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Thwarted Belongingness Mediates Interpersonal Stress and Suicidal Thoughts: An Intensive Longitudinal Study with High-risk Adolescents

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ABSTRACT

Objective: Interpersonal negative life events (NLEs) have been linked to risk for suicidal thoughts and behaviors. However, little is known about how this risk is conferred over the short term and the mechanisms linking interpersonal NLEs to suicide risk, particularly in adolescents. This study used an intensive longitudinal design to examine thwarted belongingness with family and friends as potential mechanisms linking interpersonal NLEs to suicidal thoughts.

Method: Forty-eight adolescents ($M_{\text{age}} = 14.96$ years; 64.6% female, 77.1% White), who recently received acute psychiatric care for suicide risk, were followed intensely for 28 days after discharge. Smartphone-based ecological momentary assessment was used to measure presence of interpersonal NLEs at the day level, fluctuations in thwarted belongingness with family and friends (separately) within day, and fluctuations in suicidal thoughts within day. A multi-level structural equation model was utilized to examine family thwarted belongingness and friend thwarted belongingness as parallel mediators in the relationship between interpersonal NLEs and next-day suicidal thoughts.

Results: Significant direct effects were observed between interpersonal NLEs and family thwarted belongingness, family thwarted belongingness and suicidal thoughts, and friend thwarted belongingness and suicidal thoughts. In addition, family, but not friend, thwarted belongingness significantly mediated the association between interpersonal NLEs and next-day suicidal thoughts.

Conclusions: Interpersonal NLEs predicted greater suicidal thoughts over the short term (next day) in high-risk adolescents. Findings suggest how interpersonal NLEs may confer risk for suicidal thoughts – by reducing feelings of family belongingness. Future research is needed to examine how modifying belongingness may reduce suicide risk in adolescents.

Suicidal thoughts and behaviors (STBs) are a major public health concern among adolescents. STBs are related to significant academic and social impairment (Copeland et al., 2017; Foley et al., 2006) and confer risk for suicide death (Ribeiro et al., 2016). Suicidal thoughts typically begin during the transition to adolescence and rates increase significantly during this developmental period (Nock et al., 2008, 2013). Moreover, for about a third of adolescents, escalation from suicidal thoughts to suicide attempts (i.e., deliberate, self-inflicted injury with at least some intent to die; Silverman et al., 2007) will occur within one to two years after the onset of suicidal thoughts (Glenn et al., 2017; Nock et al., 2008, 2013). Recent estimates from the Centers for Disease Control and Prevention's 2019 Youth Risk Behavior Survey suggest that approximately 19% of high school students thought about suicide in the past year and 9% attempted suicide at least once (Ivey-

Stephenson et al., 2020). Alarming, STB-related hospitalizations have doubled for youth over the past decade (Plemmons et al., 2018).

Effective suicide prevention for youth will require a range of upstream (i.e., build protective factors) and downstream (i.e., crisis intervention) approaches (JED Foundation, 2017; Suicide Prevention Resource Center, 2020). To enhance downstream suicide prevention approaches, the field needs knowledge about *when* youth are most at risk and *what* factors may be modifiable during this time to reduce risk. Although considerable research has aimed to identify potential suicide risk factors (Franklin et al., 2017), this work has been limited in its examination of short-term risk factors and high-risk periods (Glenn & Nock, 2014). For instance, one of the highest risk periods for suicidal behavior and suicide-related rehospitalizations is the month following

discharge from psychiatric hospitalization (Chung et al., 2017). This also is a time period with significant fluctuations in suicide ideation among adolescents (Prinstein et al., 2008). However, far less is known about how risk is conferred during the post-hospitalization period. One factor that has been related to suicide risk, and may help to clarify risk processes during this time, is the presence of negative life events (NLEs), specifically interpersonal NLEs.

Interpersonal Negative Life Events and Suicide Risk

NLEs have been linked to risk for STBs across the life-span (Liu & Miller, 2014). The range of NLEs that have been associated with STBs can be broadly categorized as either interpersonal (e.g., loss, difficulties or conflict with family, friends, and romantic partners) or non-interpersonal events (e.g., health, financial, legal). This distinction between interpersonal and non-interpersonal NLEs is important given research indicating that interpersonal NLEs are robustly related to suicide risk (Bagge et al., 2013; Brent et al., 1993; Liu & Miller, 2014; Stewart et al., 2019). Among adolescents, interpersonal NLEs related to family (e.g., conflict, rejection), peers (e.g., rejection, exclusion, victimization), and romantic partners (e.g., relationship breakups) are the most strongly linked to STBs (Beautrais et al., 1997; Cheek, Goldston et al., 2020; Fergusson et al., 2000; Holt et al., 2015).

Interpersonal NLEs may play a particularly important role in adolescents' risk for STBs, due to the socioemotional changes that normatively occur during this developmental period. Specifically, adolescence is marked by significant changes in social salience and peer relationships, including increased desire for affiliation and belonging with peers, as well as greater sensitivity to social evaluation and rejection (Crone & Dahl, 2012; Crosnoe & Johnson, 2011; Powers et al., 2013; Santor et al., 2000; Somerville, 2013). There also is a normative increase in parent-child conflict as adolescents develop increased autonomy and their own identity, separate from that of their parents (Crosnoe & Johnson, 2011; Laursen & Collins, 2009).

To date, most studies examining the link between interpersonal NLEs and STBs have been cross-sectional or examined the association over long follow-up periods (Cheek, Reiter-Lavery et al., 2020) – a limitation of most suicide risk factor research (Franklin et al., 2017). However, growing evidence suggests that interpersonal NLEs may confer risk for STBs over the short term. For instance, longitudinal studies indicate that interpersonal NLEs are common in the month prior to a suicide attempt in adults (Yen et al., 2005) and adolescents

(Cheek, Goldston et al., 2020). Even more proximal to suicidal behavior, one study using an intensive Timeline Followback methodology with adults found that interpersonal NLEs were more common on the day a suicide attempt occurred, compared to the day before, when all distal risk factors were the same for that individual, but they did not attempt suicide (Bagge et al., 2013). In addition, a recent daily diary study (i.e., one daily assessment) with adults found that NLEs (both interpersonal and non-interpersonal) were contemporaneously related to greater suicidal thoughts that day (Franz et al., 2021). Greater temporal resolution comes from an ecological momentary assessment (EMA) study with adults finding that family NLEs, but not general NLEs, predicted greater suicide ideation that day (Husky et al., 2017). However, this level of temporal sensitivity (i.e., examining how NLEs relate to STB risk over the subsequent hours and day) has not been examined in youth.

Although there is some evidence linking interpersonal NLEs to suicide risk in adolescents, significant gaps still exist. First, as noted above, research in youth has examined these associations over long periods of time, such as assessment of lifetime NLEs or predicting subsequent STBs over months to years (Cheek, Reiter-Lavery et al., 2020). Therefore, far less is known about how interpersonal NLEs relate to STBs over short time periods. Second, whereas there is some research exploring factors that may moderate the impact of NLEs on suicidal thoughts among adults (e.g., greater reappraisal and expressive suppression decrease risk for suicidal thoughts among those who experience stress; Franz et al., 2021), these mechanisms are understudied and poorly understood, particularly among adolescents. Elucidating these risk mechanisms has implications for understanding the development of STBs, as well as informing effective intervention and prevention efforts. Notably, this line of research is consistent with the National Institute of Mental Health's experimental therapeutics approach (Gordon, 2017), which aims to identify factors that cause and maintain psychopathology to directly intervene on those mechanisms to improve clinical outcomes.

Belongingness and the Link between Interpersonal NLEs and Suicide Risk

Belongingness, or connectedness, may be one potential mediator, or mechanism, by which interpersonal NLEs confer risk for STBs in adolescents. The ability to satisfy our basic psychological need to form social connections and to belong has significant implications for health and well-being (Baumeister & Leary, 1995). Connectedness has been conceptualized to include subjective (i.e.,

feeling satisfied in interpersonal relationships and social groups) and structural components (i.e., social networks and integration; Holt-Lunstad et al., 2017; Townsend & McWhirter, 2005; Whitlock et al., 2014). Although connectedness/belongingness has not been examined in longitudinal research as a mechanism linking interpersonal NLEs to STBs, there is converging research to suggest that it may, at least partially, mediate this association. Separate research literatures have found that: (1) interpersonal NLEs lead to reduced connectedness/thwarted belongingness, (2) reduced connectedness/thwarted belongingness is related to increased risk for STBs, and (3) loneliness mediates (in cross-sectional research) the association between interpersonal stress and a range of negative outcomes. Each will be discussed briefly in turn.

First, several lines of research indicate that interpersonal NLEs lead to social disconnection or reduced belonging. Studies using lab-based social rejection paradigms have found that rejection reduces feelings of belongingness and social connection (Gerber & Wheeler, 2009; Hartgerink et al., 2015), including among early adolescents (Ruggieri et al., 2013). Experiences of social rejection in the real world also impact belongingness among youth. Parental and peer rejection, including peer victimization, lead to feelings of loneliness among adolescents (Asher & Paquette, 2003; Baker & Bugay, 2011; Ferguson & Zimmer-Gembeck, 2014). In addition, online experiences of ostracism or rejection can negatively impact youth's sense of belonging and connectedness (Allen et al., 2014).

Second, conceptual and empirical work have linked thwarted belongingness, or reduced connectedness, to greater risk for STBs. Building on early sociological theories of suicide positing the key role of social disintegration (Durkheim, 1897/1951), contemporary theories of suicide include thwarted belongingness, or reduced connectedness, as important factors leading individuals down the pathway to suicidal behavior (Klonsky & May, 2015; O'Connor & Kirtley, 2018; Van Orden et al., 2010). There also is empirical evidence linking thwarted belongingness and social disconnection to risk for STBs (Stewart et al., 2017; Whitlock et al., 2014). Disruptions in social connectedness (family, peers, school) have been found to increase risk for STBs in youth, and greater social connectedness reduces risk for STBs in youth (e.g., Czyz et al., 2012; Foster et al., 2017; Gunn et al., 2018; Whitlock et al., 2014). Family connectedness (often operationalized as parent/caregiver involvement, degree of attachment, and quality of supportive relationship) has demonstrated a consistent association with STB risk; reduced

family connection increases risk (e.g., Ackard et al., 2006; Arria et al., 2009; Fotti et al., 2006; Kerr et al., 2006) and greater connection reduces risk (e.g., Cuesta et al., 2021; Steiner et al., 2019; Xiao & Lindsey, 2021). The link between peer connectedness (e.g., degree of peer support, relationship strength) and STB risk has been more mixed. Some studies have found that peer connectedness buffers risk for STBs (e.g., Czyz et al., 2012; Kia et al., 2021; Massing-Schaffer et al., 2020), whereas others do not find this association or find that peer connections may increase risk (e.g., Arango et al., 2016; Kaminski et al., 2010; Kerr et al., 2006). Peers may increase risk by promoting STB engagement, either through their own behaviors or attitudes supporting STBs (Whitlock et al., 2014). Studies comparing these relationships have found that family, compared to peer, connections demonstrate a more robust role in reducing risk for STBs among youth (Barzilay et al., 2019; Fotti et al., 2006; Kaminski et al., 2010; De Luca et al., 2012).

Notably, several studies using intensive retrospective and prospective designs have found that reduced belongingness (sometimes conceptualized specifically as loneliness) relates to STBs over the short term. For instance, using an intensive Timeline Followback interview methodology with adults, one study found greater feelings of loneliness reported in the hours, specifically the six hours, prior to a suicide attempt (Bagge et al., 2017). Further support comes from recent intensive longitudinal studies. EMA studies with adults have found that thwarted belongingness (or loneliness) relates to greater suicidal thoughts contemporaneously (Hallensleben et al., 2019; Kleiman et al., 2017) and prospectively (Kyron et al., 2018). Further, in the only study with adolescents, Czyz et al. (2019) utilized a daily diary study (i.e., one daily assessment) with high-risk adolescents ($n = 34$; 652 total observations), hospitalized for suicide risk, during the post-hospitalization period. Lower social connectedness was significantly related to same-day suicide ideation frequency, duration, and urges (Czyz et al., 2019). In addition, the interaction between lower connectedness and either hopelessness or burdensomeness predicted next-day suicide ideation frequency and duration.

The third, and final, piece of evidence comes from work suggesting that lack of social connection may mediate the association between interpersonal NLEs and negative mental health outcomes. For example, loneliness has been found to mediate the association between interpersonal stress and psychological distress in adults (Aanes et al., 2010), and the association between peer victimization and depressive symptoms in adolescents (Baker & Bugay, 2011). Moreover, in an adult outpatient sample, thwarted belongingness mediated the link between

bullying and suicide ideation (Brailovskaia et al., 2020). This finding is consistent with the interpersonal theory of suicide (Van Orden et al., 2010), which posits that thwarted belongingness is a mediator between NLEs and suicide ideation. Although promising, a major limitation of this prior mediation research is that all studies were cross-sectional and therefore unable to establish the temporal precedence needed for mediation (Cole & Maxwell, 2003).

Taken together, there is considerable evidence suggesting that reduced social connectedness, or thwarted belongingness, may help to explain how interpersonal NLEs increase risk for STBs in youth. However, this mechanism has not been examined directly in prior longitudinal research with adolescents.

Current Study

The current study aims to fill a significant gap in previous research by examining how thwarted belongingness with family and friends may temporally mediate the association between interpersonal NLEs and suicidal thoughts in a high-risk adolescent sample. First, we predicted that interpersonal NLEs would relate prospectively to lower belongingness (i.e., greater thwarted belongingness) with both family and friends. Second, we hypothesized that thwarted belongingness with family and friends would prospectively lead to greater suicidal thoughts. Finally, we predicted that thwarted belongingness (with family and friends) would temporally mediate the association between interpersonal NLEs and suicidal thoughts.

Method

This study was part of a larger project examining short-term risk factors for suicidal thoughts in adolescents during the high-risk post-discharge period. The method for this project has been described in detail in a prior paper (Glenn et al., 2021). A brief overview of methods related to the current study are summarized below.

Participants

Participants were recruited from an urban academic medical center in the northeastern U.S. Adolescents, ages 12–18 years, were eligible for this study if they had recently received acute psychiatric care (i.e., psychiatric emergency department, inpatient care, partial hospitalization) for

suicide risk (i.e., suicide attempt, suicide ideation with intent and/or a plan) and were transitioning to outpatient care at the site's medical center (for risk and safety monitoring reasons: Glenn et al., 2021). All adolescents (regardless of age) were enrolled with one parent or legal guardian (referred to collectively as *Parents*) within two weeks following the adolescent's discharge from acute psychiatric care. Adolescents were ineligible for the following reasons: inability to provide assent/consent (due to severe cognitive impairment, current manic or psychotic state), unwillingness to complete the study procedures (e.g., smartphone-based EMA), or concerns for their safety (i.e., imminent risk for suicide or violence). Of those initially referred (i.e., any adolescent receiving acute psychiatric care), 39% were eligible for the current study; of those eligible, 65% enrolled in the study.¹ Out of the full ($n = 53$) sample (Glenn et al., 2021), the first five adolescents were excluded because they did not receive the same questions about momentary suicidal thoughts as the rest of the sample. These questions were revised after the fifth participant was enrolled. Therefore, only 48 adolescents were included in the current paper because they received the same four questions about momentary suicidal thoughts (see Measures). Major sociodemographic and clinical characteristics for this sample are presented in Table 1.

Procedure

Study procedures were approved by the University of Rochester's Institutional Review Board (RSRB00066408). Adolescents and one parent were enrolled in the study from September 2017 to July 2019. Prior to study initiation, adolescents provided assent (12–17 year-olds) or consent (18 year-olds), and parents provided permission for their child (12–17 year-olds) or consent for their own participation (for 18 year-olds). There were two main phases relevant to the current study: (1) baseline assessment with the adolescent and their parent, within two weeks of discharge from acute psychiatric care, and (2) a 28-day EMA period following the baseline, for the adolescent only.

Phase 1 Baseline

The baseline assessment included a series of interviews and questionnaires for the adolescent and parent (details below). The baseline concluded with an orientation to the smartphone-based EMA application (described in Phase 2 EMA) and a review of the adolescent's most

¹At the time of eligibility screening, only adolescents' age and gender were available. Enrolled and unenrolled adolescents did not differ in age ($t[80] = -0.12$, $p = .902$) or gender ($\chi^2[2, N = 82] = 1.05$, $p = .591$).

Table 1. Major sociodemographics, psychiatric disorders, and suicidal thoughts and behaviors in the adolescent sample (n = 48).

Sociodemographics		Current Major Psychiatric Disorders ^d : % (n/N)	
Age (years): <i>M</i> (<i>SD</i>)	14.96 (1.60)	Anxiety disorder	93.5% (43/46)
Gender Identity: % (n/N)		Attention-deficit hyperactivity disorder	27.9% (12/43)
Female	64.6% (31/48)	Bipolar disorder	6.5% (3/46)
Male	16.7% (8/48)	Disruptive behavior disorder	25.0% (11/44)
Nonbinary ^a	18.8% (9/48)	Eating disorder	20.9% (9/43)
Race and Ethnicity: % (n/N)		Major depressive disorder	82.6% (38/46)
White	77.1% (37/48)	Obsessive compulsive disorder	9.3% (4/43)
Black/African American	8.3% (4/48)	Posttraumatic stress disorder	20.0% (9/45)
American Indian/Alaskan Native	2.1% (1/48)	Psychotic symptoms	7.0% (3/43)
Multi-racial	10.4% (5/48)	Substance use disorder	8.7% (4/46)
Hispanic/Latinx ^b	13.6% (6/44)		
Sexual Orientation: % (n/N)		Suicidal Thoughts and Behaviors and Non-Suicidal Self-Injury	
Heterosexual	41.7% (20/48)	<i>Lifetime:</i>	
Gay or Lesbian	6.3% (3/48)	Suicide ideation: % (n/N)	100% (48/48)
Bisexual	31.3% (15/48)	Suicide attempt: % (n/N)	85.4% (41/48)
Pansexual	6.3% (3/48)	Multiple attempts ^c :	61.0% (25/41)
Asexual	4.2% (2/48)	NSSI: % (n/N)	81.3% (39/48)
Unsure	10.4% (5/48)	# NSSI methods ^f : <i>M</i> (<i>SD</i>)	2.11 (0.89)
Annual Household Income: % (n/N) ^c		<i>Past year:</i>	
< \$29,000	4.2% (2/48)	Suicide ideation: % (n/N)	100% (48/48)
\$30,000 – \$69,000	31.3% (15/48)	Suicide attempt: % (n/N)	78.7% (37/47)
\$70,000 – \$99,000	35.4% (17/48)	Multiple attempts ^c :	51.4% (19/37)
> \$100,000	18.8% (9/48)	NSSI: % (n/N)	77.1% (37/48)
Prefer not to report	10.4% (5/48)	<i>Past month:</i>	
		Suicide ideation: % (n/N)	91.7% (44/48)
		Suicide attempt: % (n/N)	31.3% (15/48)
		NSSI: % (n/N)	58.3% (28/48)

NSSI = nonsuicidal self-injury

^aNonbinary includes adolescents identifying as transgender, nonbinary, or agender.^bFour adolescents did not report their ethnicity.^cAnnual household income was reported by parents/guardians.^dAnxiety disorder includes any of the following current disorders: panic disorder, agoraphobia, social anxiety disorder, specific phobia, or generalized anxiety disorder; Attention-deficit hyperactivity disorder includes any of the following current subtypes: inattentive only, hyperactive/impulsive only, or combined; Bipolar disorder includes current bipolar I or II disorder; Disruptive behavior disorder includes current conduct disorder or oppositional defiant disorder; Eating disorder includes current anorexia nervosa or bulimia nervosa; Substance use disorder includes current alcohol use disorder or substance (drug) use disorder. Given time constraints, not all disorder modules were administered to all participants resulting in missing data.^eOut of those with a history of suicide attempts, the percentage who reported more than one suicide attempt in the specified time period.^fAmong adolescents reporting lifetime NSSI, the average number of NSSI methods used over their lifetime.

recent safety plan (created with their clinical team) for use during crisis in the EMA phase of the study. For the baseline assessment, adolescents and parents were each compensated \$25/hour (maximum of \$75 each).

Background sociodemographic and diagnostic information. At baseline, adolescents provided their own demographic information (age, gender identity, race, ethnicity, sexual orientation) and parents provided information about family socioeconomic status (see Table 1). To characterize the sample, adolescents' major psychiatric disorders were assessed using the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-Kid) – a brief, fully structured diagnostic interview that has demonstrated good psychometric properties in adolescents (Duncan et al., 2018). In the current study, adolescents and parents were interviewed separately and current psychiatric diagnoses were determined by integrating adolescent and parent reports (see Table 1).

Suicidal thoughts and behaviors, and self-injury.

Adolescents' suicide ideation and attempts (i.e., lifetime, past year, and past month) were assessed, from the adolescent, with the Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011). As needed, parents separately provided missing details about their adolescent's suicidal behavior (e.g., lethality of, and medical treatment received for, a suicide attempt). The C-SSRS has been validated in adolescents (Brent et al., 2009; Gipson et al., 2015). To assess history of nonsuicidal self-injury (NSSI), a supplemental form based on the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007) was used. Prevalence of STBs and NSSI over adolescents' lifetime, past year, and past month are presented in Table 1.

Phase 2 Ecological Momentary Assessment (EMA)

The EMA period was for 28 days following the baseline assessment. Several types of EMA surveys were utilized in this project. This study will focus on two types of surveys

(1) Interval-contingent surveys were completed at a fixed time each evening (ICPM), around the adolescent's bedtime (tailored to each adolescent's schedule to increase adherence). After receiving the survey prompt, adolescents were given two hours (one hour before and one hour after specified bedtime) to complete each survey. During the EMA period, participants completed an average of 16.42 ICPM surveys ($SD = 8.46$, range = 2–28). The median ICPM completion time was 1 minute 16 seconds. In these surveys, adolescents indicated whether a range of interpersonal NLEs occurred that day (see Measures).

(2) Signal-contingent (SC), or random, surveys were completed multiple, 3–6, times each day. After receiving the survey prompt, adolescents were given 30 minutes to complete each survey. The window to complete surveys was based on each adolescent's availability, which provided more time on some days than others (leading to a range of 3–6 available surveys). Adolescents were not prompted to complete surveys during weekday school hours. Although several SC prompts were offered each day, adolescents were only required to complete three SC surveys daily to receive full compensation. During the EMA period, participants completed an average of 62.36 SC surveys ($SD = 31.03$, range = 6–116).² The median completion time for these surveys was 3 minutes 25 seconds. In these surveys, adolescents responded to prompts about momentary belongingness with family and friends and suicidal thoughts (see Measures).

EMA surveys were completed on adolescents' iOS or Android smartphones (i.e., either their personal phone or one loaned to them by the researchers) using a HIPAA-compliant smartphone application specifically designed for mobile EMA research (www.metricwire.com). During the 28-day EMA period, adolescents were compensated with a \$25 Amazon gift card for each week they completed at least 75% of the EMA surveys. The constructs assessed in these surveys are described below and the specific questions included in each survey are provided in Table 2.

Measures

Interpersonal Negative Life Events (Predictor)

At the end of each day (ICPM survey), adolescents indicated whether a range of interpersonal NLEs occurred that day. The list of interpersonal NLEs provided was based on the Life Events Scale for Children (LES-C; Coddington, 1972), and assessed a range of interpersonal experiences, such as arguments/

disagreements, disappointments, rejection, loss, humiliation/embarrassment, and victimization (see Table 2). Events were clustered based on the relationship to the adolescent: family, friends/peers, significant other/romantic partner, or others (e.g., teacher, authority figure, someone else who did not fit into any of these categories). Adolescents were able to indicate (with checkboxes) all events that occurred that day (yes/no). A “none of the above” option was provided for each cluster (coded as 0). Finally, a write in “other stressful life event” option was provided. “Other” events were reviewed by both the first and last author to determine whether these free responses were interpersonal NLEs that should be included in the analyses. A list of coding decisions is provided in Supplement 1. In the current sample, 89.6% of adolescents reported an interpersonal NLE occurred during the EMA period (total NLEs between-person $M = 13.63$; $SD = 15.35$): 79.2% of the full sample reported a family NLE, 64.6% reported a peer NLE, 37.5% reported a romantic partner NLE, and 47.9% reported an interpersonal NLE with someone else. For the current study, the frequency of total interpersonal NLEs was utilized as the primary predictor (see Table 3).

Thwarted belongingness (Mediator). Belongingness with family and friends was assessed multiple times each day in the SC surveys using a subset of belongingness items from the Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012). The INQ is a self-report measure developed to assess thwarted belongingness and perceived burdensomeness related to the interpersonal theory of suicide (Van Orden et al., 2012), and has demonstrated good psychometric properties in adolescents (Hill et al., 2020). Items from the INQ have been adapted to measure belongingness in prior EMA studies with adults (Hallensleben et al., 2019; Kyron et al., 2018) and a daily diary study with adolescents (Czyz et al., 2019). For the current study, a subset of INQ belongingness items was adapted to assess belongingness with family and friends separately. Specifically, four belongingness items (included on the full INQ-25, as well as briefer INQ-15 and INQ-12 versions; Hill et al., 2015) were modified from “other people” to ask about either “family” or “friends” to specifically assess belongingness with these individuals. Items were rates on a scale from 0 = *Not at all true for me* to 3 = *Very true for me* (specific items are provided in Table 2). For the current study, family

²Because the number of total SC prompts varied across adolescents depending on the number of days enrolled in the study and number of daily prompts (based on each adolescent's availability), survey completion is reported as raw numbers instead of percentages.

Table 2. Ecological momentary assessment items utilized to assess interpersonal negative life events (predictor), thwarted belongingness with family and friends (mediators), and suicidal thinking (outcome).

Interpersonal negative life events		
Instructions: Did any of the following happen to you today? <i>Select all that apply.</i>		
1. <i>Events with a family member:</i>		
Argument with a family member		
Criticized by a family member		
Ignored by a family member		
A family member canceled plans		
A family member broke a promise to you		
There were arguments among your family members		
2. <i>Events with a friend or peer:</i>		
Argument with a friend/peer/someone else around your age		
Criticized by a friend/peer/someone else around your age		
Ignored by a friend/peer/someone else around your age		
A friend/peer/someone else around your age canceled plans		
A friend/peer/someone else around your age broke a promise to you		
You were bullied while you were at school		
You were bullied online		
You were bullied somewhere other than school or online		
3. <i>Events with a significant other/romantic partner:</i>		
Argument with a significant other/romantic partner		
Criticized by a significant other/romantic partner		
Ignored by a significant other/romantic partner		
Significant other/romantic partner canceled plans		
Significant other/romantic partner broke a promise to you		
You broke up with your significant other/romantic partner		
Significant other/romantic partner broke up with you		
Significant other/romantic partner cheated or was unfaithful to your relationship		
4. <i>Stressful events with others:</i>		
Argument with a teacher/principal/authority figure		
Argument with someone else		
Other stressful event(s) ¹ (Please describe: _____)		
¹ See Supplement 1 for information about how "other" stressful life events were coded.		
Thwarted Belongingness		
Instructions: The following questions ask you to think about yourself and other people. Please base your responses on how you feel <u>right now</u> .		
Scale: 0 = Not at all true for me, 1 = Somewhat true, 2 = Quite a bit true, 3 = Very much true for me.		
<i>Family belongingness items</i> (items scored so higher values indicate greater thwarted belonging)		
1. My family cares about me (reverse scored)		
2. I feel disconnected from my family		
3. I feel that I can turn to my family in times of need (reverse scored)		
4. I am close to my family (reverse scored)		
<i>Friend belongingness items</i> (items scored so higher values indicate greater thwarted belonging)		
1. My friends care about me (reverse scored)		
2. I feel disconnected from my friends		
3. I feel that I can turn to my friends in times of need (reverse scored)		
4. I am close to my friends (reverse scored)		
Suicidal Thoughts		
Variable	Question	Scale
Suicide desire	"How intense is your desire to kill yourself right now?"	0 = Absent/no desire, 1 = Present, but not at all intense to 5 = Extremely intense

(Continued)

Table 2. (Continued).

Suicide intent	"How strong is your intent to kill yourself right now?"	0 = Absent/no intent, 1 = Present but not at all strong to 5 = Extremely strong
Ability to keep self safe	"How able are you to keep yourself safe right now?"	1 = I definitely CAN keep myself safe to 5 = I definitely CANNOT keep myself safe
Desire for life	"How strong is your desire to live right now?"	1 = Very strong to 5 = Very weak

thwarted belongingness and friend thwarted belongingness were examined as separate latent constructs (see Table 3).

Suicidal thoughts (Outcome). During the multiple SC surveys daily, adolescents reported their momentary suicidal thoughts, using four items adapted from prior EMA studies with adolescents (Nock et al., 2009) and adults (Kleiman et al., 2017). These questions assessed current (at that moment) suicide desire, suicide intent, ability to keep oneself safe, and desire for life (specific items are provided in Table 2). All items were rated on a 0–5 scale with higher scores indicating greater suicidal thoughts. We created a latent variable consisting of these four items (see Table 3). Given the high-risk sample included in the current study, adolescents' responses to these questions were monitored daily to assess their risk and ensure their safety (consistent with guidelines for conducting EMA research with high-risk youth; Bai et al., 2021; Nock et al., 2021). Appropriate steps were taken to

keep adolescents safe during this assessment study (additional details about the risk and safety monitoring protocol are reported in Glenn et al., 2021).

Data Preparation and Analysis

The study included 2,733 total observations over 945 days of data ($M = 2.89$ surveys per person per day; $SD = 1.33$). Correlations between major study variables (within-person and between-person) are provided in Supplement 2.

Missing Data

EMA data were missing at the survey level (i.e., a survey was not completed) rather than at the item level (i.e., all items in a single survey were completed). The current study utilized the prior day's ICPM survey to predict the next day's SC responses. If an ICPM survey was missing, that day's data were not included in the model, because the predictor was missing for that day. If a next-day SC survey was missing (i.e., mediator: belongingness, outcome: suicidal thoughts), other SC surveys from that day were included in the model. If all SCs were missing the next day (following an ICPM), or all but one (since we were using two consecutive SCs for mediation), that day's data were not included in the model. The configuration of our missing data involved a completely missing survey rather than a missing item from an otherwise complete survey. This type of missingness is expected in multi-level modeling (effectively only leading to unevenly spaced data) and is not something that can be imputed.

Analytic Strategy

Overview

We conducted a multi-level structural equation model (SEM) in *lavaan* in R, which examined (1) family thwarted belongingness and (2) friend thwarted belongingness as parallel mediators in the relationship between interpersonal NLEs and suicidal thoughts. We created latent variables for (1) family thwarted belongingness,

Table 3. Descriptive information about major study variables.

Variable	<i>M</i>	<i>SD</i>	<i>ICC</i> (95% <i>CI</i>)
NLE Total	0.80	1.36	0.44 [0.35–0.56]
NLE family	0.47	0.96	0.38 [0.30–0.50]
NLE peer	0.22	0.76	0.52 [0.43–0.63]
NLE romantic partner	0.07	0.32	0.25 [0.17–0.36]
NLE others	0.05	0.23	0.11 [0.07–0.17]
INQ family 1	0.84	0.98	0.70 [0.61–0.78]
INQ family 2	1.33	1.05	0.67 [0.58–0.76]
INQ family 3	1.38	1.09	0.78 [0.71–0.85]
INQ family 4	1.27	1.06	0.76 [0.68–0.83]
INQ friend 1	0.80	0.97	0.72 [0.64–0.80]
INQ friend 2	1.06	1.01	0.68 [0.59–0.77]
INQ friend 3	1.09	1.02	0.68 [0.59–0.77]
INQ friend 4	0.92	0.97	0.69 [0.60–0.77]
Suicide desire	0.65	1.03	0.46 [0.37–0.58]
Suicide intent	0.27	0.62	0.45 [0.36–0.57]
Ability to keep self safe	1.30	0.49	0.45 [0.36–0.57]
Desire for life	2.71	1.25	0.70 [0.62–0.79]

ICC = intraclass correlation (higher *ICC* = more variability between vs. within person), *INQ* = interpersonal needs questionnaire, *M* = mean, *NLE* = interpersonal negative life event, *SD* = standard deviation. Correlations between major study variables are presented in Supplement 2.

(2) friend thwarted belongingness, and (3) suicidal thoughts. All three latent variables consisted of the four observed variables representing each construct. Total number of interpersonal NLEs was measured as a unitary construct and thus was specified in the model as an observed variable. We unfortunately were unable to examine NLEs by category given the co-occurrence of family and peer NLE, and the unequal occurrence of NLEs. Specifically, of the days when a peer NLE was reported, 40% of days co-occurred with a family NLE. And, of the days when a family NLE was reported, 20% of days co-occurred with a peer NLE. Therefore, it is hard to disentangle the unique effects of these NLE categories.

Temporality and hierarchical structure. Given that we were testing a mediational model, it was important to establish temporality (Cole & Maxwell, 2003). Accordingly, we included interpersonal NLEs as a day-level variable. Next-day thwarted belongingness and suicidal thoughts were measured at the momentary level multiple times daily, and therefore belongingness could be measured at the time point prior to suicidal thoughts at the within-day level. In summary, our model included interpersonal NLEs from the prior day (day 1), friend/family thwarted belongingness at the current day (day 2) at time T, and suicidal thoughts at the current day (day 2) at time T + 1 (i.e., examination of full mediation). Multi-level SEM includes, and estimates, all direct and indirect effects in the same model. As is common in SEM mediation approaches, we did not examine direct effects prior to testing the main model. Testing direct effects first is not a requirement if there is theoretical rationale for examining mediation, effect sizes may be small (recognition that proximal associations will be larger than distal ones), or suppression is possible (Shrout & Bolger, 2002).

Centering. We utilized latent variable centering (Asparouhov & Muthén, 2019), which involves estimating two simultaneous structural equation models: (1) a within-person model, which is the model testing our primary hypotheses, as described above and (2) a between-person model that includes the between-person means for the variables at the within-person level. This decomposes the variance and thus allows us to examine the within-person effects in our model (where our hypothesized effects of interest are) separate from any between-person effects. Given our focus on within-person, time-varying processes, we primarily report and discuss the within-person component of the model.

Model fit. To assess model fit, we used several common indicators (Schreiber et al., 2006). First, we used the comparative fit index (CFI), which compares the hypothesized model to a “null” model with the worst possible fit. Larger CFIs indicate a better fitting model (i.e., one that differs more to a null model). CFI should be $> .95$. We also report the Tucker-Lewis Index (TLI), which compares the chi-square of the hypothesized model to the chi-square of the null model. It is highly correlated with and interpreted similarly to the CFI. Next, we used root mean square error of approximation (RMSEA), which compares the hypothesized model to one with “perfect” fit. Smaller RMSEA values indicate a model closer to one with perfect fit. RMSEA should be $< .08$. We do not report the traditional chi-square/degrees of freedom fit metric given that it is problematic in large samples, which is the case for our level 1 sample size (Shi et al., 2019).

Results

Measurement Model

When conducting individual measurement models for the latent variables, model fit was acceptable. The two-factor (family and friends) thwarted belongingness latent variables had excellent fit: $RMSEA = .039$ (90% $CI = .033$ to $.045$), $CFI = .975$, $TLI = .959$. The suicidal thoughts latent variable had relatively poorer, but still acceptable fit: $RMSEA = .134$ (90% $CI = .111$ to $.158$), $CFI = .968$, $TLI = .806$. For parsimony, we report the factor loadings in the main SEM in Figure 1 (thinner gray paths) instead of in a separate measurement model-only figure. The loadings were nearly identical in measurement-only models as in the full structural model: across all three latent variables, the observed variables significantly loaded onto their respective factors (all $ps < .001$).

Structural Model

The structural model had acceptable fit ($RMSEA = .091$ [90% $CI = .087$ to $.095$]), $CFI = .856$, $TLI = .815$). The thicker, black paths in Figure 1 represent the structural model. There were significant direct effects (solid black lines) in the within-person model between interpersonal NLEs and family thwarted belongingness, between family thwarted belongingness and suicidal thoughts, and between friend thwarted belongingness and suicidal thoughts.

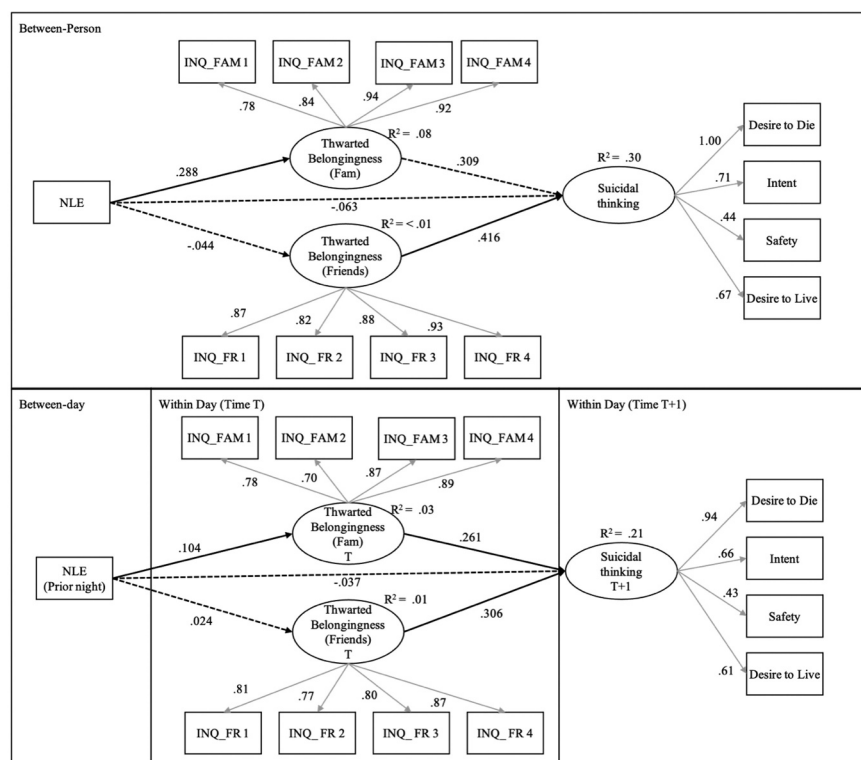


Figure 1. Results of the multi-level structural equation model testing family thwarted belongingness and friend thwarted belongingness as mediators of the association between interpersonal negative life events (NLEs) and next-day suicidal thinking. INQ = interpersonal needs questionnaire; NLE = frequency of interpersonal negative life events; T = time 1 (EMA survey), T + 1 = time 2 (subsequent EMA survey). Standardized estimates shown. Grey lines = measurement model, Black lines = structural models. Solid lines = significant at $p < .05$, dashed lines = not significant. The covariances between the family and friend latent variables are not shown for clarity purposes but reported here. Between-person level: $\beta = .07$, $p = .303$, within-person level: $\beta = .17$, $p < .001$.

Indirect Effects (Mediation)

The indirect effect, within-person effect, through family thwarted belongingness was significant ($\beta = 0.048$, $se = 0.006$, $p < .001$). The indirect effect through friend thwarted belongingness was not significant ($\beta = 0.005$, $se = 0.006$, $p = .392$).³

Discussion

The current study increases understanding of how interpersonal negative life events (NLEs) relate to suicidal thoughts in adolescents over the short term. There are three major findings from this research. First, interpersonal NLEs were significantly related to next-day suicidal thoughts in high-risk adolescents during the 28 days following discharge from acute psychiatric care. Second, thwarted belongingness with family mediated the link between interpersonal NLEs and next-day suicidal thoughts. Third, thwarted belongingness with friends

did not mediate the association between interpersonal NLEs and next-day suicidal thoughts in youth, although friend thwarted belongingness did relate to next-day suicidal thoughts. Each finding will be discussed in turn.

First, this research provides greater temporal resolution of the association between interpersonal NLEs and suicidal thoughts in youth. Consistent with prior research in adults (Bagge et al., 2013; Franz et al., 2021; Husky et al., 2017; Yen et al., 2005) and adolescents (Cheek, Goldston et al., 2020), interpersonal NLEs predicted greater suicidal thoughts over the short term. Although prior studies in adults have examined this association over the course of hours (up to one day; Bagge et al., 2013; Franz et al., 2021; Husky et al., 2017), this is the first EMA study in youth to indicate that interpersonal NLEs predict increased suicidal thoughts the next day. Notably, this association was significant when NLEs were used to predict *next-day* suicidal thoughts (in order

³When testing alternative models with only one mediator at a time, the interpretation was the same: family thwarted belongingness was a significant mediator, but friend thwarted belongingness was not.

to establish temporal precedence; Kraemer et al., 1997), suggesting the robustness of these effects for youth.

Second, thwarted belongingness with family mediated the association between interpersonal NLEs and suicidal thoughts. Specifically, interpersonal NLEs predicted greater next-day thwarted belongingness with family, family thwarted belongingness predicted greater suicidal thoughts later in the day, and family thwarted belongingness mediated the association between interpersonal NLEs and suicidal thoughts. Given the intensive longitudinal design and ability to examine full temporal mediation, these findings significantly extend prior cross-sectional research on the mediating role of belongingness (Brailovskaia et al., 2020). Further, these results align with previous longitudinal research, including a prior EMA study with adults indicating the unique role of family stressors on suicidal thoughts (Husky et al., 2017), and research in adolescents indicating that parental stressors, such as parental rejection, are significantly associated with STBs (Cheek, Reiter-Lavery et al., 2020). The importance of belongingness with family is also evidenced by research indicating that family connectedness is a protective factor for youth (Cuesta et al., 2021; Steiner et al., 2019; Xiao & Lindsey, 2021). Notably, family connectedness may buffer STB risk for high-risk clinical (i.e., previously hospitalized) youth (Czyz et al., 2012), as well as youth minoritized based on their race and ethnicity (e.g., O'Donnell et al., 2004), or sexual orientation and gender identity (e.g., Ryan et al., 2010). In fact, family connectedness has been most consistently and robustly linked to reduced risk for STBs (Whitlock et al., 2014).

Third, unlike family, thwarted belongingness with friends did not mediate the association between interpersonal NLEs and suicidal thoughts. Thwarted belongingness with friends was related to greater suicidal thoughts later in the day. However, interpersonal NLEs did not directly relate to thwarted belongingness with friends the next day, nor did thwarted belongingness with friends mediate the association between interpersonal NLEs and suicidal thoughts. This finding is somewhat surprising given the important role that peers play for adolescents (Crone & Dahl, 2012; Somerville, 2013), and consistent research indicating that peer relationship difficulties are linked with STBs (Cheek, Reiter-Lavery et al., 2020). There are several interpretations of these results. One interpretation is that friend belongingness does not play a mediating role like family belongingness. Prior research on the link between peer connections and STBs suggests that these associations are complicated: although peers can provide social support and

protection against STBs, peers can also increase STB risk if they also engage in suicidal behavior (social contagion) or hold STB-promoting attitudes (Whitlock et al., 2014). It is important to note that this sample was enrolled in the study within two weeks after discharge from acute psychiatric care. During this post-discharge period, family may play a more important role for adolescents than their friends (e.g., Kerr et al., 2006), or adolescents may simply have more interaction with family than friends during this time (e.g., the sample reported more family NLEs than friend/peer NLEs). An alternative interpretation is that the study was not designed to measure the temporal course of how interpersonal NLEs impact belongingness with friends. For instance, if the impact on friend belongingness was shorter (i.e., within day, rather than between day measured in this study) or longer (more than one day), it would not be captured in the current study. Replication is needed to examine if, and for whom, friend belongingness may play a role in the link between interpersonal NLEs and suicidal thoughts in youth.

Clinical Implications

These findings have several implications for clinical practice. First, they suggest that interpersonal NLEs are proximal risk factors for suicidal thoughts, leading to greater suicidal thoughts over a relatively short time period (i.e., the following day). These findings provide additional empirical support for the assessment of interpersonal NLEs for youth in risk assessment protocols (Linehan et al., 2012; Pisani et al., 2016). Second, this study indicates one way in which interpersonal NLEs may confer risk for STBs in youth. Not all stressors, and not even all interpersonal stressors, will increase STB risk for youth. Findings suggest that an interpersonal NLE may increase risk for adolescents to the degree that it makes them feel like they do not belong, specifically with family. Clinically, this provides additional guidance about how interpersonal stressors might impact adolescents and suggests additional details to assess their impact. Third, and finally, these findings have implications for downstream suicide prevention approaches, by indicating which factors may be proximally related, and treatment targetable, to reduce suicide risk. To reduce the likelihood of some interpersonal NLEs (e.g., arguments with parents), youth may benefit from enhancing interpersonal effectiveness skills including communication and problem-solving (e.g., Rathus & Miller, 2014). Notably, a review of evidence-based treatments for STBs among youth (Glenn et al., 2019) suggests that effective interventions include a central family component, such as family skills training (e.g., family communication). In

addition, findings suggest that modifying belongingness, for those who have experienced an interpersonal NLE, may reduce suicide risk. Greater connectedness to others (family, peers, school, community) relates to reduced risk for STBs (Whitlock et al., 2014), even during the high-risk post-hospitalization period (e.g., Czyz et al., 2012). Interventions and preventions that aim to increase social connection have shown some effectiveness for reducing suicide ideation in adults (Comtois et al., 2019; Wyman et al., 2020). Clinicians also may consider addressing the cognitive vulnerabilities and self-blaming attributions that can follow interpersonal stressors leading youth to feel like they do not belong (e.g., Graham & Juvonen, 1998; Schacter et al., 2015). Future research is needed to identify if, and how, belongingness can be modified in adolescents to reduce suicidal thoughts and risk for suicidal behaviors.

Limitations and Future Directions

Limitations of this study provide directions for future research. First, this study focused on interpersonal NLEs, given their relevance for youth, and specific mediators of interest. However, we were unable to examine interpersonal NLEs by category (e.g., family, peer), and how the impact of interpersonal NLEs compares to non-interpersonal NLEs over this high-risk period, which are important directions for future research. Second, this study focused on thwarted belongingness as one specific mechanism linking interpersonal NLEs to suicidal thoughts, but there are likely other potential mediators that may play a role (e.g., Franz et al., 2021). Third, this study examined one temporal association given the structure of the data. That is, NLEs were measured at the day level; therefore, to assume temporal precedence, they could only be used to predict next-day factors. However, the negative impact of these events is likely experienced within the same day (e.g., Chaudhury et al., 2017). Future research would benefit from utilizing alternative study designs that examine the immediate impact of these events, such as burst designs that can assess factors repeatedly in the hours following an event (Sliwinski, 2008). Finally, although the study was well-powered for within-person analyses, and our multi-level SEM model incorporated person-level means, we did not have the power for between-person analyses to examine specific individual differences in overall effects. Thus, we were underpowered to examine how effects may be moderated by demographic differences in the sample (such as gender identity, and race/ethnicity). An important direction for future research

will be to examine this mechanism among minoritized youth given the high risk of STBs (Lindsey et al., 2019; The Trevor Project, 2021) and interpersonal NLEs (e.g., discrimination) uniquely experienced by these populations (Benner et al., 2018; The Trevor Project, 2021).

Summary

This study found some support for belongingness as a potential mechanism linking interpersonal NLEs to suicidal thoughts among youth. Findings indicate that thwarted belongingness with family, but not friends, mediated the association between interpersonal NLEs and next-day suicidal thoughts among high-risk adolescents following discharge from acute psychiatric care. Belongingness may be a promising target for youth who experience interpersonal stressors to reduce their risk for suicide.

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