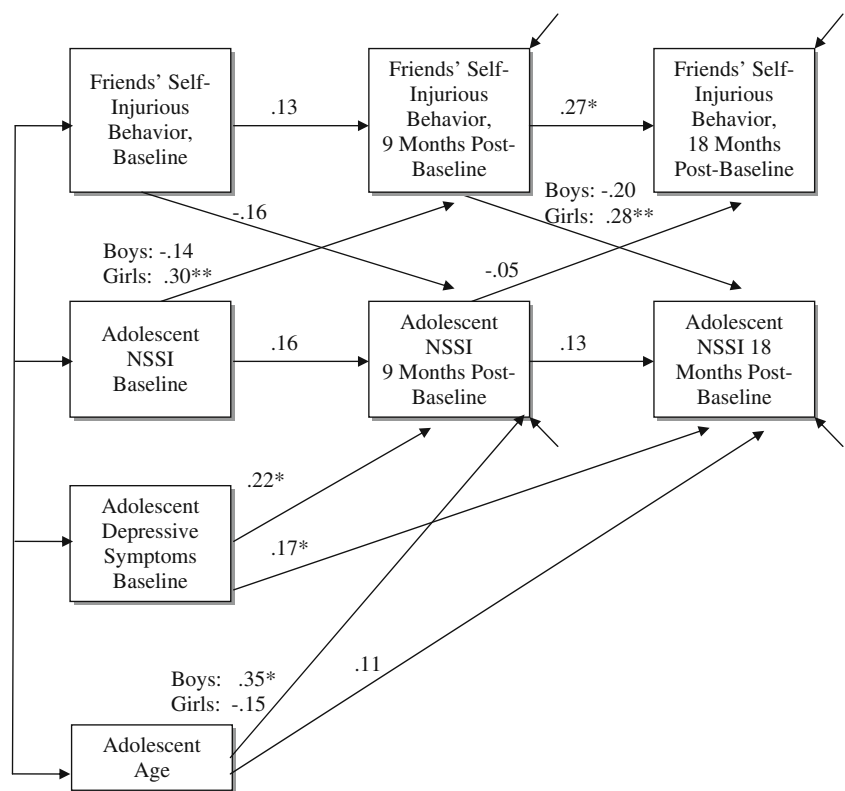
As in Study 1, results from Study 2 suggested that peer influence mechanisms may be relevant for understanding adolescents' engagement in NSSI. Findings from Study 2 were consistent both with selection and socialization effects. Consistent with selection effects, adolescents' engagement in NSSI at baseline was associated with greater perceptions of their friends' depressive/self-injurious thoughts and behaviors nine months later. Consistent with socialization effects, these perceptions of friends' thoughts and behaviors were positively associated with increases in adolescents' own NSSI 18 months post-baseline. However, note that these findings were not replicated across time points (i.e., selection effects were not observed between nine and 18 months, nor were selection effects observed between baseline and nine months post-baseline). Also note

Table 2 Descriptive Statistics (Means, Standard Deviations, Pearson r) for All Study Variables ($n=140$)

	Baseline				9 Months Post-Baseline		18 Months Post-Baseline	
	Age	Depressive Symptoms	NSSI	Friends' Self Injury	NSSI	Friends' Self Injury	NSSI	Friends' Self Injury
Mean (SD)	13.51 (0.81)	0.63 (0.37)	1.14 (0.57)	0.12 (0.17)	1.11 (0.30)	0.08 (0.14)	1.10 (0.27)	0.09 (0.05)
Baseline								
Age	–	–0.01	–0.11	–0.17	0.40**	–0.31	–0.18	–0.03
Depressive Symptoms	0.19*	–	0.52**	0.41*	0.38*	–0.09	0.51**	–0.12
NSSI	0.15	0.48**	–	0.25	0.12	–0.08	0.52**	–0.07
Friends' Self-Injury	0.16	0.33**	0.42**	–	–0.16	0.15	0.32	–0.01
9 Months Post Baseline								
NSSI	–0.11	0.12	0.22	0.42**	–	–0.16	0.15	0.00
Friends' Self-Injury	0.08	0.31**	0.36**	0.33**	0.29*	–	–0.16	–0.11
18 Months Post Baseline								
NSSI	0.12	0.33**	0.45**	0.18	0.34**	0.38**	–	–0.11
Friends' Self-Injury	–0.06	0.17	0.28*	0.25*	–0.05	0.33**	0.14	
Mean (SD)	13.50 (0.72)	0.76 (0.35)	1.61 (0.63)	0.21 (0.20)	1.23 (0.42)	0.20 (0.23)	1.20 (0.48)	0.27 (0.27)

* $p<0.05$; ** $p<0.01$; *** $p<0.001$. Statistics above the diagonal are for males; below the diagonal for females

Fig. 1 Standardized path weights for reciprocal associations among adolescents' NSSI and their perceptions of best friends' self-injurious behavior at baseline, 9, and 18 months post-baseline



that these results focused only on adolescents' perceptions of their friends' thoughts and behaviors, and that these perceptions did not pertain only to NSSI. It certainly is possible that findings reflect adolescents' biased perceptions of their friends' attitudes and behaviors (i.e., a false consensus effect; Prinstein and Wang 2005) rather than a true selection effect. Similarly, the socialization effects observed pertaining to a broad index of depressive and self-injurious thoughts and behaviors may suggest a different mechanism of socialization rather than simple mimicry of NSSI specifically. It is critical that these preliminary findings be replicated in additional samples to help further understand risk factors for NSSI. It also is important to note that peer influence likely operates quite differently for suicidal vs. NSSI behaviors; these findings do not allow for a specific examination of NSSI contagion using perceptions of friends' NSSI as a sole predictor.

General Discussion

Recent research has suggested that a remarkably large proportion of individuals may engage in nonsuicidal self-injurious behaviors, perhaps as a strategy to increase or reduce either internal (i.e., affective) or social stimuli. However, little is known about why individuals select NSSI as a behavioral strategy to serve these functions as opposed to many other potentially adaptive or maladaptive behaviors. Although much preliminary research suggests that emulation of peers' behaviors may be one possible factor that promotes engagement in NSSI, a rigorous empirical examination of this hypothesis has not been available. This research offers data from two longitudinal studies suggesting that adolescents' friends' self-harm behaviors are associated longitudinally with adolescents' own NSSI. Results from both studies suggested that friends' self-harm was a significant predictor of NSSI above and beyond the effects of depressive symptoms. Both studies also yielded support for gender as a moderator of peer socialization effects, suggesting that friends' behaviors were a significant predictor of NSSI among girls, but not among boys. Together, these studies offer strong support for peer socialization effects and contribute not only to literature on NSSI predictors, but also to the growing literature on risk behaviors that appear to be susceptible to peer influence.

Although these results reveal a consistent pattern of associations between adolescent girls' friends' behavior and their own NSSI, it is important to note that these results merely suggest the presence of peer socialization effects. Conclusions regarding the potential mechanisms of peer influence are not addressed in this study. Yet, this is a crucial next step for research efforts, and numerous

possibilities require thorough investigation (see Heilbron and Prinstein 2008 for a review). Past research examining peer influence more broadly suggests that peers may influence one another through behavioral reinforcement of risk behaviors that are discussed within a social context (e.g., laughing or nodding affirmatively when discussing deviant acts; Dishion et al. 1996; Piehler and Dishion 2007). Other research suggests that peer conformity may be the result of adolescents' attempts to adhere to perceived social norms and/or to manage one's own sense of identity by aligning one's behaviors to those with a valued social status (e.g., Gibbons et al. 1998; see Prinstein and Dodge 2008 for a review).

However, it is unclear whether either of these mechanisms may explain the apparent peer socialization effects for NSSI revealed in these studies. While it may initially seem unlikely that peers would socially approve of engagement in severe self-harm behaviors, or that adolescents engage in these specific acts as a way of meeting perceived standards and norms, note that some studies have revealed similar socialization effects for similarly risk behaviors, such as weight-related behaviors (e.g., Eisenberg et al. 2005; Paxton et al. 1999; Rancourt and Prinstein 2009). Also note that some subgroups of peers, for instance non-conformists peer crowds, NSSI may indeed be associated with high status.

Peer socialization of NSSI also may occur via explicit discussions of these behaviors as effective emotion regulation strategies. If so, peer socialization effects may reflect a type of instrumental aid that is offered between friends. Girls' more frequent discussions of emotional regulation and greater levels of social support within friendships, as compared to within boys' friendships, may explain the gender moderation findings in these studies. Support for such conclusions regarding the mechanisms of peer influence will require additional data, however.

In addition to similarities revealed in these two studies supporting the presence of peer socialization effects, several important differences also emerged between these two studies. Each of these distinctions has important implications for future work. First, it is important to note that in Study 1, peer socialization was measured by examining adolescents' friends' engagement in NSSI, whereas in Study 2, effects were examined by assessing friends' engagement in a broader range of self-harm behaviors and correlates, including depressed mood and prior suicide attempts. Subsequent analyses in Study 2 revealed that friends' engagement in prior suicide attempts was specifically associated with adolescents' own NSSI. Although predictors in both studies were forms of self-harm, they represented distinct types of behaviors and interpretations across both sets of findings should be made cautiously. It may be that the consistent findings across studies are

suggestive of a robust peer influence effect; however, future research would benefit from a more comprehensive examination of the specific, potentially variable associations between a range of self-injurious behaviors and selection and socialization effects.

Second, as mentioned above, data from Study 1 examined the effects of adolescents' best friends' reported behavior as a predictor of adolescents' own NSSI. In Study 2, adolescents' perceptions of their friends' behaviors were examined. In past research on other risk behaviors (e.g., nicotine use), results have suggested that adolescents' perceptions of friends' behavior mediates the association between friends' actual reported behavior and adolescents' own behavior (Urberg et al. 1990; Urberg et al. 1997). In other words, friends' behaviors may influence adolescents most strongly when adolescents are cognizant of their friends' behaviors. Thus, both the study of friends' actual reported behavior and their perceptions of their friends' behaviors are important constructs to examine when investigating the development and maintenance of NSSI.

Third, it is interesting that peer influence effects were revealed in both studies despite a different reference group used to define "peers." In Study 1, a single best friend's engagement was examined as a source of peer influence; in Study 2, self-harm behaviors across a proportion of a group of friends were examined. Thus, in Study 1, the frequency of NSSI (severity in one individual) was a predictor while in Study 2 the prevalence of NSSI (commonalities across several people) was a predictor. In both cases, results suggested significant peer influence effects both at the level of intimate dyadic interaction and, more globally, at the friend group level. Future studies should examine the unique contributions of both the form and quality of dyadic, peer group, and other social influences on NSSI. Indeed, such an approach is consistent with a longstanding tradition of examining peer effects in multiple interpersonal contexts (Hartup 1996). In addition, potential peer influence mechanisms within each of these levels need to be researched in order to examine whether the mechanisms that underlie the observed effects are common across contexts.

Last, it is notable that Study 2 revealed both socialization and selection effects, suggesting reciprocal associations between friends' self-harm behaviors and adolescents' own NSSI. Results from Study 2 were consistent with the idea that self-harming adolescents befriend others with similar histories or proclivities (or at least perceive similarities among their friends), and self-harm behavior among these friends then promotes future engagement in adolescents' own NSSI. The finding of observed selection effects is consistent with Joiner's (1999) contention that assortative relating is of critical importance in understanding self-injury clusters. Although it is possible that some adoles-

cents might select one another as friends on the basis of shared experiences of NSSI, there likely are other theoretical pathways that may confer risk for the development of NSSI. For example, it may be that adolescents who are depressed but who do not as yet have a history of NSSI tend to form friendships with other depressed adolescents who do engage in NSSI. Thus, the initiation of NSSI may be explained through a combination of selection and socialization processes.

Several limitations must be considered when interpreting the findings of these studies. First, in Study 1, participants were limited to selecting close friends from among their grademates. Moreover, the dataset was further reduced to only include those dyadic friendships in which both friends were participants in the study, further compromising ecological validity. Given that pre-adolescents and adolescents often form significant and meaningful friendships outside of the classroom context, it follows that the reported friendships may not necessarily reflect adolescents' closest relationships. This limitation, however, was addressed in Study 2; participants were not limited to a classroom in their selection of close friendships.

A second limitation pertains to the relatively low prevalence of NSSI found among the community sample of adolescents in Study 1. This low prevalence may reflect actual low rates of the NSSI behaviors assessed among this particular sample of young students. Alternatively, it may be that assessing such a range of behaviors using only a single screening item may underestimate actual prevalence rates. In Study 2, this limitation was partially addressed through the use of a five-item composite measure. Nonetheless, a more comprehensive assessment of the frequency and severity of a variety of NSSI behaviors would be useful in future research to better understand this understudied phenomenon. Finally, it is notable that both studies employed a relatively homogenous sample that was largely comprised of European-American adolescents. Research is clearly needed to test the reported effects in more ethnically diverse samples.

Third, although both studies examined the associations of peers' behavior (or perceptions of peers' thoughts and behavior) on adolescents' own behavior above and beyond the effects of a known risk factor for NSSI (i.e., depressive symptoms), it should be noted that several other possible "third variables" require exploration. For instance, shared stressors experienced among adolescents and their peers also may account for similar increases in NSSI among both members of a friendship dyad. Such a "third variable" effect could be a causative agent for what mistakenly appears to be a peer socialization effect. This is an important limitation inherent to all correlational research.

In conclusion, convergent findings drawn from two prospective studies offer an important first step toward

understanding the effects of peer influence processes on the development and maintenance of NSSI. Importantly, these effects were observed across both community and clinical samples of adolescents. These findings provide preliminary evidence that underscores the significance of peer influence processes on adolescent NSSI behaviors, thereby contributing to the nascent empirical literature on this understudied phenomenon.

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