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Social Support and Nonsuicidal Self-injury among adolescent Psychiatric Inpatients

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Abstract

Cross-sectional studies and prospective studies with long follow-up periods (e.g., years) have shown that lower levels of social support are associated with nonsuicidal self-injury (NSSI) among adolescents. This study examined how short-term changes in social support may contribute to NSSI behavior and whether different sources of support (e.g., friends, family members) provide differential protective effects against NSSI. We examined fluctuations in NSSI and social support perceived from multiple sources among a sample of 118 high-risk adolescents hospitalized for serious self-harm risk. Participants provided daily reports of social support and any self-injurious behavior for the duration of their inpatient treatment (721 total observations, average observations per participant = 6.11). Multi-level models were used to assess variability in social support and how these fluctuations relate to whether or not an individual engages in NSSI. Over one-third of participants reported engaging in NSSI at least once during inpatient hospitalization and self-reported social support varied within person across sources of support (*ICC* range = 0.68–0.81). Support perceived from family members and inpatient unit staff was inversely associated with NSSI, but no relationship was found between NSSI and support from other patients on the unit or friends outside of the unit. These findings suggest that the protective effects of social support for NSSI vary over short periods of time and that support perceived from adults is particularly relevant among this high-risk clinical sample. This study represents an important step in identifying risk factors to improve the detection and prevention of NSSI among adolescent inpatients.

Keywords Social support · Self-injury · Risk factors · Adolescence

Social support, or the perception that one would be loved, valued, and supported in times of need by members of their social network (Barrera, 1986; Cohen & Wills, 1985), is inversely associated with risk for both suicide and nonsuicidal self-injury (NSSI; the purposeful destruction of body tissue without suicidal intent; Kleiman & Liu 2013; Klonsky & Muehlenkamp, 2007; Miller et al., 2015; Muehlenkamp et al., 2013). Among both clinical and community adolescent samples, between-subjects analyses indicate that higher levels of social support from family and friends are cross-sectionally associated with decreased likelihood of NSSI behavior (Swahn et al., 2012; Wolff et al., 2014). Longitudinally, adolescents with greater social support are at lower risk of NSSI behavior onset over a 2-year follow-up (Hankin & Abela, 2011; Wichstrøm, 2009). Although researchers have identified cross-sectional and prospective between-subjects relationships between NSSI and social support, few studies have examined: (1) how short-term, within-person changes in social support may contribute to whether or not an adolescent engages in NSSI and (2) whether there are potentially differential protective effects from different sources of social support. In addition to these unanswered questions, most research on social support in adolescents has not focused on relevant high-risk groups (like those at risk for self-injurious thoughts or behaviors). The goal of this study is to answer these two questions in a

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clinically severe sample of adolescents hospitalized for serious self-harm risk.

Why should we examine short-term changes in social support?

Social support has been conceptualized as a dynamic construct prone to changes from day to day, but research has only recently begun to empirically examine within-person variability of perceived social support over such short periods (House et al., 1988; Thoits, 1982). A recent daily diary study conducted with suicidal adults (Coppersmith et al., 2019) supports the suggestion that individual perceptions of current social support fluctuate considerably from one day to the next. Nearly half of all daily reports of social support in this study varied by at least one standard deviation from the previous day's report. Furthermore, fluctuations in social support were associated with short-term changes in suicidal ideation, indicating that some of the protective effects of social support are time-varying and operate on a short timescale. These early findings suggest that studying social support as a dynamic construct through daily repeated assessments may offer a more thorough understanding of the protective effects of social support than is afforded by cross-sectional research or longitudinal studies with extended gaps between assessments.

To our knowledge, there is only one paper to date that specifically examines the relationship between NSSI and short-term (daily) fluctuations in social support (Turner et al., 2016). Findings provided preliminary evidence that, among young adults engaging in NSSI, disclosure of self-injury was associated with short-term fluctuations in perceived support. This study focused primarily on the socially reinforcing consequences of NSSI. Specifically, the study found that engaging in NSSI and then disclosing served to reduce interpersonal conflict (i.e., social negative reinforcement) and increase social support (i.e., social positive reinforcement). In the present study, we are concerned with social support as an antecedent of NSSI, specifically, whether lower social support is associated with increases in NSSI behavior. This is an important question to study because adolescents engage in NSSI for many reasons other than receiving social reinforcement. For example, one of the most common reasons adolescents engage in NSSI is to regulate negative emotions (i.e., automatic negative reinforcement; Klonsky, 2007; Taylor et al., 2018; Zetterqvist et al., 2013). This suggests that one way social support might be associated with reduced NSSI is by decreasing negative emotion, thereby reducing the need for adolescents to engage in NSSI.

Are there differential effects from different sources of support?

In addition to varying over time, different sources of social support may provide differential protective effects (e.g., support from family, friends, teachers; Czyz et al., 2012; Raffaelli et al., 2013; Stewart & Suldo, 2011). Adolescence is a unique stage of social development during which peer influence and peer relationships become more important for the development of autonomous social identities. NSSI is also more prevalent during adolescence than any other developmental period and adolescence is the stage during which the onset of self-injurious behavior most commonly occurs (Cipriano et al., 2017; Jacobson & Gould, 2007). Studying social support among adolescents provides the opportunity to examine how multiple, evolving sources of support protect against NSSI behavior during a high-risk developmental period.

Research examining multiple sources of social support among adolescents indicates that perceived parental support is a stronger predictor of broad psychopathology development, general mental health, and NSSI behavior than other sources of support, including support from friends (Stewart & Suldo, 2011; Swahn et al., 2012; Wolff et al., 2014). However, a study of first-year undergraduate students found that NSSI was associated with lower levels of social support from friends but not with perceived support from family, suggesting that peer support may become a more important protective factor against NSSI in young adulthood (Heath et al., 2009). Increases in the importance of peer support and decreased influence of parental support may be partially attributable to changing social environments between high school and college, where students are less likely to live with parents and where autonomy may be less dependent on parents and other adults. Research on this topic has not yet extended to the assessment of multiple sources of support for adolescents in atypical or high-risk social environments.

The importance of studying self-harm among high-risk groups

Adolescence is a period of elevated risk for NSSI, with reported lifetime prevalence rates up to 15–25% and 60% among community and clinical adolescent samples, respectively (Darche, 1990; DiClemente et al., 1991; Plener et al., 2009; Swannell et al., 2014). Despite particularly high prevalence levels among severe clinical samples, the majority of NSSI research has been conducted with community-recruited adolescents with low levels of psychopathology (Glenn & Klonsky, 2011; Wichstrøm, 2009). Given increased prevalence rates among clinical samples, studying

occurrences of NSSI among high-risk adolescents may be particularly important to identify both predictors of lifetime self-harm and proximal risk factors that contribute to individual instances of NSSI.

Over 60% of adolescents admitted to inpatient psychiatric treatment report history of NSSI behaviors, and growing evidence indicates that some adolescents continue to engage in self-injurious behavior during their stay on the inpatient unit (Guerry & Prinstein, 2010; Klonsky et al., 2013; Livesey, 2009; Nixon et al., 2002; Pollak et al., 2020; Vivona et al., 1995; Zhand et al., 2016). However, research is limited on factors that contribute to the maintenance or onset of NSSI behaviors while hospitalized. A relationship has been found between perceived social support and inpatient adolescents' depressive symptoms, but research has yet to examine the relationship between social support and inpatient NSSI or the perceptions of support from sources specific to the inpatient unit (e.g., perceptions of support from hospital staff or fellow patients on the unit; Barrera & Garrison-Jones 1992). Studying the differential contributions of multiple sources of social support may be particularly relevant for hospitalized adolescents, given that inpatient psychiatric units are, by nature, atypical social environments where individuals have reduced interaction with primary sources of support (i.e., family and friends) for an extended period of time. Social support, which has been found to exert the greatest protective effects during periods of elevated stress, may also be particularly relevant to coping and emotion regulation during stressful hospitalizations (Cohen & Wills, 1985). Limited research has examined changes in perceived social support over time during inpatient treatment, and no studies to date have assessed how these fluctuations may affect NSSI behavior during psychiatric hospitalization.

The present study

This study used daily diaries to explore hypotheses about dynamic fluctuations in social support from different sources among inpatient adolescents and how these fluctuations are associated with NSSI behaviors that occur during hospitalization. First, in line with prior research among related populations (e.g., suicidal adults; Miller et al., 2015), we hypothesized that there would be substantial day-to-day variations in social support reported by participants. Second, we hypothesized that fluctuations in social support would be related to the odds of engaging in NSSI. Third, we aimed to answer a novel question about how perceptions of social support from different sources (i.e., unit staff, other patients on the unit, family members, and friends outside the unit) may differentially contribute to NSSI behaviors. This question was exploratory and had no *a priori* hypothesis.

Method

Participants

Data were drawn from a broader study of risk factors among suicidal adolescent inpatients (Kleiman et al., 2019). Participants were 118 adolescents aged 12–19 (average age 15.78 years, $SD = 1.77$ years) recruited from a large, urban adolescent inpatient psychiatric unit. Individuals who were admitted for serious self-harm risk (e.g., severe nonsuicidal self-injury, suicidal thoughts and behaviors) were eligible to participate. The sample was 79.8% female. Regarding race and ethnicity, the sample was 80.5% White, non-Hispanic, 4% Asian, 4% African American, 4% Hispanic, and the remainder endorsed more than one race. At admission, approximately 87% of the sample had a history of suicidal thinking, 63% had a history of non-suicidal self-injury, and 54% had a history of suicide attempts. Regarding the most common chart diagnoses, 77% of the sample was diagnosed with a Depressive Disorder (e.g., major depressive disorder) and 49% with an Anxiety Disorder (e.g., Generalized Anxiety Disorders).

The inpatient unit was located within a large, urban children's hospital and served adolescents ages 12 to 19 seeking short-term inpatient treatment for stabilization of psychiatric crises, including acute suicide risk. The primary focus of the unit was ensuring and maintaining safety and reducing safety-threatening behaviors, particularly suicidal behaviors. To achieve this goal, patients have limited access to means of self-harm and are observed by unit staff at least once every 5 minutes through regular checks. In addition to individual and group therapy, patients can visit with family members during scheduled hours. They also have scheduled time during which they are able to use hospital phones to call family and friends outside of the unit. Patients are not permitted access to mobile phones or social media during inpatient hospitalization, potentially reducing access to typical forms of social support and connection. Unit staff, including psychiatrists, nurses, and additional personnel (e.g., educational staff) are expected to interact with patients in a compassionate and supportive manner while prioritizing safety and stabilization.

Procedure

The study was conducted during participants' stay on the inpatient unit and participants were recruited and enrolled as close as possible to their hospital admission date. Potential participants ages 18 years and older were directly approached by a member of the study team to assess interest in participation and to complete a written informed consent

protocol. Parents/guardians were approached and completed a written consent protocol prior to approaching potential participants under age 18, who also provided written assent. Individuals who presented with any psychopathology that interfered with ability to provide consent, including low intellectual functioning, psychosis, and developmental disabilities, were ineligible to participate. In collaboration with unit staff, study staff reviewed prospective participants' medical records to confirm eligibility prior to approaching them about the study. All study procedures were approved by the governing hospital and university institutional review boards.

Following a baseline assessment, participants met with a study staff member at approximately the same time each weekday for the duration of their inpatient stay to answer a series of self-report questions. Upon meeting with a participant, the study staff member would enter the participant and staff study ID numbers into an iPad, which was then given to the participant to complete an anonymized survey (i.e., they were told their information was only associated with a participant ID that could not be readily matched to their name). Participants answered questions about experiences, emotions, and events since the prior check-in (approximately 24 hours prior during weekdays). In instances where more than 24 hours passed between check-ins, participants were asked to report on experiences that had occurred across the entire period since the last check-in with study staff. Participants were not compensated, in accordance with hospital policy.

Measures

Nonsuicidal Self-Injury. NSSI was assessed by asking participants whether they had "hurt themselves on purpose" since the last check-in ("since the last check-in" was changed to "since yesterday" when speaking to a patient for the first time). Participants who endorsed self-harm since the last check-in were asked how many times they had hurt themselves in that time period as well as when each instance occurred. Finally, participants were asked to describe what they did to hurt themselves in each instance of self-harm since the last check-in (e.g., "cut/carved myself," "burned myself on purpose," "hit myself on purpose") to assess NSSI methods. Items were created in collaboration with the director of the inpatient unit. To ensure that participants understood questions about NSSI behavior, questions were worded to correspond with the unit's milieu and used language unit staff used with patients.

Reports of NSSI were made anonymously through an iPad used for the study and were not reported directly to study staff. The inpatient unit protocols include patient checks every 5 minutes by a member of the inpatient staff to monitor participant safety and behavior. For this reason and to protect participant confidentiality, data was not reviewed in real-time and study staff were not mandated to retroactively report instances of NSSI to inpatient staff. To reduce reporter bias, participants were made aware of reporting protocols and that their responses would not be linked to their name and would not be given to the clinical staff.

Social Support. Participants were asked to report how supported they felt by unit staff, other patients on the unit, family members, and friends outside of the unit since the last check-in using separate, single items for each source of support (e.g., "Since the last check-in, my family members have been…"). Each source of support was rated on a 1 (most unsupportive) to 10 (most supportive) scale. Participants were not asked to provide ratings for support from family members and friends outside of the unit if they had not had contact with that source of support since last check-in (i.e., "Choose N/A for not applicable if you didn't speak to the people in the question").

Analytic strategy

To examine the day-to-day fluctuations in social support, we used the intraclass correlation (ICC). Specifically, *ICCs* showed the proportion of variance attributable to within-person and between-person differences for each source of social support. Higher *ICC* scores indicate greater between-person variance and lower within-person (i.e., observation-to-observation) variance.

To examine whether different sources of social support were associated with NSSI, we used multi-level modeling. Multi-level modeling was most appropriate because we had repeated-measures data (i.e., multiple observations from each participant). We conducted two logistic multi-level models, which differed in the predictors included but shared all other properties. Both models included two levels where observations (level 1) were nested within people (level 2), specified as the outcome variable occurrence of NSSI (yes/no), used fixed-slopes (i.e., random intercepts only), and had participant-mean centered predictor variables. The first model examined associations between NSSI and social support from unit staff, other patients on the unit, and family members controlling for duration of hospitalization and participant age. The second model was identical to the first model but added as a predictor variable social support from friends outside of the unit. We tested this model in addition to the model with support from staff, other patients, and family members because participants reported contact with friends on approximately 51% of days. Thus, this second model examining associations between NSSI and all four

sources of social support was necessary to account for the reduction in the number of included observations. All analyses were conducted in R (R Core Team, 2016) with the lme4, Psych, and EMAtools packages (Bates et al., 2015; Kleiman, 2017; Revelle, 2017). Tables and figures were created with the sjPlot (Lüdecke et al., 2020) and ggplot packages (Wickham, 2020).

Results

Participants responded to the daily diary questions a total of 721 times with an average of 6.11 responses each ($SD = 6.06$ responses, Range = 1–37). Forty-four participants (37.3%) reported engaging in NSSI at least once on the inpatient unit and 74 participants reported no NSSI behavior. Across the 44 participants who reported self-injurious behavior, NSSI in the time since last check-in was reported 165 times and participants reported a total of 392 individual instances of self-harm across the study. Participant age was associated with NSSI behavior on the inpatient unit with older participants more likely to report NSSI than younger participants ($OR = 0.80$, *95% CI* = 0.71, 0.89, $p < .001$). Similarly, longer duration of inpatient hospitalization was associated with a greater likelihood of NSSI occurring on the unit ($OR = 1.02$, *95% CI* = 1.02, 1.03, $p < .001$). It is unclear whether duration of hospitalization contributes to NSSI behavior, whether NSSI behavior on the unit recorded by unit staff increased duration of hospitalization, or whether greater overall severity of psychopathology was associated with both longer stay and greater frequency of NSSI.

Variability in social support. Across the sample, participants reported similar average levels of perceived social support from unit staff ($M = 7.69$ [out of 10], $SD = 2.34$), other patients on the unit ($M = 7.42$, $SD = 2.41$), friends outside of the unit ($M = 7.67$, $SD = 2.97$), and family members ($M = 7.5$, $SD = 2.62$). When examining between-person ICCs, we found that, although between-person differences accounted for the majority of the variability in social support from each of the four sources included in the present analyses, levels of perceived support from unit staff, other patients on the unit, family, and friends varied considerably across check-ins (Fig. 1). The proportion of the variability accounted for by between-person differences was similar across sources of social support. Within-person differences accounted for approximately 30% of the variability in support from unit staff ($ICC = 0.71$, 95% *CI* = 0.65, 0.77), other patients on the unit ($ICC = 0.73$, 95% *CI* = 0.67, 0.79), and family members ($ICC = 0.68$, 95% *CI* = 0.61, 0.74) and 20% of the variability in support from friends outside of the unit ($ICC = 0.81$, 95% *CI* = 0.75, 0.86).

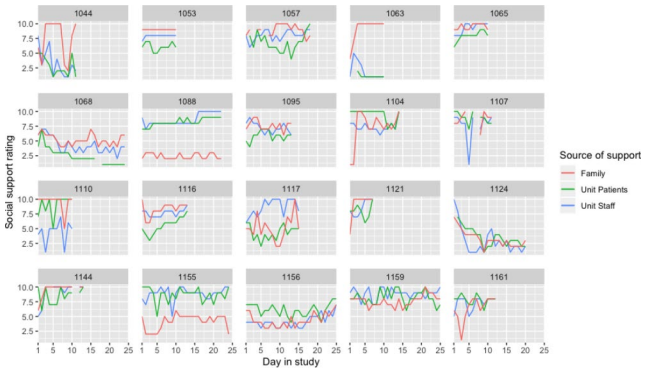

Fig. 1 Individual plots of multiple sources of social support across inpatient hospitalization. This figure shows the daily changes in individual participants' ratings of social support from family members, other patients on the unit, and unit staff from Day 1 to Day 25 of the study. Note. Only data from participants with more than 10 assessments are included here.

Repeated measures correlations were used to assess the relationships between each of the four sources of support, accounting for the nested structure of the data. Significant between-person positive correlations were found between each pair of sources (see Table 1). Between-person correlation coefficients ranged from $r = .58$ ($p < .001$) for support from unit staff and support from other patients to $r = .34$ ($p < .001$) for support from unit staff and support from parents. Significant within-person positive correlations were found between support from unit staff and each of the other three sources, with correlation coefficients ranging from $r = .22$ ($p < .001$) for support from parents to $r = .14$ ($p = .005$) for support from friends outside of the unit (see Table 1). No significant within-person correlations were found between support from family, other patients, and friends outside of the unit.

Associations between social support and NSSI. The multi-level modeling results for social support and NSSI behavior are shown in Table 2. Perceived social support from unit staff was significantly and negatively associated with NSSI behavior in Model 1 ($OR = 0.72$, *95% CI* = 0.57,

Table 1 Sources of Perceived Social Support: Between-person & Within-person Repeated Measures Correlations

Variables	Repeated Measures Correlations (above diagonal = within person, below = between)			
	1	**2**	**3**	**4**
1. Support from unit staff	–	**0.22**	**0.22**	**0.14**
2. Support from other patients	**0.58**	–	0.04	0.95
3. Support from parents	**0.34**	**0.50**	–	0.00
4. Support from friends outside of the unit	**0.39**	**0.41**	**0.42**	–

Note: Bold = significant at p < .01.

Table 2 Multilevel models showing the relationship between multiple sources of social support and nonsuicidal self-injury

	Model 1: NSSI and Perceived Social Support from unit staff, other patients, and family members			Model 2: NSSI and Perceived Social Support from all sources		
Predictors	*Odds Ratios*	*CI*	*p*	*Odds Ratios*	*CI*	*p*
Intercept	10.70	0.02–4639	0.444	9.09	0.01–10,976	0.542
Age	0.65	0.44–0.97	**0.034**	0.68	0.43–1.07	0.097
Length of hospitalization	1.04	1.02–1.07	**0.001**	1.04	1.01–1.06	**0.004**
Support from staff	0.72	0.57–0.91	**0.005**	0.67	0.50–0.90	**0.007**
Support from patients	1.06	0.84–1.32	0.639	0.83	0.61–1.12	0.231
Support from family	0.78	0.64–0.95	**0.015**	0.68	0.52–0.89	**0.005**
Support from friends				1.02	0.77–1.36	0.866
Random Effects						
σ^2	3.29			3.29		
τ_{00}	6.19_{ID}			4.12_{ID}		
ICC	0.65			0.56		
N	112_{ID}			68_{ID}		
Observations	639			350		
Marginal R^2 / Conditional R^2	0.238 / 0.735			0.277 / 0.679		

This table shows the day-level associations between ratings of perceived social support from multiple sources and same-day NSSI behavior, controlling for participant age and duration of hospitalization for each participant. Note: ICC = proportion of variance explained by between-person differences; σ2 = within-person residual variance; Marginal R^2 = variance accounted for by fixed effects only; conditional R^2 = variance explained by fixed + random effects.

0.91, $p = .005$) and Model 2 ($OR = 0.67$, *95% CI* = 0.50, 0.90, $p = .007$). A significant association between perceived social support from family members and NSSI behavior was also found in Model 1 ($OR = 0.78$, *95% CI* = 0.64, 0.95, $p = .015$) and in Model 2 ($OR = 0.68$, *95% CI* = 0.52, 0.89, $p = .005$). When accounting for other sources of social support, no association was found between NSSI behaviors and perceived social support from other patients on the unit or from friends outside of the unit. Duration of hospitalization was significantly associated with NSSI behavior in both Model 1 ($p = .001$) and Model 2 ($p = .004$). Participant age was significantly associated with NSSI in Model 1 ($p = .034$) but no significant association was found between age and NSSI in Model 2 ($p = .097$). When examining between-person ICC's, approximately 69% of the variance in the first model and 64% of the variance in the second model was explained by between-person differences. This indicates relatively low fluctuation in NSSI behaviors from check-in to check-in, although there is still sufficient fluctuation to warrant a multi-level design.

45 participants reported no contact with friends during their enrollment in the study. No significant difference in NSSI behavior was found between these participants and adolescents who reported contact with friends outside of the unit during the study period ($p = .964$). Further, no significant difference was found in NSSI behavior on days when participants had contact with friends outside of the unit compared to days when participants did not have contact ($OR = 1.15$, *95% CI* = 0.45, 2.91, $p = .773$). All participants reported contact with family members during the study period, with family contact reported during 93.3% ($n = 673$) of daily survey responses.

Discussion

This study shows a relationship between short-term fluctuations in social support and NSSI behaviors among adolescents receiving inpatient psychiatric treatment. Supporting our first hypothesis, reported levels of social support were found to vary within-person across the study, accounting for 20–32% of the overall variance in social support. This finding aligns with recent research on the dynamic, time-variable nature of social support and expands upon current literature by demonstrating that perceived social support across multiple sources fluctuates over short time periods (Coppersmith et al., 2019; Turner et al., 2016). Given these changes in day-to-day perceptions of support, future research utilizing repeated-assessment designs is likely necessary to capture these fluctuations in ways that cross-sectional assessments cannot. Future research may help to illuminate whether certain dimensions of social support are differentially stable or prone to change over periods of hours and days.

The results also supported our second hypothesis that changes in social support over time are related to occurrences of NSSI. This contributes to a large body of literature on low social support as a risk factor for poor mental health outcomes. The existing literature finds that social support

serves as a long-term protective factor against the initiation and maintenance of NSSI during adolescence (Hankin & Abela, 2011; Wichstrøm, 2009). Our study suggests that social support may also act as a proximal protective factor operating at a daily level. Although additional research is needed to determine the specific mechanisms through which increased social support may lower the likelihood of engaging in NSSI behavior among adolescents, social support is theorized to indirectly protect against NSSI behaviors by improving emotion regulation (Tatnell et al., 2014). People who report higher levels of perceived social support are able to more positively and more effectively regulate their emotions (Lakey, 2010). High levels of support are also associated with increased use of cognitive reappraisal, which has been found to moderate the relationship between perceived support and depressive symptoms (d'Arbeloff et al., 2018; Sachs-Ericsson et al., 2019). Cognitive reappraisal may function as the mechanism through which social support improves emotion regulation. Increased emotion regulation related to perceived social support may help adolescents cope more healthily with interpersonal and other types of proximal stressors during hospitalization without turning to self-injury. Additionally, individuals who engage in NSSI may exhibit heightened rejection sensitivity and may be particularly likely to expect, perceive, and experience intense emotional reactions to social rejection (Downey & Feldman, 1996; Jiang et al., 2021; Nock, 2010). Therefore, perceptions of social support as well as the protective effects of perceiving social support from various groups may operate differently within this sample compared to other adolescent samples who have not engaged in NSSI behavior.

The relationship between social support and NSSI was found to vary by source of support. Changes in support from both family members and unit staff were associated with changes in NSSI behavior. No relationship was found, however, between NSSI behavior and social support from friends and other unit patients. The relationship between low social support from unit staff and family members and NSSI behaviors suggests an important role of support from authority figures, supporting previous findings that support from teachers and adult family members is more protective than peer support (Gariépy et al., 2016; Stewart & Suldo, 2011). In inpatient units, adolescents have limited autonomy and authority figures have increased control over what happens to an adolescent patient (e.g., determining discharge date, determining treatment referrals). This environment may make perceived support from adult authority figures particularly relevant for mental health.

Adolescents on the inpatient unit were able to interact with family members via hospital phone and in person during scheduled visiting hours. Contact with family members was reported on 93.3% of the days participants completed surveys and all participants reported contact with family during the study period. Given that participants reported high contact levels with family members, fluctuations in perceived family support are likely attributable to other factors. Future research should examine possible daily-level contributors to fluctuations in perceived social support during inpatient hospitalization, including invalidation and alignment of child and parent goals for hospitalization.

Participants had consistent contact with rotating unit staff members throughout their hospitalization. Interactions with different staff members on different days may have contributed to fluctuations in perceived social support from unit staff. Further, adolescents who engage in NSSI on the unit or who wish to may feel an inherently adversarial relationship with unit staff who are responsible for preventing self-injury and conducted patient checks every 5 minutes to ensure safety. Adolescents may feel less supported by staff who prevent them from engaging in NSSI or who enforce rules or repercussions following an incidence of NSSI, leading to a reciprocal relationship between lower perceived support and self-injury and motivating NSSI concealment. Future research should target patient and staff interactions and perceived support levels before and after individual occurrences of NSSI and NSSI disclosure. Given the atypical social nature of inpatient units and the context-specific role of unit staff and other patients as sources as social support, future studies should also examine fluctuations in social support from additional sources that may be more broadly relevant for adolescents who are not receiving inpatient treatment.

Findings that changes in peer support during hospitalization did not predict NSSI behavior may reflect the potentially mixed influence of peer support on NSSI, acting as a protective factor for some while reinforcing maladaptive behavior for others. Reinforcement models posit that NSSI may, at times, be used to elicit desired interpersonal outcomes, such as increased social support from peers (Klonsky & Muehlenkamp, 2007; Nock & Prinstein, 2004). Therefore, high levels of peer support may lead to increases in NSSI for individuals who receive a desired response for engaging in self-injurious behavior. Social contagion, through which adolescents are at elevated risk for initiating NSSI by modeling peers' behaviors, may also be particularly dangerous in inpatient settings where patients report high NSSI prevalence rates (Jarvi et al., 2013) found that nearly 40% of adolescents who reported lifetime NSSI behavior learned about NSSI from peers (Deliberto & Nock, 2008). Additional research should explore whether this social learning is occurring on inpatient units and whether individuals experience NSSI onset during hospitalization. The multiple roles that peer social support can play in the initiation and maintenance of NSSI behavior may contribute to the present null

findings on daily peer support and NSSI, obscuring trends in which peer support functions differentially as a proximal protective or risk factor for certain groups of adolescents.

Analyses indicated that contact with friends outside of the unit was not significantly associated with NSSI, nor was perceived support from friends. Limited opportunities to interact with friends (i.e., phone calls during specified hours) as well as atypical types of interaction (i.e., phone calls rather than texts, social media, or in-person interactions) may have affected the impact of friend support on NSSI. More research is also needed to better understand the effects of peer social support on inpatient units given that adolescents are primarily interacting with new individuals with whom they do not yet have relationships rather than friends or established peer support systems. Null findings for the relationship between NSSI and support from peers during hospitalization may reflect the atypical social environment and may not generalize to adolescents outside of an inpatient setting.

This study contributes to the limited body of research on NSSI among adolescents receiving intensive treatment. Expanding upon previous literature identifying social support as a potential protective factor against NSSI, findings that short-term changes in social support are associated with same-day NSSI behavior indicate that social support may influence whether or not an individual chooses to engage in NSSI on a given day in addition to lowering risk of lifetime NSSI behavior. To our knowledge, this is the first study to examine daily NSSI behaviors among an adolescent inpatient sample. Although the clinical severity and atypical social setting of our sample limit generalization to social support among a broader adolescent population, this study has important practical implications for understanding and preventing NSSI in a hospital setting. We found that over one-third of participants reported engaging in NSSI on the inpatient unit, illustrating the prevalence of self-injury among high-risk adolescents even during intensive treatment. 63% of participants reported a history of NSSI at intake, suggesting that NSSI behavior decreased during inpatient hospitalization for some participants. However, the prevalence of NSSI on the inpatient unit indicate that safety measures currently being utilized on adolescent inpatient units (e.g., patient checks) may have limited efficacy for the detection and prevention of NSSI during hospitalization. The observed relationship between dynamic decreases in perceived support from parents and unit staff and NSSI represents an important step towards identifying short-term risk factors for on-unit self-harm. Investigating further short-term risk factors that may bolster unit staff's ability to predict which individuals are at elevated risk for NSSI at different points in time and to intervene before high-risk behavior occurs remains a crucial target for future research.

This study used daily diaries to document and assess day-to-day changes in perceptions of social support and NSSI that occur during inpatient hospitalization. By asking only about events and experiences since the last daily assessment, participants were not asked to recall specific details about events that had occurred over periods of weeks or months, allowing for more precise and detailed responses than would be afforded with traditional longitudinal assessments. These findings contribute to a burgeoning literature using intensive repeated assessments designs (e.g., daily diary, ecological momentary assessment) to analyze short-term fluctuations in risk for suicide and self-harm (Coppersmith et al., 2019; Czyz et al., 2018; Kleiman et al., 2017). Repeated measures approaches may be particularly important for understanding how risk changes over short periods during inpatient hospitalization and other high-risk, atypical environments.

This study was subject to several limitations. First, social support was assessed daily rather than at multiple time-points during the day and was therefore not able to capture within-day fluctuations in perceived support. Therefore, it is unclear whether changes in perceived social support preceded or followed NSSI behavior. Future research should examine how social support varies over periods of hours among both clinical and community samples of adolescents, in addition to how these fluctuations affect NSSI behavior. Establishing the directionality of the temporal relationship between changes in perceived social support and NSSI is an essential step in effective prediction and reduction of NSSI behavior. Second, the study was underpowered to test a potential prospective relationship between social support and next-day NSSI behavior. Variability in the duration of hospitalization and number of assessments per participant further limited our ability to test this effect, and a future study conducted with a larger sample and more assessments per participant should examine the relation between social support and NSSI beyond same-day effects. Third, assessment of NSSI behavior relied on self-report measures. Self-harm is often concealed from others (Walsh, 2006; Whitlock et al., 2006). Although participants were told that all responses were anonymous and that study staff were not mandated reporters about NSSI, our assessments may not have captured the extent to which NSSI occurred on the unit. Fear of negative responses to disclosure, which drives concealment of NSSI for some adolescents (Klineberg et al., 2013), may further contribute to underreporting during hospitalization where disclosure may lead to direct and unwanted consequences (e.g., extended inpatient treatment, increased surveillance from staff). The sample was largely white and largely female, and future research with a more diverse adolescent sample is an important step to examine

differences in the relationships between social support and NSSI across demographic characteristics.

In conclusion, this study finds that social support varies over short periods of time among adolescent inpatients and that changes in support from specific sources are related to NSSI behavior on the unit. The mechanism through which social support may protect against self-injurious behavior is still unclear and future studies should examine both potential mechanisms that drive this relationship and whether different sources of social support exert influence on NSSI behaviors through different mechanisms. Further research exploring what causes these fluctuations in social support and identifying other potential proximal protective factors is crucial to reduce the prevalence and impact of NSSI on adolescent inpatient units.

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Conflict of Interest Dr. Evan Kleiman (author on this manuscript) is on the editorial board for Research on Child and Adolescent Psychopathology. All authors declare no other known conflicts of interest.

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