Interpersonal Problems and Suicidal Ideation in Daily Life: Examining the Moderating Role of Social Problem-Solving

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Abstract

Borderline personality disorder (BPD) is associated with significant impairment in interpersonal functioning and risk of suicidal ideation (SI). One mechanism underlying interpersonal problems in BPD is deficits in social problem-solving. Using ecological momentary assessment, this study investigated how acute interpersonal problems (conflict, social isolation, lack of support, and rejection) were associated with daily SI in adolescents presenting with BPD features. Perceived rejection ($\beta = 0.05, SE = 0.02, p = .03$), support ($\beta = 0.09, SE = 0.02, p < .001$), and conflict ($\beta = 6.07, SE = 1.30, p < .001$) were associated with SI concurrently. Those with weaker social problem-solving abilities were more likely to experience SI in response to perceived rejection ($\beta = -0.3, SE = 0.01, p = .04$). This study contributes to the growing literature on advancing near-term prediction of SI, and highlights a potentially modifiable skill that is important for understanding suicide risk.

Keywords

Borderline personality disorder, suicidal ideation, interpersonal problems, social problem-solving, adolescent psychopathology, ecological momentary assessment.
Summary for Lay Audience

Borderline personality disorder (BPD) is a mental condition that is marked by interpersonal difficulties and elevated risk of having suicidal thoughts. Adolescents and adults with features of BPD often report experiencing high rates of social isolation, conflict, and lack of social support, and are highly sensitive to feeling rejected by others. These same interpersonal experiences also put individuals at greater risk of suicide, more generally. Having a weaker capacity to solve social problems may be one reason why people with BPD features face difficulties maintaining healthy relationships. Social problem-solving encompasses skills that help individuals solve and cope with interpersonal problems and stressors that occur in everyday life. Prior research suggests having poor social problem-solving abilities is linked with both BPD and suicide risk.

The current study examined whether interpersonal problems (i.e., conflict, lack of support, social isolation, and rejection) were associated with suicidal thoughts in everyday life among adolescents presenting with BPD features. Results suggest that adolescents who argued with another person and felt rejected by others were simultaneously more likely to think about suicide. I also investigated how social problem-solving related to these experiences, and found that those who had weaker social problem-solving abilities were more likely to think about suicide after feeling rejected. Finally, this study shows that daily experiences of interpersonal problems and suicidal thoughts can fluctuate dramatically over even several hours. This is important given that most prior research does not capture changes in these experiences over such short periods of time. Overall, this study demonstrates that interpersonal problems are linked with elevated suicide risk in everyday life, and the ability to solve social problems is a skillset that should be targeted to prevent escalations in suicidal thoughts—particularly among those vulnerable to rejection.
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**Introduction**

Borderline personality disorder (BPD) is a debilitating mental condition characterized by emotion dysregulation, identity disturbance, impulsivity, and interpersonal volatility (American Psychiatric Association [APA], 2013). BPD is associated with significant impairment and distress for the affected individual and their social interaction partners (Fruzzetti et al., 2005). Persons with this disorder also utilize medical and mental health services at an elevated rate, which places a heavy burden on the healthcare system (Bode et al., 2017; Meuldijk et al., 2017). Unfortunately, evidence-supported treatments for BPD, including Dialectical Behavior Therapy (DBT) are incredibly costly and often inaccessible (Soeteman et al., 2008; van Asselt et al., 2007). These challenges underscore the need for improved prevention and early intervention initiatives for vulnerable persons. BPD features typically onset during adolescence, leading many to seek treatment by age 18 (Bradley et al., 2005; Zanarini et al., 2006). A growing literature also demonstrates that developmental antecedents of BPD are evident among youth, and are shaped throughout childhood and adolescence prior to disorder onset (Cramer, 2016; Crowell et al., 2009). These findings suggest adolescence is a key developmental period in which to study BPD features, such that we may interrupt risk trajectories prior to adulthood.

Historically, researchers studying BPD have often utilized clinical samples that met full diagnostic criteria (Sheets & Craighead, 2007). However, the field is increasingly favouring dimensional models for conceptualizing personality pathology (Hopwood et al., 2018; Widiger & Trull, 2007). Dimensional models stress the importance of assessing symptoms across a continuum of severity, rather than adhering to rigid categories with artificially defined diagnostic thresholds (Helzer et al., 2008; Widiger & Trull, 2007). This movement in the field is particularly applicable to studying BPD as even subthreshold levels of associated symptoms are
functionally impairing (e.g., Gratz et al., 2017; Scott et al., 2015). Given that BPD symptoms during adolescence are clinically meaningful, and mark increased risk for developing the diagnosis, further attention is needed among vulnerable youth.

**BPD and Suicide**

BPD is characterized by a range of maladaptive behaviours, including impulsivity and risk-taking (e.g., spending sprees, unsafe sex, reckless driving), self-injury, and suicide (Kaess et al., 2014; Linehan, 1993; Penner et al., 2019). Suicide is arguably the most devastating health outcome associated with BPD. An alarmingly high proportion of individuals with BPD attempt or die by suicide at some point in their lives (i.e., 75-80% and 10%, respectively; Black et al., 2004; Soloff et al., 2002). Although adolescents are less likely than adults to be diagnosed with BPD, a large proportion of adolescents with a history of suicide attempt also meet criteria for the disorder (Aouidad et al., 2020; Yen et al., 2013). Regardless of whether individuals with BPD go on to attempt suicide, nearly all affected persons experience recurrent or chronic suicidal thoughts (Black et al., 2004; Soloff et al., 2002).

Suicidal ideation (SI) refers to thoughts or desires to end one’s own life—ranging from passive (e.g., “I don’t want to be alive anymore”) to active cognitions (e.g., “I am going to kill myself, and I have a plan in mind;” Nock et al., 2006). SI is relatively common in the general population, with an estimated 9-14% of people reporting these thoughts at some point in their lives (Nock et al., 2009). Some research suggests rates are even higher among adolescents (18.8%; Centers for Disease Control and Prevention [CDC], 2017; Nock et al., 2009; 2013). Risk of SI both surges and peaks during this developmental period, and suicide is the *second leading cause of death* among individuals ages 13-18 years (Nock et al., 2013; WHO, 2017). Although many who contemplate suicide do not engage in self-injurious behaviours, suicidal thoughts
mark increased risk and are inherently distressing in their own right (CDC, 2017; Reinherz et al., 2006). Adolescents with BPD experience SI more frequently and earlier in life than those without BPD (Greenfield et al., 2015). When coupled with evidence that risk of suicide attempts is elevated among this population, it is clear that research on SI among members of this group warrants special consideration (Jacobson et al., 2008; Muehlenkamp et al., 2011; Venta et al., 2012).

It is important to note that the majority of research on BPD has explored suicide attempts and nonsuicidal self-injury (i.e., NSSI; defined as deliberate damage of one’s bodily tissue in the absence of an intent to die; Nock, 2009). Although SI, suicide attempt, and NSSI are distinct behaviours with unique functions, they often co-occur and are interrelated (Stanley et al., 1992). For example, although NSSI occurs in the absence of suicidal intent, these behaviours are a strong predictor of future suicide attempts (Asarnow et al., 2011; Wilkinson et al., 2011). It is worth noting that the presence of a suicide attempt inherently reflects accompanying or precipitating SI. Thus, evidence linking BPD to suicide attempt denotes robust associations with SI, even when this outcome is not explicitly examined. In almost all cases, SI is theorized to interact with broad vulnerabilities and stressful life events to escalate risk of a suicide attempt (e.g., Rubinstein, 1986).

**Interpersonal Problems and BPD**

Disrupted interpersonal functioning is a hallmark feature of BPD and one of the most robust risk factors for suicidal thoughts and behaviours (King & Merchant, 2010; Lazarus et al., 2014; Linehan, 1993). A wide range of social problems are associated with BPD features, including loneliness, relationship instability, aggression, extreme sensitivity to rejection, and low social

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1In this study, I intentionally exclude research on NSSI given its theoretical and empirical distinction from suicidal thoughts and behaviours.
support (Gunderson, 2007; Liebke et al., 2017; Modestin, 1987; Stepp et al., 2011). Impaired interpersonal functioning is so central to the disorder that multiple diagnostic criteria reflect problems in this domain (e.g., unstable relationships, fear of abandonment; APA, 2013). Furthermore, theoretical models of BPD development and maintenance implicate interpersonal problems in BPD etiology, and as a harmful consequence of the disorder (Crowell et al., 2009; Linehan, 1993; Wagner & Linehan, 1997). Persons with BPD frequently report high levels of loneliness and social isolation, despite having a strong desire for social connection (Gunderson, 1996; Liebke et al., 2017; Stiglmayr et al., 2005). Prior research suggests BPD is associated with individuals having smaller and less diverse social networks, fewer social interactions in everyday life, and greater difficulty identifying sources of social support (Beeney et al., 2018; Clifton et al., 2007; Leibke et al., 2017; Stepp et al., 2009). Social isolation appears to be uniquely related to BPD, as persons with this disorder report greater isolation than both healthy controls and individuals with other forms of personality pathology longitudinally (i.e., across 20 years; Pucker et al., 2019).

One possible reason that persons with BPD experience intense feelings of loneliness and isolation is a heightened sensitivity to perceived and actual rejection (Downey & Feldman, 1996). Researchers propose that sensitivity to rejection may perpetuate interpersonal problems in BPD by increasing hypervigilance during social interactions (Downey et al., 2004). Once developed, hypervigilance may prompt emotional reactions that negatively impact social exchanges and relationships (i.e., including behaviours to avoid further rejection), thereby contributing to and maintaining feelings of loneliness and isolation (Downey et al., 1998; 2004; Zielinski & Veilleux, 2014). Indeed, evidence indicates that individuals’ perceptions of loneliness worsen following social rejection, and sensitivity to rejection partially explains relations between
BPD symptoms and low social support (Staebler et al., 2011; Zielinski & Veilleux 2014).

Individuals with elevated BPD symptoms who display high sensitivity to rejection are also more likely than healthy controls to respond to perceived rejection with hostility and aggression (Romero-Canyas et al., 2010). Taken together, extant findings highlight that lacking connectedness to, and being rejected by, others each underlie interpersonal dysfunction in BPD.

Unsurprisingly, individuals with BPD often develop relationships marked by frequent conflicts and arguments, intense criticism, and recurrent break-ups and reunions (Beeney et al., 2018; Clifton et al., 2007; Haliczer et al., 2020; Lazarus et al., 2014; Lazarus & Cheavens, 2017). Interpersonal conflict is broadly defined and encompasses: arguments, disagreements about opposing goals, anger and hostility towards others, and physical fights (Lazarus et al., 2019; Russell et al., 2007; Stepp et al., 2009). Individuals with BPD also exhibit stronger emotional arousal and negative affect (e.g., sadness, hostility, anger) in response to interpersonal conflict relative to healthy controls (Berenson et al., 2011; Hepp et al., 2017; 2018; Walter et al., 2008). Thus, available findings suggest interpersonal problems—such as conflict, loneliness, isolation, and rejection—are both common among, and particularly distressing to, individuals with BPD. Such experiences likely have profound social consequences for individuals presenting with symptoms of this disorder. A better understanding of how individuals with BPD features experience and manage these interpersonal problems may help prevent escalations in distress that exacerbate relationship turmoil and, ultimately, contribute to SI.

The Role of Relationship Context

Although some prior research has examined interpersonal problems with specific social partners, we know relatively little about the comparative effects of relationship context (e.g., romantic, peer, familial) on interpersonal problems in samples with BPD features. Prominent
theorists stress the importance of early familial relationships in shaping BPD development (Crowell et al., 2009; Fonagy & Luyten, 2009; Linehan, 1993). Consequently, much of the literature explores interpersonal problems within the family environment (Johnson et al., 1999; Kalpakci et al., 2014; Stepp et al., 2014; Zweig & Paris, 1991). For example, prior work demonstrates that retrospective perceptions of parental rejection in childhood are associated with BPD symptoms in adolescents and adults (Armour et al., 2022; Rohner & Brothers, 1999). Interestingly, some research has differentiated between maternal and paternal rejection; yet, evidence is mixed regarding whether one is more strongly implicated in BPD risk (Fatimah et al., 2020; Rohner & Brothers, 1999).

Familial conflict is predominantly studied within the context of mother-daughter relationships (e.g., Stepp et al., 2014). Some prospective studies suggest maternal-child discord prospectively predicts later BPD symptoms (Stepp et al., 2013). A few notable studies also observed mother-child dyads in experimental settings, where conversations were probed to elicit conflict (Walter et al., 2008; Whalen et al., 2014). During these conflict discussion tasks, escalations in negative behaviours between mothers and their daughters (i.e., conflict, negative affect and aversive behaviours) were associated with greater BPD severity (Whalen et al., 2014). These findings suggest conflictual mother-child interactions play an important role in shaping BPD pathology among adolescents.

Numerous studies also demonstrate high rates of conflict within romantic relationships among adolescents with BPD symptoms, as well as increases in the frequency of these romantic conflicts over the course of adolescence (Bouchard et al., 2009; Hill et al., 2011; Lazarus et al., 2019). Conflict may contribute to elevated rates of separation and shorter romantic relationship duration observed among those vulnerable to BPD (Navarro-Gómez et al. 2017). Individuals
with BPD features are also more likely to respond with hostility and aggression when they perceive rejection from a romantic, relative to a non-romantic, partner (Lazarus et al., 2018). Thus, it appears that experiences of interpersonal conflict and social rejection within parent-child and romantic relationships are particularly salient for persons vulnerable to BPD.

Within peer relationships, loneliness appears to be especially troubling to those with this disorder. For example, some prior research suggests social exclusion and emotional maltreatment from peers is associated with BPD features in youth, cross-sectionally (Crick et al., 2005; Ostrov & Houston, 2008) and prospectively (Wolke et al., 2012). However, with the exception of bullying research, few studies have examined interpersonal conflict and social rejection within peer relationships. Nevertheless, BPD is proposed to lead to interpersonal problems across social contexts (APA, 2013). A more fine-grained examination of relationship context/type may inform our understanding of when and with whom interpersonal problems are especially problematic. This is particularly important for adolescents with BPD features, given significant developmental shifts in social roles, growing independence, and increased prioritization of peer relationships during this developmental period (Robins et al., 2001; Rubin et al., 2010).

### Interpersonal Problems and Suicidal Ideation

Interpersonal problems play an undoubtably fundamental role in BPD development and maintenance. Such difficulties are also central to most theories of suicide (e.g., most notably, Interpersonal Theory of Suicide; Joiner, 2005; see also Klonsky et al., 2018; O’Connor, 2011; Shneidman, 1993). In fact, interpersonal stressors are some of the most well-studied and empirically robust risk factors for SI and suicide attempt (see Brodsky et al., 2006; Gould et al., 2003; King & Merchant, 2008 for a review). Although a broad range of interpersonal problems have been studied, two general types are consistently found to elevate risk: 1) perceived lack of
support, connectedness to others, or sense of belonging, and 2) acute social stressors (i.e., interpersonal conflict, social rejection, or victimization).

**Social Isolation and Perceived Social Support**

Researchers often describe SI as a reaction to intense distress or psychological pain that occurs in the context of social disconnection or separation (Joiner, 2005; Shneidman, 1993). Both cross-sectional and longitudinal research indicates that lower perceived social support from parents and peers is linked with higher SI and greater risk of suicide attempt among adolescents (Sharaf et al., 2009; Czyz et al., 2012; Fotti et al., 2006; King et al., 2008; McNeely & Falci, 2004; Pettit et al., 2011). Perhaps one of the most well-established interpersonal factors preceding and maintaining SI is thwarted belongingness—defined as feelings of disconnection that arise from a person’s unmet need to belong (Joiner, 2005). A key facet of thwarted belongingness is loneliness and a sense of social isolation (Van Orden, 2010). Prior research shows that perceived loneliness and social isolation are strong prospective predictors of SI, even when controlling for general psychopathology and depressive symptoms (Stickley et al., 2016). In fact, network models of depressive symptoms demonstrate that loneliness explains most of the variance in SI, suggesting there is something unique about this painful interpersonal experience for suicide risk (Gijzen et al., 2021). Further research is needed to understand how and when everyday experiences of disconnection and low social support lead people to consider suicide.

**Social Rejection and Interpersonal Conflict**

Acute social stressors associated with intense negative affect (such as rejection, or conflict), are also linked to suicide and thought to be particularly influential for escalating risk in moments of heightened distress (Nock et al., 2008; Wenzel & Beck, 2008). Experiencing frequent rejection and having a heightened sensitivity to perceived rejection are each associated with
elevated SI (Cheek et al., 2020; Mereish et al., 2019). Those with a sensitivity to rejection are especially prone to experiencing SI in response to victimization, suggesting this general risk factor may be activated in moments of distress (Mereish et al., 2019; Williams et al., 2017). Although short-term studies are relatively uncommon, some daily diary research shows that within-person changes in perceived rejection over several days is associated with later suicidal urges via increases in negative affect (Victor et al., 2019). Thus, it appears that persons who are vulnerable to SI may be especially sensitive to perceived rejection overall, and that fluctuating experiences of rejection in daily life elevate acute risk for suicidality. Interpersonal conflict is also directly linked with SI and has been identified as an acute, precipitating factor leading to suicide attempts in retrospective studies (McFeeters et al., 2015; Weyrauch et al., 2001).

In prospective studies, interpersonal conflict is also a predictor of SI among adolescents, and elevated SI into early adulthood (i.e., Jonson et al., 2002; Pettit et al., 2011). These findings suggest interpersonal conflict is an important stressor that plays a role in explaining and predicting escalations in SI, and perhaps in the transition from SI to suicidal behaviour (Klonsky et al., 2018). Unsurprisingly, interpersonal conflict is a precipitant of suicidal thoughts and behaviours among individuals with BPD, specifically (Brodsky et al., 2006; Kaurin et al., 2020).

**Social Problem Solving, BPD, and Suicide**

Researchers hypothesize that some portion of the interpersonal problems observed in BPD may be attributable to poor social problem-solving abilities (Platt et al., 1974). *Social problem solving* is defined as a set of cognitive, affective, and behavioural skills and strategies that facilitate adaptive coping with interpersonal problems as they arise in everyday life (Davila et al., 1996; D’Zurilla and Nezu, 1999). The approach individuals take to solving socially-oriented problems is both relevant to the study of interpersonal difficulties generally, and may be
particularly important for individuals with BPD—who are prone to interpersonal instability. A person’s social problem-solving ability is determined by multiple factors, including: (1) the number of strategies the person can generate to solve a given problem, (2) the effectiveness and adaptiveness of those strategies, (3) the persons’ confidence in their ability to carry out those strategies, (4) and the individuals’ approach to viewing those problems (e.g., positive: a challenge to be solved, vs. negative: a barrier in the way; D’Zurilla & Goldfried, 1971).

Individuals with BPD are theorized to have insufficient skills to solve interpersonal problems, and/or may struggle to apply their skills during moments of heightened emotional arousal (Linehan, 1993). Yet, only a handful of studies have empirically explored the importance of social problem-solving ability in this clinical population. Some evidence suggests adults with BPD display deficits in social problem-solving abilities generally (Bray et al., 2007; Kremers et al., 2006). For example, these individuals appear to generate fewer adaptive and more impulsive solutions to social problems, and experience stronger negative affect in the face of social problems compared to healthy controls (Bray et al., 2007; Dixon-Gordon et al., 2011). Prior research using laboratory-based measures also suggests that persons with BPD show marked difficulty with social problem-solving following social rejection. This suggests deficits in social-problem solving are especially influenced by the immediate context and may be particularly important to target among those who regularly experience social stressors (Dixon-Gordon et al., 2011). Although social problem-solving is underexamined in BPD research, general problem-solving ability is targeted in DBT—a gold standard treatment for BPD and suicidality (Linehan, 1993). Thus, it appears that social problem-solving abilities are clinically meaningful for this population and possibly modifiable through treatment (Linehan, 1993).
Deficits in social problem-solving are also observed among individuals with a history of suicide attempt (Speckens & Hawton, 2005 for a review; Arie et al., 2008; Marx et al., 1992; Pollock & Williams, 1998). In particular, these individuals show impairments in both the number of solutions generated and their effectiveness (Speckens & Hawton, 2005). Studies demonstrate that social problem-solving interacts with indices of life stress to predict SI, such that individuals with lower social problem-solving abilities are more likely to experience SI in response to stressful events (Esposito et al., 2002; Nezu et al., 2017; Schotte & Clum, 1987; except see Chang, 2002). Examining social problem-solving abilities might help explain who is particularly vulnerable to SI following interpersonal stressors. Such investigations would align with existing models of suicide, as they propose pathways to suicide involve acute life events that activate painful cognitive-affective states that proximally confer risk for SI (Klonsky & May, 2015; Van Orden et al., 2010).

**Methodological Limitations: Interpersonal Problems and Suicidal Ideation**

Although an extensive literature examines interpersonal problems and SI, a number of important questions remain unanswered, and many limitations of prior studies have gone unaddressed. First, assessment quality varies substantially depending on the specific interpersonal construct examined. For example, interpersonal conflict is often assessed via a single self-report measure of “general life stress” (e.g., Life Experiences Survey; Sarason et al., 1978). This instrument covers several negative events and limits our understanding of how conflict may uniquely contribute to SI. Relatedly, studies typically assess interpersonal problems at a single time point, yet treat these data as reflecting a stable pattern of social behaviour (i.e., as a tendency to: get into conflicts, be lonely, or experience rejection across many relationships), rather than focusing on specific experiences (Liu & Miller, 2014). This approach is problematic
given that acute interpersonal problems are common among adolescents with SI, and all do not carry equal weight in predicting negative outcomes (i.e., some interpersonal events are more salient than others; Vitiello et al., 2009). As a related point, little is known about whether social conflict in specific relationships precipitate elevations in SI risk. These gaps in the current literature illustrate a need to investigate acute experiences of interpersonal stressors across relationship types and situations to determine their potential influence on adolescent SI.

Several limitations also impede suicidal risk detection efforts broadly. Despite several decades of research focusing on suicide risk factors and correlates, researchers have been generally unsuccessful at predicting suicide attempts and completions (Franklin et al., 2017). This is partially attributable to methodological constraints that precluded direct observation of suicidal thoughts and behaviours as they occur in everyday life. Available data also indicate SI frequency and severity can vary considerably over brief periods of time (e.g., in a single day or a few hours), which further complicates predictive efforts (Hallensleben et al., 2018; Kleiman et al., 2017). Another important limitation of extant suicide research is overemphasis on distal, rather than proximal, risk factors (Franklin et al., 2017). Improving SI detection must go beyond identifying who is generally at risk for suicidal thoughts, toward assessing the timing and specific contexts under which suicidal thoughts arise for a given individual (Cha et al., 2018). This is especially important given that the same interpersonal problems may simultaneously confer distal and proximal risk for suicidality (e.g., chronic perceptions of loneliness may predispose someone to SI, whereas moments of increased separation and isolation may further escalate urges and behaviours).
Ecological Momentary Assessment

Daily diary studies offer some insight into persons’ daily experiences and are fairly well-equipped to capture transient psychological processes (Larson & Csikszentmihalyi, 1983). Ecological momentary assessment (EMA) is a type of daily diary methodology that uses repeated sampling over short intervals to collect data in real-time, thereby maximizing ecological validity. This approach is more conducive to measuring short-term fluctuations and within-person variability in interpersonal problems and SI compared with other available methods (Kleiman et al., 2017). For example, recent EMA research demonstrated that suicidal ideation—previously conceptualized as a stable vulnerability factor—fluctuates rapidly over short periods of time (i.e., over several hours; Kleiman et al., 2017; Hallensleben et al., 2018). Traditional methods of assessing suicide risk fail to account for this variability and may consequently miss opportunities to observe these experiences when they are most salient or risky. Multiple recent studies have used EMA to advance our understanding of which factors predict near-term risk (see Kivelä et al., 2022 for a review). Similarly, EMA has proven to be a useful for studying BPD, particularly with regards to detecting mood instability, substance use, and self-injury (Ammerman et al., 2017; Scala et al., 2018; Trull et al., 2008; Vansteelandt et al., 2017).

Current Study

The overarching goal of the current study is to investigate how experiences of acute interpersonal problems (i.e., conflict, social isolation, lack of support, and rejection) are associated with SI over time in a sample of adolescents presenting with clinically impairing BPD features. Given (1) the well-established links between SI and interpersonal problems among individuals with BPD and (2) the need to better capture transient experiences of SI and interpersonal problems, this study examined whether acute experiences of social isolation,
rejection, support, and conflict predict near-term SI frequency and severity in daily life using an EMA design. I also aimed to replicate and extend prior work examining to what degree SI and interpersonal problems are variable over the course of several hours.

Given prior research on problems in familial and romantic relationships, an exploratory aim was to examine patterns of conflict and interpersonal problems in specific types of relationships (i.e., family, friends, romantic partner, classmates etc.). I initially intended to examine whether interpersonal problems in specific relationships are more or less predictive of SI. However, given sample size-related restrictions, I elected to use descriptive statistics to illustrate patterns of risk among those with conflict in specific relationships (rather than testing these relations statistically).

Another key aim of this study was to examine potential moderating effects of social problem-solving ability on the relation between daily interpersonal problems and SI. As previously described, both the BPD and suicide literatures propose social problem-solving deficits are most apparent when individuals experience heightened stress. Experiences of interpersonal problems may be frequent, negative, and intense among adolescents with BPD symptoms. Those with poorer social problem-solving ability may be less equipped to manage interpersonal problems and, consequently, may be more prone to experiencing suicidal thoughts. Findings from this study may further our understanding of how interpersonal problems and SI are experienced in daily life among a high-risk sample of adolescents, and identify a social-cognitive deficit that could be targeted through intervention.

Hypotheses

In line with prior research, I hypothesized that there would be a relatively high degree of variability in SI scores and interpersonal problems across daily assessments. Essentially, I
expected to see a relatively high proportion of variability attributable to within-person effects. Second, I hypothesized that reported daily experiences of interpersonal problems (isolation, rejection, lack of support, and conflict) would predict subsequent SI. Third, I hypothesized that this effect would hold when controlling for base levels of SI, thereby examining whether interpersonal problems predicted changes in SI. Finally, I expected that social problem-solving would moderate these prospective associations, such that the relation between interpersonal problems and SI would be strongest among adolescents with low social problem-solving abilities. I did not have specific hypotheses about descriptive patterns for conflict and interpersonal problems within specific relationship types, yet expected to see higher rates of conflict in familial and romantic relationships, given the extant literature on these topics.

**Method**

**Participants**

A community sample of 14 adolescents aged 13-19 years (50% female, $M$ age = 17.33, $SD$ = 1.15) were recruited from the London, ON area. Adolescents learned about the study through online and local advertisements. All participants endorsed at least three clinically impairing symptoms of BPD at the time of study enrollment—which was assessed during an initial screening interview and confirmed at a subsequent virtual lab visit via semi-structured interview. Participants were deemed eligible if they (1) had a parent or guardian to participate in the larger study from which these data were collected, (2) were fluent in English, (3) owned and/or had unrestricted access to a smartphone, and (4) had the ability to complete surveys from home using internet or a cellular data plan. Verbal and written consent were obtained from adolescents and their parents. Adolescents with intellectual disabilities were excluded from the study, as surveys were not adapted to accommodate wide variability in reading comprehension levels. Participants
for this study were drawn from a larger study investigating BPD symptoms and sleep disturbances. As such, adolescents who report having other psychiatric diagnoses known to be linked to impaired sleep were also excluded from the present study (e.g., schizophrenia spectrum disorders). The demographic breakdown of the sample is included in Table 1 and clinical characteristics are shown in Table 2. During informed consent, participants were briefed on the sensitive nature of the study and safety procedures used to monitor and manage potential suicide risk (e.g., daily response monitoring, mood improvement and safety planning procedures, contacting family and therapists). Approval for the study was obtained from University of Western Ontario’s Institutional Review Board (see Appendix A).

Measures

Demographics. Participants completed a series of online demographic questionnaires at baseline that assessed the following: sex, gender identity, sexual orientation, race, ethnicity, education level, & socioeconomic status. A series of questions were also used to determine what psychiatric diagnoses

The McLean Screening Instrument for BPD (MSI-BPD). The MSI-BPD (Zanarini, 2003) is a self-report instrument that was used to screen adolescents for BPD symptoms and determine initial eligibility. For this study, the MSI-BPD was adapted into a semi-structured interview and administered via phone to screen participants. The measure includes questions for each of the nine BPD criteria listed in the DSM-5: relationships troubled by a lot of arguments or repeated breakups, deliberate self-harm or suicide attempt, impulsive behaviours, extreme moodiness, distrust or suspicion of others or dissociative symptoms, chronic emptiness, identity disturbance, and fear of abandonment. Eligible adolescents had three or more clinically impairing symptoms (APA, 2013; see Table 2).
The Social Problem-Solving Inventory-Revised: Short Form (SPSI-R:S). The SPSI-R:S is a 25-item self-report instrument that assesses individuals’ general ability to identify social problems, generate effective solutions, and implement problem solving strategies (D’Zurilla, 2002). This scale measures individual differences in social problem-solving ability and is validated for use with adults and adolescents (D’Zurilla, 2002). Within the SPSI-R:S, social problem-solving involves three different styles or approaches to problem-solving (i.e., rational, impulsive/careless, and avoidance) and two orientations or outlooks on social problems (i.e., positive and negative). SPSI-R:S items are organized into five core subscales that reflect these dimensions: 1) a Positive Problem Orientation (i.e., the tendency to view problems as solvable challenges and opportunities to learn), 2) a Negative Problem Orientation (i.e., the tendency to view problems as threatening barriers or obstacles), 3) an Impulsivity/Carelessness Style (i.e., problem-solving that is carried out impulsively, rashly, or carelessly), 4) an Avoidance Style (i.e., passivity or procrastination when solving problems; or redirecting responsibility onto others), and 5) a Rational Problem Solving Style (i.e., deliberate, constructive, and effective problem-solving; D’Zurilla, 2002). Studies with undergraduate samples indicate the SPSI-R:S has good test-retest reliability ($r = .73$ to $r = .89$ across subscales) and high internal consistency ($\alpha = .73$ to $\alpha = .90$ across subscales; Hawkins et al., 2009; D’Zurilla et al., 2002). Cronbach’s alpha in the current sample was $\alpha = .88$. Participants completed the SPSI-R:S from home in an online survey format administered via Qualtrics. Total scores for each subscale were first calculated to reflect specific problem-solving abilities (ranging from 0 to 20 with higher scores indicating greater ability). A composite score was then computed to represents participants’ overall social problem-solving ability (ranging from 0 to 140, with higher scores indicating greater ability). The latter score was used for analyses in this study.
Ecological Momentary Assessment (EMA)

Items measuring interpersonal problems and SI were administered using EMA. Prompts were sent to participants via text message five times per day. Text messages contain links to a web-based Qualtrics survey that participant completed via smartphone. At each EMA prompt, participants answered two questions pertaining to interpersonal conflict. First, “Did you have an argument with someone since your last completed survey”, where response options are “yes” or “no.” If participants respond “yes,” a second question asked who they argued with, out of a list of possible relationship partners (e.g., parents, friends, teachers, siblings, therapist, other). In order to assess other interpersonal variables, participants were also asked to respond to the following prompts: “at this moment, I feel…supported by others,” “isolated/alone and apart from others,” and “rejected or ignored by others,” ranging from a scale from 0 (“not at all”) to 100 (“very much”). SI was assessed at each EMA prompt with one question pertaining to how strong their current desire was to die by suicide, ranging from 0 (“not strong at all”) to 100 (“very strong”). Questions assessing perceived rejection, isolation, support, and SI were administered five times daily, whereas the item pertaining to conflict was administered four times daily.

A major strength of the EMA design is its capability to capture short-term changes in participants’ experiences across time. However, given this high degree of repeated sampling, EMA researchers are often restricted to using single-item assessments to maximize feasibility and reduce participant burden. Although multi-item assessments are generally more accurate (Gratch et al., 2022; Matthews et al., 2022), research indicates that single item EMA measures demonstrate comparable predictive validity (Fisher et al., 2022).

Procedure
Upon completing an initial phone screening interview, eligible participants provided verbal consent via Zoom and were enrolled in the study. Written consent was documented by researchers and shared with participants. After enrollment, participants received a web-based survey link containing baseline questionnaires and the SPSI-R:S to be completed from home. Researchers obtained rough estimates of the participants’ usual wake and sleep times, along with any times of the day they would be unavailable to complete an EMA survey on their smartphone. During the EMA procedure, participants were prompted over text message to complete brief surveys five times per day for two periods of ten consecutive days (twenty days in total). The first ten-day period took place prior to the delivery of a sleep intervention, whereas the second ten-day period took place after the intervention. The sleep intervention for the larger study did not address suicidality, interpersonal problems, or social problem-solving. There were no significant differences between average SI scores pre ($M = 10.94$, $SD = 16.78$) to post intervention ($M = 9.35$, $SD = 14.80$; $t(476) = 1.86$, $p = .06$). However, there was a significant decrease in average rejection scores pre ($M = 29.63$, $SD = 32.31$) to post intervention ($M = 22.11$, $SD = 28.49$; $t(470) = 4.91$, $p < .001$), and between average support scores pre ($M = 30.94$, $SD = 32.69$) to post intervention ($M = 25.30$, $SD = 31.04$; $t(472) = 3.59$, $p < .001$).

The pre-scheduled, automated text messages were sent at random intervals within 3-5-hour bins that were deliberately spaced out throughout the day, accounting for participants’ daily routine. Each prompt contained survey questions and participants were allotted 2 hours to complete each assessment before a parcel was treated as missing data. All assessments included in analyses were completed in chronological order. To encourage adherence, participants were compensated commensurate to their degree of participation (i.e., the percentage of total possible surveys completed [100] corresponded to the value of total possible compensation [$70]$; amount
ranged from $33.60 to $70 in this sample). A $20 bonus was given for high adherence (i.e., above 80% of surveys completed). EMA surveys were monitored daily to track adherence as well as participants’ suicide risk. When participants reported elevated suicidal thoughts, intentions, or specific suicide-related plans in their survey(s), an automated email message immediately alerted the research team, and a graduate-level researcher contacted and carried out safety procedures to ensure the safety of participants. During the course of EMA procedure, three participants reported engaging in suicidal behaviours (i.e., preparatory actions or steps taken to begin a suicide attempt) and non-suicidal self-injury (i.e., behaviours without suicidal intent). Between these three participants, a total of 8 suicidal behaviours and 11 instances of non-suicidal self-injury were reported. Half of the participants (n= 7) were contacted throughout the study in response to having a desire, urge, or plan to kill themselves, or engaging in suicidal behaviours. During those contacts, thorough risk assessments were conducted and resources were provided. No participants completed suicide during the study.

**Data Analytic Plan**

In order to quantify the variability of SI scores in our sample, I used intraclass correlations (ICC) and root mean square of successive differences (RMSSD). ICC was used to demonstrate the proportion of variance attributable to between-person variability in SI scores, where 1-ICC represented within-person variability. RMSSD was used to index the average variability in SI and interpersonal problems over time, while accounting for temporal dependency between assessment points. Larger RMSSD values represent more variability from one assessment point to the next (Ebner-Priemer et al., 2009). To visualize the relative variability in SI over time across the entire sample (aim 1), I modeled participant-mean centered time-series plots. With this approach, plots are standardized such that participants’ deviation from mean scores represent
variability across their own average. Time series plots were created using the ggplot2 R package (Wickham, 2009).

To address my second aim, three-level (hierarchical) multi-level models (MLM) were used to examine relations between interpersonal problems and SI. Here, momentary assessments (Level 1) were nested within days (Level 2), which were nested within people (Level 3). To assess whether each risk factor predicted near-term SI, interpersonal variables were entered as predictors at Time T, and SI was entered as the outcome variable at Time T + 1. To assess whether interpersonal variables were predictors of short-term changes in SI, the same models were retained, with SI at Time T entered as a covariate. Interpersonal variables were modeled with random intercepts and slopes.

For predictive models, I considered the options of using a grand-mean and participant-mean centering approach. A grand-mean centering approach involves subtracting the overall sample mean from participant scores, and days from each response. This technique allows for interpretation of participants’ daily responses on interpersonal variables compared to the overall sample. In contrast, a group or participant-mean centering approach involves subtracting each participant’s overall mean across days from each of their daily responses. This approach removes between-person variation in scores over time. Given that either approach would be suitable for this study and few guidelines exist on optimal centering approaches (Hofmann & Gavin, 1998), I opted to compare models to determine the best centering approach. The model centering predictor variables on the grand-mean provided a better fit to the data (AIC = 6836.54) than the model centered on participants’ means (AIC = 6842.50), and thus I used the grand-mean centered scores in subsequent analyses.
For each predictor (conflict, support, perceived rejection, and isolation), a multilevel moderated regression was used to test cross-level interactions between all interpersonal variables and social problem-solving in predicting SI scores. Social problem-solving, which was only assessed at baseline, was entered as a Level 3 predictor. Given the relatively small sample size, exploratory analyses to examine the type of relationship context were descriptive in nature. Analyses were conducted in R (R Core Team, 2016) using the lme4 package (Bates et al., 2015) and the RStudio development environment (RStudio Team, 2015).

Sample Size Considerations

Given the use of repeated sampling in EMA, this research design typically recruits fewer participants than is needed in cross-sectional and longitudinal research. This is especially true of EMA studies that produce many datapoints and involve high participant burden (e.g., multiple daily assessments). Typically, the goal of EMA research is to study fewer participants in greater depth, over time. At the outset of this study, I sought to recruit 30 adolescents. Power analyses (Kleiman, 2021) indicated that I would be sufficiently powered (.80) to detect large effects and moderately powered (.40) to detect medium-size effects, at a 75% completion rate.

Results

Descriptive Statistics

Participants completed a total of 1098 assessments (352 missed), with an average response rate of 0.784 ($SD = 0.17$) per person (78.4% compliance rate). Approximately 10 surveys were missed due to technical malfunction of a participant’s cellphone. Across the sample, participants reported an average SI score of 9.21 out of a possible 100 ($SD = 15.04$). Nearly all ($n = 13, 92.9\%$) participants reported having at least one argument during their time in the study. The average number of arguments among all participants was 8.36 across the 20 assessment days ($SD$
= 8.37, Range = 27) and the total number of arguments reported was 117. Across all assessment points, average SI scores were higher during prompts where participants reported getting into an argument with someone ($M = 21.09$, $SD = 2.34$) than those where no argument occurred ($M = 7.76$, $SD = 0.47$). The majority of arguments were with a parent (41.02%), followed by a friend (17.95%), other family member (9.4%), romantic partner (7.69%), classmate or co-worker (6.84%), acquaintance (5.13%), therapist or doctor (3.42%), stranger (3.42%), and a boss or teacher (1.71%). Bivariate correlations, intraclass correlations (ICCs), and descriptive statistics are reported in Table 2.

**Variability in SI and Interpersonal Problems Over Time**

The ICC for SI show that approximately 64% of the variability in SI was due to within-person variance, whereas 36% of the variability was due to between-person variance. This result highlights the importance of day-level rather than person-level changes in SI and reinforces the suitability of using MLM as an analytic strategy in this study. I observed a similarly high degree of variability in all interpersonal variables at the within-person level (see Table 3), suggesting the variance in interpersonal problems is more attributable to daily fluctuations or changes in one’s environment than between-person differences. The RMSSD statistic demonstrates that there was considerable variability in SI scores over time, consistent with prior EMA studies (Kleiman et al., 2017). Based on RMSSD values, there were even higher rates of variability in interpersonal problems over time. Time series plots depicting short-term changes in study variables are presented in Figure 1. The clear saw tooth pattern depicted in these plots suggests non-linear and unpredictable shifts in these experiences over the EMA period. Although most participants in this sample showed some degree of variability in SI scores around their average score over time, four participants experienced little to no SI throughout the entirety of the study (see Figure 2). A
total of 54.23% of all ratings of SI differed from one timepoint to the next by at least one within-person standard deviation. Unsurprisingly, RMSSD values and the mean for SI scores were positively correlated, suggesting participants with the higher average SI showed greater variability around their own mean ($r = 0.78, p < .001$). A visual representation of individuals’ raw SI scores is depicted in Figure 2.

**Daily Interpersonal Problems Predicting Changes in SI**

Results of the hierarchical linear models examining concurrent and prospective associations between daily interpersonal problems and SI are presented in Table 3. In line with study hypotheses, perceived rejection ($\beta = 0.05, SE = 0.02, p = .03$) and the presence of conflict ($\beta = 6.07, SE = 1.30, p < .001$) were significantly positively associated with SI. Surprisingly, the association between social support and SI was significant and positive ($\beta = 0.09, SE = 0.02, p < .001$), suggesting that those with greater social support experienced worse SI at the same timepoint. Contrary to our hypotheses, being isolated and apart from others was not significantly associated with SI ($\beta = -0.01, SE = 0.02, p = .48$). When examining prospective associations, only SI at Time T predicted SI at Time T+1 ($\beta = 0.19, SE = 0.04, p < .001$). These results suggest that while most interpersonal problems are associated with SI in some way, they did not account for elevations in SI at the following assessment point in the current sample.

**Social Problem-Solving as a Moderator**

When examining social problem-solving as a moderator, the only significant interaction effect predicting Time T+1 SI (controlling for Time T SI) was between perceived rejection and social problem-solving abilities ($\beta = -0.3, SE = 0.01, p = .04$). In this model, the main effect for perceived rejection predicting subsequent SI was significant ($\beta = 0.32, SE = 0.14, p = .03$). Upon probing the interaction effect, simple slope tests revealed that the positive relation between
perceived rejection and SI was stronger for those who had lower social problem-solving abilities (-1 SD; \( \beta = 0.08, SE = .04, p = .03 \)) than for those with average (\( M; \beta = 0.03, SE = .02, p = .26 \)) or above-average social problem-solving abilities (+1 SD; \( \beta = -0.03, SE = .03, p = .37 \)). This result was consistent with our hypotheses, and indicates that those with a weaker capacity to solve social problems are more vulnerable to the negative effects of perceived rejection on suicide risk. The results of the models testing the interaction between interpersonal problems and social problem-solving are presented in Table 4 and the simple slopes are depicted in Figure 3.

**Discussion**

With this study, I conducted a fine-grained examination of how daily interpersonal problems influence short-term changes in SI in a sample of adolescents with BPD features. Findings from this study provide a much-needed replication to prior work highlighting both a high degree of within-person variability of SI and rate of fluctuation in SI over time (Kleiman et al., 2017; Hallensleben et al., 2018). Of note, I observed a higher proportion of within-person variance (64%) attributable to SI in this sample, as compared with prior research (e.g., 38%; Kleiman et al., 2017). This was especially interesting given that some participants reported little to no SI—which would have been reflected in person-level variation. A potential explanation for this result is that the more frequent daily assessment of SI in this study (i.e., five per day) captured greater variation in experiences than was measured in prior work. This finding speaks to the importance of using repeated sampling to examine suicide risk broadly, and extends prior literature by showing that wide shifts in SI are common, even from just 3-5 hours earlier. Results from this study also demonstrated that interpersonal problems were highly variable in the short-term. Although this finding is intuitive (i.e., individuals’ social experiences are likely varied across and within days), this study provides one of the first empirical confirmations that interpersonal
problems can and do fluctuate considerably among youth with BPD features. This finding is especially informative given adolescents in this study were more prone to interpersonal difficulties in general. Essentially, I demonstrated that even those with chronically high rates of interpersonal problems experience dramatic shifts in these outcomes over the course of a day.

The present study also found that persons reporting greater perceived rejection and interpersonal conflict relative to the overall sample were more likely to experience concurrent elevations in SI. In other words, individuals who reported feeling rejected by others and experiencing an argument after their last assessment, were more likely to endorse having a desire to die by suicide in the present moment. These results are in line with prior research demonstrating interpersonal problems are risk factors for suicidality, and provide evidence that they confer risk in-the-moment (King & Merchant, 2008). This pattern of findings also aligns well with existing models of suicide that propose acute social stressors activate vulnerabilities that elevate risk of suicide in moments of distress (Van Orden et al., 2010). Although these associations were cross-sectional, they offer additional evidence that acute experiences of perceived rejection and conflict occurring in one’s daily life are linked with SI, rather than just conferring risk at the broadest (i.e., individual-differences) level. Furthermore, although the observed relation between conflict and SI was concurrent, the wording of the argument item (i.e., since your last survey) suggests that the presence of a prior argument predicted in-the-moment-SI. Thus, this finding still reflects a meaningful temporal association between conflict and SI that is not captured in most cross-sectional research. Unsurprisingly, I found that adolescents most frequently reported interpersonal conflict with their parents. Although I was unable to test the specific effects of relationship context, this finding supports the position that the presence of parent-adolescent conflict is important for characterizing suicide risk.
Adolescents’ perceived rejection was the only interpersonal variable that interacted with social problem-solving to prospectively predict near-term SI. In particular, those with lower social problem-solving abilities (as compared with average or above-average levels) were more likely to experience elevated SI in response to perceived rejection. Social problem-solving abilities enable persons to competently and confidently manage and resolve interpersonal difficulties. Thus, this finding suggests that those with a weaker capacity to solve social problems may have a harder time dealing with and managing distress in response to perceived rejection by others. Researchers propose social problem-solving skills are often deficit among individuals presenting with BPD features, and prior research has found that those with BPD exhibit poorer social problem-solving abilities following rejection, specifically (Dixon-Gordon et al., 2011). In general, social rejection also appears to be a particularly upsetting to adolescents—who tend to highly value others’ judgements (and especially their peer’s; Brown, 1990; Kloep, 1999; O’Brien & Bierman, 1988). Thus, it is possible that this painful social experience is especially tied to these individuals’ capacity to problem-solve, and may be particularly important to target in adolescents who present with BPD features. Of note, four participants (28.57%) in this sample reported clinically significant level of fear of abandonment and sensitivity to rejection, and five (35.71%) were reported clinically significant difficulties with regard to the criterion involving unstable relationships (i.e., shifting patterns of idealization and devaluation). It was surprising that social problem-solving did not moderate relations between conflict and SI, given that interpersonal conflict may more often necessitate a resolution or relationship repair, and thus, recruit skills of social problem-solving. However, relatively few participants reported experiences of interpersonal conflict in this study.
Although some of my hypotheses were supported, a number of unexpected findings also emerged. First, participants reporting greater social support simultaneously endorsed elevated SI. This was unexpected, as multiple theories of suicide propose social support is protective against suicidality (e.g., Joiner et al., 2005). Given that this adolescent sample was relatively high-risk, it is possible that individuals with elevated SI received or sought out greater support from others in spite of (or even as a result of) their suicidality. For example, adolescents’ parents consented to and actively participated in the study, and were largely aware of their child’s BPD features and suicide risk. Such characteristics may reflect a high degree of parental involvement in general or support specific to adolescent’s struggles with suicidality. Also contrary to our hypotheses, being isolated and apart from others was not related to SI. This was surprising considering that lack of connectedness has been linked with suicidal thoughts in prior EMA studies (Kivelä et al., 2022). However, this pattern also generally aligns with our finding that greater social support was indicative of elevated SI. It is plausible that adolescents in our sample were more, rather than less, likely to be around and supported by others when they were in distress.

**Limitations**

This study suffers from a number of notable limitations. First, results failed to show any prospective associations between interpersonal problems and SI. The finding that only baseline SI predicted subsequent SI has been observed in other EMA studies (e.g., Kleiman et al., 2017), suggesting that characteristics of the study design (e.g., phrasing or timing of prompts), or restricted sample size, may have impacted results. Our assessment of SI was designed to capture in-the-moment thoughts and urges—rather than the presence/absence of SI since the participant’s last prompt. Thus, if I had incorporated an item assessing SI since the last survey, perhaps I could have more accurately detected changes in SI that occurred as an immediate consequence of
an interpersonal problem. It is also possible that these effects could not be detected due to having a relatively small sample size. Despite having a good compliance rate (78.4%), this study was underpowered to detect medium-to-small effects. Unfortunately, I was unable to test whether interpersonal problems predicted subsequent suicidal behaviours, given that these occurred infrequently in our study. Although our EMA questions used a wide rating scale (0-100), many participants reported 0 for SI and interpersonal problems across repeated assessments. This response pattern suggests participants may have been less thoughtful or accurate when reporting on their experiences, or genuinely may have been experiencing no distress in these domains. Finally, all of our participants were enrolled in this study during the COVID-19 pandemic and most participated while provincial lockdowns and restrictions were in place. Important aspects of adolescents’ social environments were likely altered by this experience (e.g., less frequent in-person interactions with friends, peers, and teachers, and more frequent interactions with family members), thereby restricting our ability to observe experiences that were most typical or developmentally normative. Lastly, I was unable to assess relationship context as a moderator, given the relatively few arguments endorsed by participants across the study.

**Implications and Future Directions**

In spite of these limitations, this study offers important insight into how adolescents with BPD features dynamically experience interpersonal problems and SI in daily life, and how these experiences are related to social problem-solving abilities. These results contribute to a growing body of evidence that real-time assessments of SI are needed to accurately and meaningfully capture fluctuations in these experiences over short time intervals. Utilizing EMA enhances our ability to identify which risk factors predict suicidal thoughts in the hours or even minutes before
they arise, which may ultimately inform intervention efforts. The implications of this design capability are far-reaching.

Leveraging EMA designs, future studies could incorporate high-resolution methods to record social interactions (e.g., Electronically Activated Recorder), such that observational data can be used to understand how daily interpersonal experiences elevate suicide risk, in addition to self-report. To get a clearer picture of how interpersonal processes interact with a person’s level of risk in everyday life, future work should also investigate how these processes are reciprocally related (interpersonal problems predicting suicidality and vice versa). EMA methods may also allow for the delivery of brief interventions that can target specific skills that may help individuals manage their acute distress, such as social problem-solving. This study’s finding that poor social problem-solving worsened the effects of rejection on SI suggests that developing this skillset may be an important target for preventing escalations in suicide risk—particularly among those vulnerable to interpersonal strife. Although our measure of social problem-solving was self-report, task-based measures of this skill exist (e.g., Means-End Problem-Solving Procedure; Platt and Spivack, 1975). In the future, researchers should aim to more comprehensively examine adolescents’ problem-solving abilities via multiple methods of assessment, and investigate how this process is context-dependent (e.g., whether specific facets of problem-solving are recruited for specific social problems).
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Table 1

Demographic Characteristics of the Sample

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<th>M(SD)</th>
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Note. Additional response categories (e.g., “Transgender”) were omitted from the table when n = 0.
Table 2

*Clinical Characteristics of the Sample*

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<td>Past year SA (Total Num)</td>
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<tr>
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<tr>
<td>ADHD</td>
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*Note.* Abbreviations: SA = suicide attempt, SSI = self-inflicted injury; denotes self-injurious behaviours broadly (with suicidal or non-suicidal intent). Proportions for ‘BPD Threshold’ reflect diagnostic cutoffs (5+ clinically impairing symptoms); proportions for ‘BPD Subthreshold’ = 4 clinically impairing symptoms.
# Table 3

Descriptive and Variability Statistics and Bivariate Correlations

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<tr>
<th>Variable</th>
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<th>3</th>
<th>4</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Skew</th>
<th>ICC</th>
<th>RMSSD</th>
<th>RMSSD range</th>
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<td>1. SI</td>
<td>-</td>
<td>-.15**</td>
<td>.50**</td>
<td>.47**</td>
<td>1143</td>
<td>9.21</td>
<td>15.04</td>
<td>100</td>
<td>1.53</td>
<td>0.36</td>
<td>14.28</td>
<td>36.28</td>
</tr>
<tr>
<td>2. Isolation</td>
<td>-</td>
<td>-.15**</td>
<td>-</td>
<td>-.21**</td>
<td>.18**</td>
<td>1143</td>
<td>29.29</td>
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<td>0.12</td>
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<td>-.21**</td>
<td>-</td>
<td>-.23**</td>
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<tr>
<td>4. Support</td>
<td>.47**</td>
<td>-.18**</td>
<td>.23**</td>
<td>-</td>
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<td>27.02</td>
<td>31.13</td>
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<td>0.40</td>
<td>26.80</td>
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<td>5. SPS</td>
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<td>-.04</td>
<td>-.11**</td>
<td>.02</td>
<td>1400</td>
<td>89.41</td>
<td>8.09</td>
<td>33</td>
<td>-0.19</td>
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</tr>
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</table>

SPS - NPO 11.93 2.89 10 .05
SPS - PPO 10.29 4.39 16 -.03
SPS - ICS 6.93 3.06 11 -.37
SPS - RPS 9.51 4.21 11 -.10
SPS - AS 10.07 4.62 17 -.41

<table>
<thead>
<tr>
<th>N(%) Observations</th>
<th>N(%) Participants</th>
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</thead>
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<tr>
<td>Conflict</td>
<td>117(12.84)</td>
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</tbody>
</table>

Note. Unconditional models (i.e., without predictors or covariates) were used to calculate ICC statistics for each variable. ICC values represent variance attributable to between-person (rather than within-person) effects. Abbreviations: SI = suicidal ideation; SPS = social problem-solving composite score; subscales: NPO = negative problem orientation; PPO = positive problem orientation; RPS = rational problem-solving; ICS = impulsive/carelessness style; AS = avoidance style.

*p< .05, **p< .01.
Figure 1

Variability in Suicidal Ideation and Interpersonal Problems

Note. Binary scores for conflict were excluded from graphical depictions, yet show similar rates of variability over time.
Figure 2

Individual Time Series Plots of Suicidal Ideation Scores

Note. Raw data was participant-mean centered to represent degree of fluctuation around individual’s own mean.
### Table 4

Results of Multilevel Regression and Interaction Models

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<th>Dependent Variable</th>
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<th>Prospective (SI at Time T+1)</th>
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<td><strong>β</strong></td>
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<tr>
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<tr>
<td>(Intercept)</td>
<td>8.11</td>
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<tr>
<td>Isolation</td>
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<tr>
<td>Argument</td>
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<tr>
<td>Rejection</td>
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<td>0.01-0.09</td>
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<tr>
<td>Support</td>
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<td>0.05-0.14</td>
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<tr>
<td>Time T SI</td>
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<tr>
<td>SPS x Isolation</td>
<td>-0.01</td>
<td>-0.02-0.01</td>
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<tr>
<td>SPS x Argument</td>
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<td>-2.15-1.20</td>
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<tr>
<td>SPS x Rejection</td>
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<td>-0.02-0.03</td>
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<tr>
<td>SPS x Support</td>
<td>-0.01</td>
<td>-0.02-0.01</td>
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</table>

<table>
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<th>Estimates</th>
<th>Estimates</th>
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<td><strong>σ²</strong></td>
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<td>144.96</td>
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<td>τ₀₀ subject</td>
<td>51.07</td>
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<td>τ₀₀ day</td>
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<td>0.89</td>
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<td>14</td>
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<tr>
<td>N day</td>
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<td>239</td>
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<td>ICC subject</td>
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<tr>
<td>ICC day</td>
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<td>0.01</td>
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<tr>
<td>R²/Ω₀²</td>
<td>0.13/0.42</td>
<td>0.12/0.40</td>
</tr>
<tr>
<td>Observations</td>
<td>873</td>
<td>778</td>
</tr>
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</table>
Figure 3

The Interaction of Social Problem-Solving and Perceived Rejection Predicting Suicidal Ideation

Note. Values of social problem-solving are \(-1SD = 81.80, M = 89.84, +1SD = 97.87\). The interaction between social problem-solving and perceived rejection was statistically significant at \(-1SD\) level of the moderator.
Appendix A: Institutional Review Board Approval

Date: 17 November 2020
To: Dr Erin Kaufman
Project ID: 115454

Study Title: Real-time Experiences with Sleep Training Study

Study Sponsor:

Application Type: HSREB Initial Application

Review Type: Full Board

Meeting Date: 07/Jul/2020, 13:00-15/Sep/2020, 13:00-06/Oct/2020 13:00

Date Approval Issued: 17/Nov/2020 09:36

REB Approval Expiry Date: 17/Nov/2021

Dear Dr Erin Kaufman

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above mentioned study as described in the WREM application form, as of the HSREB Initial Approval Date noted above. This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

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No deviations from, or changes to, the protocol or WUEM application should be initiated without prior written approval of an appropriate amendment from Western HSREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA, 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB-00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Ms. Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair

*Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).*
Curriculum Vitae
Brianna Meddaoui, M.A.

EDUCATION

2020- Present  University of Western Ontario, London, ON, Canada
M.Sc., Clinical Science and Psychopathology
Advisor: Erin A. Kaufman, Ph.D.

2018- 2020  Teachers College, Columbia University, New York, NY, USA
M.A., Psychology in Education, Research Methods Concentration
Research Project: Autobiographical memory and future cognition: Associations between child abuse and adolescent prospective suicidal ideation
Project Advisor: Christine B. Cha, Ph.D.

2012- 2017  Queen’s University, Kingston, ON, Canada
B.A. Honors, Psychology

AWARDS/HONORS

2022- 2023  Ontario Graduate Scholarship, Western University, $15,000
2021-2022  Ontario Graduate Scholarship, Western University, $15,000
2020  Distinction for Outstanding MA Research Project, Teachers College, Columbia University
       (Honourable mention)
2019  Provost Grant for Conference Presentation & Professional Development, Teachers College, Columbia University, $500
2019  Psi Chi International Honors Society, Teachers College, Columbia University
2018  Graduate Scholarship, Teachers College, Columbia University, $2,500
2016  Dean’s Honor List, Queen’s University
2016  Volunteer Distinction Award, Providence Care
2015  Award for Volunteerism Excellence, Canadian Mental Health Association

PEER-REVIEWED PUBLICATIONS


INVITED CHAPTERS


ORAL PRESENTATIONS


POSTER PRESENTATIONS


Iddiols, B., Meddaoui, B., & Kaufman, E.A. (2022, November). Locus of Control mediates the relation between perceived discrimination and suicidal ideation. Poster to be presented at the 56th Annual Convention for the Association for Behavioral and Cognitive Therapies, New York City, NY.


MANUSCRIPTS IN PREPARATION

*Signifies equal contribution


TEACHING EXPERIENCE

Undergraduate Courses

*Introduction to Research Methods in Psychology*, Teaching Assistant, University of Western Ontario, 2020-2021

RESEARCH EXPERIENCE

University of Western Ontario

2020 – Present  The Multimodal Approaches to Pathogenic Personality and Emotion Development (MAPPED) Lab, Western University  
(P.I.: Erin Kaufman, Ph.D.)  
Role: Project Coordinator

2017  InterRAI Lab, University of Western Ontario  
(P.I.: Shannon L. Stewart, Ph.D., CPsych)  
Role: Research Assistant

Teachers College, Columbia University

2019 – 2020  Richardson Lab, Teachers College, Columbia University  
(P.I.: Randall Richardson-Vejlgaard, Ph.D.)  
Role: Project Coordinator
2018 – 2020  **Laboratory for Clinical & Developmental Studies, Teachers College, Columbia University**  
(P.I.: Christine B. Cha, Ph.D.)  
Role: Research Assistant

2018 – 2020  **Psychotherapy, Affirmation, & Disclosure Laboratory, Teachers College, Columbia University**  
(P.I.: Barry A. Farber, Ph.D.)  
Role: Research Assistant

**Queen’s University**

2016 – 2017  **Early Experience Lab, Queen’s University**  
(P.I.: Mark Sabbagh, Ph.D.)  
Role: Independent Researcher & Research Assistant

2017  **Sexual Health Research Lab, Queen’s University**  
(P.I.: Caroline Pukall, Ph.D.)  
Role: Research Assistant

2016 – 2017  **FABLAB, Queen’s University**  
(P.I.: Leandre R. Fabrigar, Ph.D.)  
Role: Research Assistant

2017  **The Sexuality and Gender Lab & Attention Lab, Queen’s University**  
(P.I.: Meredith L. Chivers, Ph.D. & Daryl Wilson, Ph.D.)  
Role: Research Assistant

**Non-Academic Settings**

2018 – 2019  **Roots of Empathy, Toronto, ON**  
Role: Part-time (Paid) Research Assistant

**RELEVANT WORK EXPERIENCE**

2017 - 2018  **Oakdale Child & Family Services, Toronto, ON**  
Role: Full-time Resident Counsellor

2018  **Roots of Empathy, Toronto, ON**  
Role: Classroom Instructor

2015 – 2017  **Telephone Aid Line Kingston (TALK), Kingston, ON**  
Role: Crisis Line Volunteer, Trainer, & Executive Member

2015 – 2017  **Providence Care, Kingston, ON**  
Role: Psychiatric and Occupational Therapy Volunteer

2016 – 2017  **Youth Diversion, Kingston, ON**  
Role: REBOUND Program Leader
2016  Queen’s University, Kingston, ON  
Role: Community Outreach Volunteer and Instructor

2015  Family and Children’s Services of Frontenac, Lenox, and Addington, Kingston, ON  
Role: Research Assistant

2015  Canadian Mental Health Association  
Role: Youth Group Co-Facilitator

SERVICE

2020- Present  Advocacy through Action (AtA), University of Western Ontario  
Role: Presenter and Evaluations Committee Member

2021- Present  Clinical Psychology Equity and Diversity Committee (EDI-C), University of Western Ontario  
Role: Chair

EDITORIAL SERVICE

Ad hoc Reviewer, Journal of Clinical Psychology

PROFESSIONAL MEMBERSHIP

Association for Psychological Science (APS): Member since October 2019
Association for Behavioral and Cognitive Therapies (ABCT): Member since September 2019
Academy for Eating Disorders (AED): Member since July 2019
American Psychological Association (APA): Member since May 2019
New York State Psychological Association (NYSPA): Member since December 2018