Daily Loneliness and Suicidal Ideation in Borderline Personality Disorder

Wicher, C. L.[a], Dombrovski, A. Y.[b], Hallquist, M. N.[c], Buecker, S.[d], Wright, A. G. C.[e,f] & Kaurin, A.[a]

[a] Department of Psychology, Bergische Universität Wuppertal, Germany

[b] Department of Psychiatry, University of Pittsburgh School of Medicine, USA

[c] Department of Psychology and Neuroscience, University of North Carolina, Chapel Hill, USA

[d] Faculty of Health/School of Psychology and Psychotherapy, Witten/Herdecke University, Germany

[e] Department of Psychology, University of Michigan, USA

[f] Eisenberg Family Depression Center, University of Michigan, USA

Correspondence concerning this article should be addressed to Cara Luisa Wicher, Department of Psychology, University of Wuppertal, Gaußstr. 20, 42119 Wuppertal, Germany. E-Mail: wicher@uni-wuppertal.de

Abstract

Loneliness has been linked with suicidal ideation (SI) in people with a Borderline Personality Disorder (BPD) diagnosis. However, the temporal dynamics of this association remain unclear: we do not know whether loneliness amplifies SI within clinically relevant timeframes. To fill this gap, our preregistered analysis used a 21-day ambulatory assessment study of individuals diagnosed with BPD (N = 153, 105 with a history of attempted suicide). We tested the hypotheses that within-person, daily loneliness would be linked to same- and next-day SI and that BPD features would strengthen these links. In line with our hypotheses, we found a significant contemporaneous and lagged association between loneliness and SI, yet these links were not significantly amplified by BPD features. Exploratory analyses further suggested that loneliness did not account for the within-person link between daily social interactions and SI, nor did more general personality disorder (PD) features alter loneliness-SI links. The link between loneliness and SI highlights a significant vulnerability to suicide risk and our findings suggest that BPD catalyzes the early stages of the suicidal process by predisposing to loneliness, but not the progression from loneliness to suicidal ideation.

Keywords: *suicide; loneliness; ambulatory assessment; Borderline Personality Disorder; multilevel structural equation modeling*

Daily Loneliness and Suicidal Ideation in Borderline Personality Disorder and Attempted Suicide

In community samples, the general tendency to feel lonely has been linked to suicidal ideation (SI; McClelland et al., 2020), and this association may be stronger in individuals diagnosed with borderline personality disorder (BPD; Nenov-Matt et al., 2020). This heightened risk may relate to increased rejection sensitivity (Gao et al., 2017; Nenov-Matt et al., 2020), a concept closely related to loneliness (Gao et al., 2017; Watson & Nesdale, 2012).

Previous studies, however, provide only a limited understanding of the temporal relationship between loneliness and SI, especially in distinguishing between individual differences and time-specific within-person associations (e.g., daily fluctuations; Bolger & Laurenceau, 2013). Therefore, it remains unclear whether loneliness can intensify SI within clinically significant timeframes — a crucial consideration for immediate clinical safety planning and interventions for those at risk. To address this gap, the present preregistered study (https://osf.io/u5nak/) used a 21-day ambulatory assessment procedure in sample of individuals diagnosed with BPD, some of whom had previously attempted suicide to characterize temporal aspects of the relationship between loneliness and SI in everyday life. Because previous findings suggest loneliness and SI may exhibit similar short-term fluctuations (Kleiman et al., 2017; Rönkä et al., 2018), we investigated whether changes in loneliness were linked to concurrent as well as lagged shifts in SI among people with BPD.

Humans have an inherent and powerful need for meaningful and reciprocal social relationships (Baumeister & Leary, 1995), which, in turn, significantly contribute to overall health and well-being (e.g., Holt-Lunstad, 2018). When this need is not met, individuals may experience feelings of loneliness, the subjective feeling that one's 'network of social relations is

deficient in some important way, either quantitatively or qualitatively' (Perlman et al., 1984, p. 31). In simpler terms, experiences of loneliness emerge when there is a perceived mismatch between a person's need for social contact and the actual social encounters they experience (Cornwell & Waite, 2009; Perlman et al., 1984).

Individuals diagnosed with personality disorders (PDs) often feel lonely (Gao et al., 2017), and loneliness is particularly prevalent in BPD (Gao et al., 2017; Liebke et al., 2017; Schermer et al., 2020; Skaug et al., 2022). This is unsurprising because loneliness overlaps with cardinal symptoms such as rejection sensitivity (Gao et al., 2017; Gunderson, 2007; Nenov-Matt et al., 2020), as well as persistently disturbed relationships (Gunderson, 2007).

Conceivably, interpersonal hypersensitivity (Sadikaj et al., 2013), a tendency in BPD to perceive others generally as less affiliative, rejecting or interpersonally cold (Kaurin et al., 2020; Sadikaj et al., 2013), may shape social expectations and thus contribute to the emergence of loneliness and eventually SI in social interactions. The Interpersonal Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) provides a useful framework for conceptualizing the link between loneliness and SI (e.g., Rogers & Joiner Jr., 2016), because it emphasizes the importance of feelings of disconnectedness *from* and lacking meaningful relationships *with* others. Recent meta-analytic evidence based on cross-sectional and prospective longitudinal data suggests that thwarted belongingness (TB) is significantly positively associated with more severe suicidal ideation, greater suicide risk and suicidal behavior (Chu et al., 2016; McClelland et al., 2020). Specifically, through the lens of the IPTS, hallmark features of BPD such as extreme fear of abandonment may escalate suicide risk by increasing perceived burdensomeness and TB (Rogers & Joiner Jr., 2016; Van Orden et al., 2010). Although it appears that loneliness is linked to elevated levels of suicide risk, most studies have assessed loneliness cross-sectionally (e.g.,

Beutel et al., 2017; Calati et al., 2019; Park et al., 2020) or as a long-term risk factor for SI in community samples (McClelland et al., 2020).

In recent syntheses of empirical evidence on loneliness and personality pathology, loneliness tended to co-occur with most PDs (Kunz et al., 2023; Reinhard et al., 2022) and was positively associated with symptom severity and suicidality (Reinhard et al., 2022). Similarly, in the DSM-5 alternative model of personality disorder (AMPD), loneliness is correlated with each of the AMPD domains (negative affect, detachment, antagonism, disinhibition, and psychoticism; Freilich et al., 2024). As PDs are manifest in maladaptive behavior in social interactions, they have been conceptualized as interpersonal disorders (Hopwood, 2018; Wright et al., 2022). Thus, people showing pathological personality features such as interpersonal dysfunction are prone to experience more loneliness (Labonté & Kealy, 2023). Altogether, these studies suggest that personality pathology, whether defined in terms of diagnoses or dimensions, is broadly associated with loneliness.

What distinguishes BPD from other PDs is the extreme fear of abandonment with conflicting attachment needs and an earlier sense of rejection, which leads to maladaptive and intensive behavior in interpersonal situations, compelling the counterpart to withdraw in contact, consequently reinforcing the dynamic (Hopwood, 2018). Thus, feelings of loneliness may be particularly potent in exacerbating SI in individuals with a BPD diagnosis. The extent to which loneliness, BPD, and SI interact remains ambiguous. Additionally, it is uncertain whether BPD leads to loneliness or vice versa, exacerbating BPD symptom severity. One study employing a narrative approach found that individuals diagnosed with BPD reported persistent feelings of loneliness often beginning in early childhood, suggesting that loneliness may even be experienced as aspect of their personality (Sagan, 2017). This experience of loneliness may

distinguish those diagnosed with BPD from those without the diagnosis. Indeed, one genomic study suggested a potential genetic overlap between loneliness and BPD, underscoring the intricate relationship between these conditions, and implying a heightened genetic predisposition to loneliness among individuals with a BPD diagnosis (Schulze et al., 2023).

Whereas results of cross-sectional research suggest a high relevance of loneliness in the context of BPD and SI, longitudinal studies with clinical samples present a more nuanced picture. Some longitudinal studies have failed to establish a direct association between loneliness and SI over time (Groholt et al., 2006; Trakhtenbrot et al., 2016), while intensive longitudinal studies showed that loneliness exacerbates SI and how this association varies across disorders. The temporal dynamics of loneliness in daily life have been linked to symptoms of anxiety and depression (Buecker et al., 2023). Daily loneliness has been correlated with increased SI in both clinical adult populations (Kleiman et al., 2017) and undergraduate students (Mournet et al., 2022). Furthermore, loneliness has been suggested as a mediator in the relationship between negative daily events and SI in adolescents (Glenn et al., 2022). Preliminary findings from a small-scale study ($N = 35$) using Ecological Momentary Assessment (EMA) suggest that, at the daily level, loneliness tends to co-occur more often with SI in in individuals diagnosed with BPD compared to those without the diagnosis (Mou et al., 2018). Mournet et al. (2022) found that heightened levels of loneliness increased the likelihood of experiencing SI the following day. However, attempts to replicate these results in adult clinical samples have yielded inconsistent outcomes (Hadzic et al., 2019; Parrish et al., 2021; Rath et al., 2019), raising doubts about the short-term predictive value of loneliness for SI. Furthermore, there is limited evidence concerning disorder-specific (e.g., PD specific) processes, with current EMA studies providing

scant information regarding the diagnoses of participants, even when clinical samples were studied (e.g., Glenn et al., 2022; Kleiman et al., 2017).

Thus, what cannot be ascertained from this line of previous research is whether loneliness exacerbates SI in BPD in clinically informative timeframes. This methodological differentiation is crucial for discerning whether experiences of loneliness can effectively signal short-term changes in the risk of SI or are merely correlated with the long-term SI risk in BPD due to shared characteristics between loneliness and hallmark symptoms of BPD. Addressing this distinction is critically important for enhancing clinical risk assessments, which aim to predict and prevent suicidal behavior in the near future (Kaurin, Dombrovski, et al., 2022b).

The present preregistered study

The preregistered study (https://osf.io/u5nak/) expands upon prior research by disentangling and separately estimating the day-level and person-level associations among loneliness and SI in individuals diagnosed with BPD. In this study, we focused on SI. SI is often neglected in research, practice, and policy. Nevertheless, SI serves as a crucial predictor for subsequent suicidal behaviors and suicide attempts (Franklin et al., 2017; Klonsky et al., 2018). Following ideation-to-action theoretical frameworks of suicidal behaviors (Klonsky et al., 2018), understanding and addressing SI are key in early intervention for suicide prevention. By intercepting its onset or progression, we can mitigate the likelihood of suicide attempts and fatalities (Jobes et al., 2024). Our study is based on a 21-day EMA protocol in a clinical sample of adult BPD patients, including individuals with a history of at least one suicide attempt. As part of this study, another $N = 52$ healthy controls were recruited in addition to the clinical groups; however, because these participants did not endorse suicidal ideation during the study period, they were excluded from the analyses, in line with procedures outlined in Tsypes et al. (2022).

The aim was to assess concurrent and lagged associations between daily levels of feelings of loneliness and SI, as well as the effect of BPD features on this within-person association.

Our preregistered hypotheses were as follows: At the within-person level, we hypothesized that higher levels of same-day (t) loneliness would be positively linked to same-day SI (t; **H1a**) and that higher levels of loneliness (t) would be positively linked to next-day SI (t+1), after controlling for same-day SI (t) as well as next-day loneliness (t+1; i.e., *full within-person cross-lagged model*; **H1b**). At the between-person level, we hypothesized that average levels of loneliness would be positively linked to average levels of SI (i.e., assessments of both constructs averaged across all assessment days; **H2a**). Building on the links assessed in **H1a** and **H1b,** we then turned to cross-level moderations of within-person processes. We hypothesized that BPD features would amplify the concurrent within-person association between loneliness and SI (**H3a**), as well as the lagged within-person association between loneliness (t) and SI (t+1) as depicted in H1b (**H3b**).

Method

All study procedures were approved by the Institutional Review Board of the University of Pittsburgh (STUDY19050210).

Transparency and Openness

We report all data exclusions and all measures that have been conducted in this study. All data and analyses have been made publicly available at the Open Science Framework (OSF; OSF-LINK). Data were analyzed using Mplus with Bayesian parameter estimation (version Version 8.4; Muthén & Muthén, 2019). This study's design, hypotheses and analysis were preregistered.

Sample

Participants were 153 individuals diagnosed with BPD. Of these, 105 had a history of suicide attempts (BPD-ATT) and 48 reported no past suicide attempts (BPD-NON). Among all participants, 79% identified as White, 1.3% Asian, 9.1% Black or African American, 6.5% as Hispanic and the rest identified as more than one or another race. More than 13.5% had a yearly income of $70,000 and above, ~28% $10,000 - $14,999.99 or less, and the remaining participants fell in-between these two income brackets. Twenty-seven participants did not provide any income information. Compliance rates for loneliness items administered at the end of the day were 63.33%. Of the participants, 100% reported SI at least on one day, 97% on five days, 93% on 10 days, and 82% at least on 20 days. For further details on the recruiting process, study procedure, and study compliance, see Tsypes et al. (2022).

The sample has been examined in previous papers with conceptually distinct foci (Kaurin, Dombrovski, et al., 2022a, 2022b, 2023; Kaurin et al., 2022; Tsypes et al., 2022). Together, these analyses revealed particularly strong positive associations between negative affect and suicidal ideation, and negative associations between positive affect and suicidal ideation. However, the remaining hypotheses using the related specific set of variables stated in this preregistration have not been tested or examined previously. The data used in this study were not collected specifically for this research; instead, they were derived from a broader study. As a result, the sampling approach and some of the measures employed in the broader study are not pertinent to the current analysis and are not detailed here.

Dispositional measures

BPD. Symptom severity of BPD was assessed with the Personality Assessment Inventory-Borderline Scale (PAI-BOR; Morey, 1991): The PAI-BOR assesses four BPD features

using six items per subscale: affective instability, identity problems, negative relationships and self-harm.

AMPD domains. The PID-5 is a 220-item self-rated personality trait assessment scale for adults aged 18 and older. These can be combined to yield indices of the five broader trait domains of Negative Affect, Detachment, Antagonism, Disinhibition, and Psychoticism. Reliability was excellent with Cronbach's alpha for each of the facets ranging from .94 to .96, results similar to previous publications (e.g., Fossati et al., 2013; Krueger et al., 2012; Roche et al., 2019). Each item asks the individual to rate how well the item describes them generally.

Momentary Assessments

Participants used the MetricWire smartphone application to complete a 21-day EMA protocol. During those days, participants were provided with a password-protected smartphone that prompted them for the random surveys 6 times per day within an approximately 12-h time window corresponding to the participants' typical waking hours, along with one additional end of day survey. The total number of participants in our study is $N = 153$ (i.e., Level 2 units; see section above for details on sample composition). Thus, based on a 21-day ambulatory assessment protocol, the maximum number of daily assessments in our sample is $N = 3213$ (i.e., Level 1 units). Level 1 units include daily average of the 6 ratings of SI and retrospective loneliness-ratings over the past 24 hours, summarized as an overall loneliness value. Participants were required to provide a minimum of two days of data to be included in analyses, to estimate both same-day and next-day associations.

Momentary Measures

Loneliness. To capture a broad range of the loneliness spectrum and eventually increase validity, loneliness was assessed via three items in the current study, with one item directly

targeting experiences of loneliness ("During the past 24 hours, how often did you feel lonely?"), and two items derived from the Revised UCLA Loneliness Scale (Russell et al., 1980 i.e., "During the past 24 hours, how often did you feel isolated?" UCLA-item 14; "During the past 24 hours, how often did you feel left out?", UCLA-item 11) at the end of each day. Participants rated their experiences on a 5-point Likert Scale ranging from "Never" to "Very often". Reliability shows good to excellent results with within-person omega = .96 and between-person omega = .84 for the three items lonely, isolated and left out is excellent. Total loneliness was calculated as the mean value from the three individual items.

Suicidal Ideation. SI was assessed with two dichotomous items (1 = yes, 0 = no) from the Columbia Suicide Severity Rating Scale (Posner et al., 2011): "Have you wished you were dead or wished you could go to sleep and not wake up?", "Have you had any thoughts of killing yourself?". These items were assessed six times per day and combined to form daily averages of SI for the purpose of the present study. For a more detailed understanding of the study protocol, additional details can be found elsewhere (Tsypes et al., 2022). Descriptives and correlations of the items are presented in Table 1.

Social interaction. Participants answered 6 times during the day whether an interpersonal interaction has taken place (yes/no).

Data Analysis

Repeatedly sampling loneliness and SI resulted in a hierarchical data structure: Daily loneliness assessments (within-person level) were nested within individuals (between-person level). To test our preregistered hypotheses, we employed multilevel structural equation modeling (MSEM; Sadikaj et al., 2021). MSEM can accommodate the nested data structure by partitioning the variability in daily ratings into between- and within-person variance. At each

level, MSEM could be used to examine associations among variables (Sadikaj et al., 2021). The between-person portion of the model estimated associations among individual differences in each observed variable, akin to coefficients derived from cross-sectional designs such as the correlation or regression path between how suicidal a person tended to be with how lonely they felt on average. In contrast, within-person associations reflected how strongly variables were dynamically coupled together as they fluctuated from day to day, offering a quantification as to whether loneliness might serve as a target for risk monitoring and therapy. MSEM further allowed estimation of random slopes (i.e., associations among daily variables that varied between individuals). The variability in those random slopes could be understood as another between-person variable that may be related to additional between-person variables, assessed outside the ambulatory assessment protocol (here, dispositional assessments of BPD features via the PAI-BOR). This framework allowed us to test whether daily deviations from a participant's mean level of daily loneliness tended to co-occur with deviations in their daily SI reports, and whether average levels of loneliness and SI as well as their respective within-person association were affected by individual differences in dispositional BPD features. Daily ratings of loneliness were operationalized as the mean score across the three loneliness items. Momentary ratings of SI were aggregated into daily means across the two SI items.

All models were estimated in Mplus with Bayesian parameter estimation (version Version 8.4; Muthén & Muthén, 2019). Missing data were assumed to be missing at random and accommodated using a Bayesian approach that used all available data in estimation: with increasingly large samples, it provides similar results to Full Information Maximum Likelihood to address missing data (Asparouhov & Muthén, 2010). Significance for all model parameters

was based on 95% Credibility Intervals (CIs), with CIs that excluded zero being indicative of a parameter that differed significantly from zero.

Covariates

Sex (0 = female; 1 = male) and age (centered on mean age) were included as covariates in all models at the between-person level, and day number (i.e., day centered on the mean of observations) as well as weekday vs. weekend were entered as within-person covariates. Along with other parameters not reported in the tables (e.g., residual variances), coefficients for covariates were not reported, but full specifications and detailed output from all models were uploaded at OSF (https://osf.io/u5nak/) and are posted further below (see "Code").

Test of preregistered hypotheses

Figure 1 provides a schematic overview of the estimated models, organized hypothesis by hypothesis. To test **H1a**, ratings of SI were regressed on concurrently assessed daily ratings of loneliness at the within-person level. At the between-person level, we examined individual differences in the association of person-average SI with person-average loneliness (test of **H2**). For within-person regressions, individual differences in the strength of the daily within-person associations (i.e., random slopes) were modeled. In **H1b**, the temporal precedence of the relationship between daily loneliness and daily SI was examined via *a full cross-lagged analysis*. In this model, the effects of current day loneliness on next day SI were examined and adjusted for current day SI and next-day loneliness. Code specifications for these models are provided in the supplemental materials.

In a second step, to test hypothesis 3, baseline measurements of BPD features as assessed via the PAI-BOR were introduced to the models specified above. More specifically, BPD features were added as predictors of individual differences in loneliness and SI, as well as

moderators of the concurrent (**H3a**) and lagged (**H3b**) within-person paths (i.e., cross-level interaction of the random slope). Regarding the cross-level interactions, regression coefficients denoted the extent to which the association of the daily diary variables depended on the severity of BPD traits. Code specifications and detailed output from all models can be found online (https://osf.io/u5nak/).

Exploratory analyses

Figure 2 provides a schematic overview of the estimated models for both sets of exploratory analyses. In a first set of analyses (Set A: Effects of interpersonal interactions on the link between loneliness and SI, i.e., situational constraints), we first tested in our baseline model whether social interaction (yes/no) was associated with SI and whether the experience of loneliness would mediate this association. To accomplish this aim, we examined three critical pathways on the within-person level: SI in response to social interaction (sc), experiences of loneliness in response to social interactions (sa) and SI in response to loneliness (sb). In a second model (i.e., the mediation model), we tested whether the strength of paths sa, sb and sc differ as a function of BPD features and, consequently, whether the mediation of the social interaction-SI relationship by loneliness depends on BPD features (i.e., cross-level moderated mediation). In another set of analyses (Set B: Assessing the moderating role of dimensionally assessed maladaptive personality traits), we used PID-5 assessed AMPD domains as cross-level moderator variables in five individual models (i.e., one per domain) as well as one model, accounting for the shared variance across domains.

Results

Within-Person Links Between Loneliness and SI

We found a significant contemporaneous link between loneliness and SI, corroborating H1a (Table 2, first within person-column). That is, on days when participants reported above average daily experiences of loneliness, they also tended to report more pronounced levels of SI. This effect was mirrored at the between-person level, such as individuals who generally tended to feel lonelier did also experience more SI in general (Table 2, first between person-column), confirming H2. We found a significant link between current day loneliness and next day SI, corroborating H1b (Table 2, within person-column four), but not vice versa. At the same time, the concurrent link between loneliness and SI remained significant, consistent with the temporal precedence of loneliness. That is, the lonelier participants felt on one day, the likelier it was that they would also experience SI the next day.

Impact of BPD on Loneliness and SI

Tests including BPD as a moderator revealed a significant association between loneliness and SI. BPD was positively linked to average experiences of loneliness, but not to SI (see Table 2 for details). Thus, individuals who reported higher levels of BPD features tended to feel lonelier. At the same time, BPD did not amplify the concurrent within-person link between loneliness and SI, not supporting H3a. BPD features significantly weakened the lagged association between current-day loneliness and next-day SI, contradicting H3b.

Sensitivity analyses

To probe the robustness of these effects, we performed several sensitivity analyses including tests of our hypotheses based on the subsample of attempters only, differential effects of distinct PAI-BOR scales, as well as those of single item momentary assessments of loneliness.

Overall, these analyses returned comparable patterns of findings and a detailed overview can be found in supplementary materials S1 to S7.

Exploratory Analyses

In a series of exploratory analyses, we tested in Set A whether and under which circumstances the link between daily interactions and SI could be accounted for by experiences of loneliness. We first tested whether the daily link between social interactions and SI was accounted for by loneliness. The results of this model are presented in the left column of Table 3. We found that the presence of social interactions was significantly negatively related to daily experiences of loneliness (path *sa*) on a between- and within-person level, and that loneliness was significantly positively linked to daily SI (path *sb*) between but not within persons. Social interaction and SI were not significantly related on a between- or within-person level. The indirect effect (ai*bi + ψab, where ψab = covariance of random effects ai and bi; Shrout & Bolger, 2002) was not significant either, nor did the *sc* path crossed the threshold for significance. Thus, although loneliness was associated with social interaction and SI, social interaction and SI were not related, which unsurprisingly led to non-significant results in terms of the mediation of loneliness of this association. In a next step, we tested whether BPD features moderated the paths of the within-person mediational model. Individual differences in the strength of paths *ai*, *bi*, and *ci* were regressed on BPD features, sex, and age, as were the intercepts of SI and loneliness. Coefficients from this model are displayed in the right column of Table 3. Results showed that loneliness and SI as well as BPD features and loneliness were significantly associated. Cross-level interactions were nonsignificant; however, BPD features did not amplify the strength of the above-mentioned paths. Thus, we found no evidence for

moderated mediation, where BPD features amplified the within-person links between social interaction, loneliness and SI.

In Set B, exploratory tests of the five AMPD domains (negative affect, detachment, antagonism, disinhibition, psychoticism) found no significant moderation of the concurrent or lagged association between loneliness and SI by AMPD dimensions (see Table 4).

Discussion

Consistent with previous research (Kleiman et al., 2017), we found that loneliness was linked to increased suicidal thoughts both on the same day (H1a) and the following day (H1b). However, our hypothesis that BPD features catalyze the transition from loneliness to SI was strongly non-supported, and as daily social interactions and SI were unrelated, loneliness could not account for any variance in the association between daily social interactions and SI, nor did BPD features amplify this connection.

BPD features were significantly associated with loneliness but not with SI. Thus, interpersonal dysfunction in the context of personality pathology appears to catalyze the earlier stages of the suicide process (i.e., emergence of loneliness) but not the transition to SI. Nevertheless, loneliness was associated with SI on the same day and its effect persisted until the following day. Thus, since the predictive value of loneliness appears to extend beyond a momentary context to a medium- to long-term context, BPD remains a significant risk factor in the development of SI. Yet, BPD features did not moderate the concurrent or lagged association between loneliness and SI. Conceivably, patterns of unstable relationships, self-perception, and emotions, coupled with impulsive behavior, all of which are characteristic for BPD can lead to a tolerance or habituation of experiences of loneliness, potentially lessening its direct impact on SI (Sagan, 2017). Thus, those with higher BPD traits may adapt to states of chronic loneliness,

resulting in fluctuations in suicidal ideation unrelated or inversely related to loneliness. Alternatively, in those with high BPD traits, aversive socio-emotional states, like loneliness, may be more transient or short-lived, lacking prolonged influence on SI and thus weakening the loneliness-suicidal ideation link.

Unsurprisingly, we found that average social interaction and average experiences of loneliness in our exploratory baseline model were negatively associated, as it has been reported in previous studies (Shrestha et al., 2024; Van Roekel et al., 2016). This means that fewer social interactions are associated with higher levels of loneliness, both between different individuals (between-level) and within the same individual (within-level). Additionally, there was a significant between-person association of loneliness and SI, indicating that individuals who generally experience more loneliness also report more SI. However, the relationship between concurrent loneliness and SI was not significant on a within-person level and loneliness did not mediate the relationship between social interactions and SI within individuals. In neither of our two exploratory models, social interaction was significantly associated with SI. This finding highlights that the subjective evaluation of social interactions and the resulting affective response (i.e., loneliness) is psychologically more meaningful and has higher predictive value for psychological outcomes than the objective presence of others (i.e., interactions yes/no; Hong et al., 2023; Ko, 2018; Kuczynski et al., 2022). These results are initially inconsistent with recent results evidencing that high average loneliness in individuals with a BPD diagnosis was prospectively related to SI (Allen et al., 2022). However, these findings are based on annual assessments over 30 years, thus underlining again the dynamic nature of loneliness and BPD. Furthermore, the extent of BPD features did not alter the relationships between social interactions, loneliness, and SI. This underlines the chronic experience of loneliness in

individuals with a BPD diagnosis that is represented in the moderately strong association between BPD features and loneliness. This might due to lower experiences of positive affect during social interaction in individuals with suicidality than those without (Hoffman et al., 2023). Thus, loneliness in individuals with a BPD diagnosis, might be a primarily internal state, closely related to chronic feelings of loneliness, that is independent of the external circumstances. Feelings of loneliness may be accompanied by to feelings of worthlessness or self-loathing, rather than interpersonal experience itself, suggesting that interventions directed at increasing social interactions may show little effect in BPD.

Overall, our preregistered study (https://osf.io/u5nak/) extends previous (predominantly cross-sectional, 'snapshot') research on the relevance of loneliness for suicide risk in BPD in several ways. We used an intensive longitudinal design to capture processes of interest in real-time and assess contexts that really matter to participants (Kaurin, King, et al., 2023). The sample in this study bears the advantage that it showed a high proportion of individuals with a history of suicide attempts. Because past suicide attempts represent one of the most reliable predictors of future suicide attempts (Black et al., 2004; Franklin et al., 2017), our sampling approach increased the likelihood of participants reporting SI during the study period. Moreover, our assessment of loneliness followed recent recommendations to use multi-item assessments to capture the construct of loneliness more adequately (i.e., feeling lonely, isolated, left out), as opposed to previous studies often employing a single item to assess loneliness (e.g., Kleiman et al., 2017; Mou et al., 2018; Mournet et al., 2022). Sensitivity analyses revealed that outcomes vary depending on the specific item used (see supplementary materials S2 to S5). Particularly, the term "left out" yielded non-significant results for all hypotheses, highlighting the need for a nuanced conceptualization and assessment of loneliness.

Despite these strengths, the present study has several limitations that provide directions for future research. First, we relied on self-report data (Brown, 2016), both for momentary assessments as well as assessments of BPD features, and shared method variance between variables. Including informant-reports of BPD features (Brown, 2016; Olino & Klein, 2015) could increase the validity of assessments. In a wide range of research, acquaintances' ratings have shown good predictive validity for real-life outcomes, across both normative and pathological personality traits (Kaurin et al., 2018; Oltmanns & Turkheimer, 2009). At the same time, self-reports of loneliness and SI capture subjective perception and aspects of conscious motivation that may be important in understanding the role of loneliness in SI.

Another limitation to consider is that loneliness was only measured once in the evening of each study day, which may have introduced retrospective biases by averaging over momentary shifts. Similarly, momentary endorsements of SI tended to be relatively low, though in the range of previously published work (e.g., Husky et al., 2014). Finally, our analyses are based on an adult sample. Loneliness is a natural aspect of adolescent growth, facilitating individuation and identity formation by granting autonomy and introspective opportunities (Laursen & Hartl, 2013; Majorano et al., 2015). At the same time, it also poses risks such as peer exclusion, victimization, and mental health problems (Boivin et al., 1995; Dunn & Sicouri, 2022; Oh et al., 2008) and particularly among those with pronounced experiences of rejection sensitivity (Kaurin et al., 2022). Adolescents tend to be hypersensitive to cues of social rejection (Foulkes & Blakemore, 2016; Kaurin, Do, et al., 2023; Kaurin et al., 2022; Sebastian et al., 2011; Tomova et al., 2021), while at the same time lacking mature coping mechanisms to deal with those experiences (Tomova et al., 2021). Thus, beyond aspects of the sampling scheme, another factor to consider

448 is the developmental context within which differential links may likely emerge due to socio-
449 cognitive maturation processes.

450 Conclusion

451 In individuals diagnosed with BPD, loneliness was consistently linked to increased SI
452 both on the same day and the next day. Overall, BPD features did not alter this link and there
453 was even weak evidence to suggest that BPD features attenuate the association between
454 loneliness and SI. Personality pathology seems to play a crucial role at the early onset of the
455 suicidal process, i.e., in the emergence of loneliness, which in turn, leads to SI. Future research is
456 needed to better qualify mechanisms that alter the loneliness-SI link in those diagnosed with
457 BPD such as testing opposed hypotheses of habituation to chronic experiences of loneliness vs.
458 transient or short-lived socio-emotional states in BPD lacking prolonged links to on SI.

References

Allen, T. A., Hallquist, M. N., Wright, A. G. C., & Dombrovski, A. Y. (2022). Negative affectivity and disinhibition as moderators of an interpersonal pathway to suicidal behavior in borderline personality disorder. *Clinical Psychological Science : A Journal of the Association for Psychological Science*, *10*(5), 856. https://doi.org/10.1177/21677026211056686

Asparouhov, T., & Muthén, B. (2010). *Bayesian analysis using Mplus: Technical implementation (Mplus Technical Report)*. http://statmodel.com/download/Bayes3.pdf

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Beutel, M. E., Klein, E. M., Brahler, E., Reiner, I., Junger, C., Michal, M., Wiltink, J., Wild, P. S., Munzel, T., Lackner, K. J., & Tibubos, A. N. (2017). Loneliness in the general population: prevalence, determinants and relations to mental health. *BMC Psychiatry*, *17*(1), 97. https://doi.org/10.1186/s12888-017-1262-x

Black, D. W., Blum, N., Pfohl, B., & Hale, N. (2004). Suicidal Behavior in Borderline Personality Disorder: Prevalence, Risk Factors, Prediction, and Prevention. *Journal of Personality Disorders*, *18*(3), 226–239. https://doi.org/10.1521/pedi.18.3.226.35445

Boivin, M., Hymel, S., & Bukowski, W. M. (1995). The roles of social withdrawal, peer rejection, and victimization by peers in predicting loneliness and depressed mood in childhood. *Development and Psychopathology*, *7*(4), 765–785. https://doi.org/10.1017/S0954579400006830

Bolger, N., & Laurenceau, J.-P. (2013). Intensive longitudinal methods: An introduction to diary and experience sampling research. In *Intensive longitudinal methods: An introduction to diary and experience sampling research.* Guilford Press.

Brown, A. (2016, July). Response distortions in self-reported and other-reported measures: Is there light at the end of the tunnel? *10th Conference of the International Test Commission (ITC)*.

Buecker, S., Horstmann, K. T., & Luhmann, M. (2023). Lonely Today, Lonely Tomorrow: Temporal Dynamics of Loneliness in Everyday Life and its Associations With Psychopathological Symptoms. *Https://Doi.Org/10.1177/19485506231156061*, *15*(2), 170–181. https://doi.org/10.1177/19485506231156061

Calati, R., Ferrari, C., Brittner, M., Oasi, O., Olié, E., Carvalho, A. F., & Courtet, P. (2019). Suicidal thoughts and behaviors and social isolation: A narrative review of the literature. *Journal of Affective Disorders*, *245*, 653–667. https://doi.org/10.1016/J.JAD.2018.11.022

Chu, C., Rogers, M. L., & Joiner, T. E. (2016). Cross-sectional and temporal association between non-suicidal self-injury and suicidal ideation in young adults: The explanatory roles of thwarted belongingness and perceived burdensomeness. *Psychiatry Res*, *246*, 573–580. https://doi.org/10.1016/j.psychres.2016.07.061

Cornwell, E. Y., & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, *50*(1), 31–48. https://doi.org/10.1177/002214650905000103

Dunn, C., & Sicouri, G. (2022). The Relationship Between Loneliness and Depressive Symptoms in Children and Adolescents: A Meta-Analysis. *Behaviour Change*, *39*(3), 134–145. https://doi.org/10.1017/BEC.2022.13

Fossati, A., Krueger, R. F., Markon, K. E., Borroni, S., & Maffei, C. (2013). Reliability and Validity of the Personality Inventory for DSM-5 (PID-5). *Http://Dx.Doi.Org/10.1177/1073191113504984*, *20*(6), 689–708. https://doi.org/10.1177/1073191113504984

Foulkes, L., & Blakemore, S. J. (2016). Is there heightened sensitivity to social reward in adolescence? *Current Opinion in Neurobiology*, *40*, 81–85. https://doi.org/10.1016/J.CONB.2016.06.016

Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., Musacchio, K. M., Jaroszewski, A. C., Chang, B. P., & Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological Bulletin*, *143*(2), 187–232. https://doi.org/10.1037/BUL0000084

Freilich, C. D., McGue, M., South, S. C., Roisman, G. I., & Krueger, R. F. (2024). Connecting loneliness with pathological personality traits: Evidence for genetic and environmental mediation from a study of older twins. *Personality Disorders*, *15*(1), 34–45. https://doi.org/10.1037/PER0000635

Gao, S., Assink, M., Cipriani, A., & Lin, K. (2017). Associations between rejection sensitivity and mental health outcomes: A meta-analytic review. *Clin Psychol Rev*, *57*, 59–74. https://doi.org/10.1016/j.cpr.2017.08.007

Glenn, C. R., Kleiman, E. M., Kandlur, R., Esposito, E. C., & Liu, R. T. (2022). Thwarted Belongingness Mediates Interpersonal Stress and Suicidal Thoughts: An Intensive Longitudinal Study with High-risk Adolescents. *J Clin Child Adolesc Psychol*, *51*(3), 295–311. https://doi.org/10.1080/15374416.2021.1969654

Groholt, B., Ekeberg, Ø., & Haldorsen, T. (2006). Adolescent suicide attempters: What predicts future suicidal acts? *Suicide and Life-Threatening Behavior*, *36*, 638–650. https://doi.org/10.1521/suli.2006.36.6.638

Gunderson, J. G. (2007). Disturbed relationships as a phenotype for borderline personality disorder. *The American Journal of Psychiatry*, *164*(11), 1637–1640. https://doi.org/10.1176/APPI.AJP.2007.07071125

Hadzic, A., Spangenberg, L., Hallensleben, N., Forkmann, T., Rath, D., Strauss, M., Kersting, A., & Glaesmer, H. (2019). The association of trait impulsivity and suicidal ideation and its fluctuation in the context of the Interpersonal Theory of Suicide. *Compr Psychiatry*, *98*, 152158. https://doi.org/10.1016/j.comppsych.2019.152158

Hoffman, S. N., Depp, C. A., & Taylor, C. T. (2023). Examining affective reactivity as a link between suicidality and social disconnection. *Journal of Psychiatric Research*, *157*, 271–275. https://doi.org/10.1016/J.JPSYCHIRES.2022.12.008

Holt-Lunstad, J. (2018). Why Social Relationships Are Important for Physical Health: A Systems Approach to Understanding and Modifying Risk and Protection. *Annu Rev Psychol*, *69*, 437–458. https://doi.org/10.1146/annurev-psych-122216-011902

Hong, J. H., Nakamura, J. S., Berkman, L. F., Chen, F. S., Shiba, K., Chen, Y., Kim, E. S., & VanderWeele, T. J. (2023). Are loneliness and social isolation equal threats to health and well-being? An outcome-wide longitudinal approach. *SSM - Population Health*, *23*, 101459. https://doi.org/10.1016/J.SSMPH.2023.101459

Hopwood, C. J. (2018). Interpersonal Dynamics in Personality and Personality Disorders. *European Journal of Personality*, *32*(5), 499–524. https://doi.org/10.1002/PER.2155

Husky, M. M., Olié, E., Guillaume, S., Genty, C., Swendsen, J., & Courtet, P. (2014). Feasibility and validity of ecological momentary assessment in the investigation of suicide risk. *Psychiatry Research*, *220*, 564–570. https://api.semanticscholar.org/CorpusID:25512706

Jobes, D. A., Mandel, A. A., Kleiman, E. M., Bryan, C. J., Johnson, S. L., & Joiner, T. E. (2024). Facets of Suicidal Ideation. *Archives of Suicide Research*, 1–16. https://doi.org/10.1080/13811118.2023.2299259

Joiner, T. (2005). *Why people die by suicide*. Harvard University Press.

Kaurin, A., Beeney, J. E., Stepp, S. D., Scott, L. N., Woods, W. C., Pilkonis, P. A., & Wright, A. G. C. (2020). Attachment and Borderline Personality Disorder: Differential Effects on Situational Socio-Affective Processes. *Affective Science*, *1*(3), 117. https://doi.org/10.1007/S42761-020-00017-7

559 Kaurin, A., Do, Q. B., Ladouceur, C. D., Silk, J. S., & Wright, A. G. C. (2023). Daily
560 Manifestations of Caregiver- and Self-Reported Maladaptive Personality Traits in
561 Adolescent Girls. *Personality Disorders: Theory, Research, and Treatment*, *14*(5), 490–
562 500. https://doi.org/10.1037/PER0000625

563 Kaurin, A., Dombrovski, A. Y., Hallquist, M. N., & Wright, A. G. C. (2022a). Integrating a
564 functional view on suicide risk into idiographic statistical models. *Behav Res Ther*, *150*,
565 104012. https://doi.org/10.1016/j.brat.2021.104012

566 Kaurin, A., Dombrovski, A. Y., Hallquist, M. N., & Wright, A. G. C. (2022b). Momentary
567 interpersonal processes of suicidal surges in borderline personality disorder. *Psychol Med*,
568 *52*(13), 2702–2712. https://doi.org/10.1017/s0033291720004791

569 Kaurin, A., Dombrovski, A. Y., Hallquist, M. N., & Wright, A. G. C. (2023). Suicidal urges and
570 attempted suicide at multiple time scales in borderline personality disorder. *Journal of*
571 *Affective Disorders*, *329*, 581–588. https://doi.org/10.1016/J.JAD.2023.02.034

572 Kaurin, A., Hisler, G., Dombrovski, A. Y., Hallquist, M. N., & Wright, A. G. C. (2022). Sleep
573 and next-day negative affect and suicidal ideation in borderline personality disorder.
574 *Personality Disorders*, *13*(2), 160–170. https://doi.org/10.1037/PER0000496

575 Kaurin, A., King, K. M., & Wright, A. G. C. (2023). Studying personality pathology with
576 ecological momentary assessment: Harmonizing theory and method. *Personality Disorders*,
577 *14*(1), 62–72. https://doi.org/10.1037/PER0000596

578 Kaurin, A., Sauerberger, K. S., & Funder, D. C. (2018). Associations between informant ratings
579 of personality disorder traits, self-reports of personality, and directly observed behavior.
580 *Journal of Personality*, *86*(6), 1078–1101. https://doi.org/10.1111/JOPY.12376

581 Kaurin, A., Sequeira, S. L., Ladouceur, C. D., McKone, K. M. P., Rosen, D., Jones, N., Wright,
582 A. G. C., & Silk, J. S. (2022). Modeling Sensitivity to Social Threat in Adolescent Girls: A
583 Psychoneurometric Approach. *Journal of Psychopathology and Clinical Science*, *131*(6),
584 641. https://doi.org/10.1037/ABN0000532

585 Kleiman, E. M., Turner, B. J., Fedor, S., Beale, E. E., Huffman, J. C., & Nock, M. K. (2017).
586 Examination of real-time fluctuations in suicidal ideation and its risk factors: Results from
587 two ecological momentary assessment studies. *J Abnorm Psychol*, *126*(6), 726–738.
588 https://doi.org/10.1037/abn0000273

589 Klonsky, E. D., Saffer, B. Y., & Bryan, C. J. (2018). Ideation-to-action theories of suicide: a
590 conceptual and empirical update. *Current Opinion in Psychology*, *22*, 38–43.
591 https://doi.org/10.1016/J.COPSYC.2017.07.020

Ko, Y. G. (2018). Feeling lonely when not socially isolated: Social isolation moderates the association between loneliness and daily social interaction. *Journal of Social and Personal Relationships*, *35*(10), 1340–1355. https://doi.org/10.1177/0265407517712902/ASSET/IMAGES/LARGE/10.1177_0265407517712902-FIG1.JPEG

Krueger, R. F., Derringer, J., Markon, K. E., Watson, D., & Skodol, A. E. (2012). Initial construction of a maladaptive personality trait model and inventory for DSM-5. *Psychol Med*, *42*(9), 1879–1890. https://doi.org/10.1017/s0033291711002674

Kuczynski, A. M., Halvorson, M. A., Slater, L. R., & Kanter, J. W. (2022). The effect of social interaction quantity and quality on depressed mood and loneliness: A daily diary study. *Journal of Social and Personal Relationships*, *39*(3), 734–756. https://doi.org/10.1177/02654075211045717/ASSET/IMAGES/LARGE/10.1177_02654075211045717-FIG2.JPEG

Kunz, J. I., Frey, A., Bertsch, K., Barton, B. B., Blei, L., Schirle, H. M., Konvalin, F., Jobst, A., Musil, R., Padberg, F., & Reinhard, M. A. (2023). Loneliness Is Associated With Lower Self- and Clinician-Rated Levels of Personality Functioning. *Journal of Personality Disorders*, *37*(6), 724–740. https://doi.org/10.1521/PEDI.2023.37.6.724

Labonté, L. E., & Kealy, D. (2023). Understanding loneliness: The roles of self- and interpersonal dysfunction and early parental indifference. *Https://Doi.Org/10.1521/Bumc.2023.87.3.266*, *87*(3), 266–290. https://doi.org/10.1521/BUMC.2023.87.3.266

Laursen, B., & Hartl, A. C. (2013). Understanding loneliness during adolescence: developmental changes that increase the risk of perceived social isolation. *Journal of Adolescence*, *36*(6), 1261–1268. https://doi.org/10.1016/J.ADOLESCENCE.2013.06.003

Liebke, L., Bungert, M., Thome, J., Hauschild, S., Gescher, D. M., Schmahl, C., Bohus, M., & Lis, S. (2017). Loneliness, social networks, and social functioning in borderline personality disorder. *Personal Disord*, *8*(4), 349–356. https://doi.org/10.1037/per0000208

Majorano, M., Musetti, A., Brondino, M., & Corsano, P. (2015). Loneliness, Emotional Autonomy and Motivation for Solitary Behavior During Adolescence. *Journal of Child and Family Studies*, *24*(11), 3436–3447. https://doi.org/10.1007/S10826-015-0145-3/METRICS

McClelland, H., Evans, J. J., Nowland, R., Ferguson, E., & O'Connor, R. C. (2020). Loneliness as a predictor of suicidal ideation and behaviour: a systematic review and meta-analysis of prospective studies. *J Affect Disord*, *274*, 880–896. https://doi.org/10.1016/j.jad.2020.05.004

Morey, L. C. (1991). Personality assessment screener. *Psychological Assessment Resources.*

Mou, D., Kleiman, E. M., Fedor, S., Beck, S., Huffman, J. C., & Nock, M. K. (2018). Negative affect is more strongly associated with suicidal thinking among suicidal patients with borderline personality disorder than those without. *J Psychiatr Res*, *104*, 198–201. https://doi.org/10.1016/j.jpsychires.2018.08.006

Mournet, A. M., Kellerman, J. K., Yeager, A. L., Rosen, R. L., Kim, J. S., & Kleiman, E. M. (2022). Daily-level assessment of the contexts under which seeking social support relates to risk of suicidal thinking. *Suicide Life Threat Behav*, *52*(6), 1159–1167. https://doi.org/10.1111/sltb.12911

Muthén, L. K., & Muthén, B. O. (2019). *Mplus User's Guide.* (Eighth ed.). Muthén & Muthén.

Nenov-Matt, T., Barton, B. B., Dewald-Kaufmann, J., Goerigk, S., Rek, S., Zentz, K., Musil, R., Jobst, A., Padberg, F., & Reinhard, M. A. (2020). Loneliness, Social Isolation and Their Difference: A Cross-Diagnostic Study in Persistent Depressive Disorder and Borderline Personality Disorder. *Frontiers in Psychiatry*, *11*, 608476. https://doi.org/10.3389/FPSYT.2020.608476/BIBTEX

Oh, W., Rubin, K. H., Bowker, J. C., Booth-LaForce, C., Rose-Krasnor, L., & Laursen, B. (2008). Trajectories of Social Withdrawal from Middle Childhood to Early Adolescence. *Journal of Abnormal Child Psychology*, *36*(4), 553. https://doi.org/10.1007/S10802-007-9199-Z

Olino, T. M., & Klein, D. N. (2015). Psychometric Comparison of Self- and Informant-Reports of Personality. *Assessment*, *22*(6), 655–664. https://doi.org/10.1177/1073191114567942

Oltmanns, T. F., & Turkheimer, E. (2009). Person perception and personality pathology. *Current Directions in Psychological Science*, *18*(1), 32–36. https://doi.org/10.1111/J.1467-8721.2009.01601.X

Park, C., Majeed, A., Gill, H., Tamura, J., Ho, R. C., Mansur, R. B., Nasri, F., Lee, Y., Rosenblat, J. D., Wong, E., & McIntyre, R. S. (2020). The Effect of Loneliness on Distinct Health Outcomes: A Comprehensive Review and Meta-Analysis. *Psychiatry Res*, *294*, 113514. https://doi.org/10.1016/j.psychres.2020.113514

Parrish, E. M., Chalker, S. A., Cano, M., Moore, R. C., Pinkham, A. E., Harvey, P. D., Joiner, T., Lieberman, A., Granholm, E., & Depp, C. A. (2021). Ecological momentary assessment of interpersonal theory of suicide constructs in people experiencing psychotic symptoms. *J Psychiatr Res*, *140*, 496–503. https://doi.org/10.1016/j.jpsychires.2021.06.022

Perlman, D., Peplau, L. A., & Peplau, L. (1984). Loneliness research: A survey of empirical findings. In Preventing the harmful consequences of severe and persistent loneliness. *U.S. Government Printing Office.*, 13–46.

Posner, K., Brown, G. K., Stanley, B., Brent, D. A., Yershova, K. V, Oquendo, M. A., Currier, G. W., Melvin, G. A., Greenhill, L., Shen, S., & Mann, J. J. (2011). The Columbia-Suicide Severity Rating Scale: initial validity and internal consistency findings from three multisite studies with adolescents and adults. *Am J Psychiatry*, *168*(12), 1266–1277. https://doi.org/10.1176/appi.ajp.2011.10111704

Rath, D., de Beurs, D., Hallensleben, N., Spangenberg, L., Glaesmer, H., & Forkmann, T. (2019). Modelling suicide ideation from beep to beep: Application of network analysis to ecological momentary assessment data. *Internet Interv*, *18*, 100292. https://doi.org/10.1016/j.invent.2019.100292

Reinhard, M. A., Nenov-Matt, T., & Padberg, F. (2022). Loneliness in Personality Disorders. *Curr Psychiatry Rep*, *24*(11), 603–612. https://doi.org/10.1007/s11920-022-01368-7

Roche, M. J., Pincus, A. L., & Cole, P. E. (2019). Linking dimensions and dynamics in psychopathology research: An example using DSM-5 instruments. *Journal of Research in Personality*, *82*, 103852. https://doi.org/10.1016/J.JRP.2019.103852

Rogers, M. L., & Joiner Jr., T. E. (2016). Borderline Personality Disorder Diagnostic Criteria as Risk Factors for Suicidal Behavior Through the Lens of the Interpersonal Theory of Suicide. *Arch Suicide Res*, *20*(4), 591–604. https://doi.org/10.1080/13811118.2016.1158681

Rönkä, A. R., Taanila, A., Rautio, A., & Sunnari, V. (2018). Multidimensional and fluctuating experiences of loneliness from childhood to young adulthood in Northern Finland. *Advances in Life Course Research*, *35*, 87–102. https://doi.org/10.1016/J.ALCR.2018.01.003

Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, *39*, 472–480. https://doi.org/10.1037/0022-3514.39.3.472

Sadikaj, G., Moskowitz, D. S., Russell, J. J., Zuroff, D. C., & Paris, J. (2013). Quarrelsome behavior in borderline personality disorder: influence of behavioral and affective reactivity to perceptions of others. *J Abnorm Psychol*, *122*(1), 195–207. https://doi.org/10.1037/a0030871

Sadikaj, G., Wright, A. G. C., Dunkley, D. M., Zuroff, D. C., & Moskowitz, D. S. (2021). Multilevel structural equation modeling for intensive longitudinal data: A practical guide for personality researchers. *The Handbook of Personality Dynamics and Processes*, 855–885. https://doi.org/10.1016/B978-0-12-813995-0.00033-9

Sagan, O. (2017). The loneliness of personality disorder: A phenomenological study. *Mental Health and Social Inclusion*, *21*(4), 213–221. https://doi.org/10.1108/MHSI-04-2017-0020/FULL/XML

Schermer, J. A., Colodro-Conde, L., Grasby, K. L., Hickie, I. B., Burns, J., Ligthart, L., Willemsen, G., Trull, T. J., Martin, N. G., & Boomsma, D. I. (2020). Genetic and Environmental Causes of Individual Differences in Borderline Personality Disorder Features and Loneliness are Partially Shared. *Twin Res Hum Genet*, *23*(4), 214–220. https://doi.org/10.1017/thg.2020.62

Schulze, A., Streit, F., Zillich, L., Awasthi, S., Hall, A. S. M., Jungkunz, M., Kleindienst, N., Frank, J., Schwarze, C. E., Dahmen, N., Schott, B. H., Nöthen, M., Mobascher, A., Rujescu, D., Lieb, K., Roepke, S., Herpertz, S. C., Schmahl, C., Bohus, M., … Witt, S. (2023). Evidence for a shared genetic contribution to loneliness and borderline personality disorder. *Translational Psychiatry*, *13*(1). https://doi.org/10.1038/S41398-023-02705-X

Sebastian, C. L., Tan, G. C. Y., Roiser, J. P., Viding, E., Dumontheil, I., & Blakemore, S. J. (2011). Developmental influences on the neural bases of responses to social rejection: implications of social neuroscience for education. *NeuroImage*, *57*(3), 686–694. https://doi.org/10.1016/J.NEUROIMAGE.2010.09.063

Shrestha, S., Sigdel, K., Pokharel, M., & Columbus, S. (2024). Big Five traits predict between- and within-person variation in loneliness. *Https://Doi.Org/10.1177/08902070241239834*. https://doi.org/10.1177/08902070241239834

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*(4), 422–445. https://doi.org/10.1037/1082-989X.7.4.422

Skaug, E., Czajkowski, N. O., Waaktaar, T., & Torgersen, S. (2022). The role of sense of coherence and loneliness in borderline personality disorder traits: a longitudinal twin study. *Borderline Personality Disorder and Emotion Dysregulation*, *9*(1), 1–12. https://doi.org/10.1186/S40479-022-00190-0/FIGURES/1

Tomova, L., Andrews, J. L., & Blakemore, S. J. (2021). The importance of belonging and the avoidance of social risk taking in adolescence. *Developmental Review*, *61*, 100981. https://doi.org/10.1016/J.DR.2021.100981

Trakhtenbrot, R., Gvion, Y., Levi-Belz, Y., Horesh, N., Fischel, T., Weiser, M., Treves, I., & Apter, A. (2016). Predictive value of psychological characteristics and suicide history on medical lethality of suicide attempts: A follow-up study of hospitalized patients. *Journal of Affective Disorders*, *199*, 73–80. https://doi.org/10.1016/j.jad.2016.03.054

Tsypes, A., Kaurin, A., Wright, A. G. C., Hallquist, M. N., & Dombrovski, A. Y. (2022). Protective effects of reasons for living against suicidal ideation in daily life. *J Psychiatr Res*, *148*, 174–180. https://doi.org/10.1016/j.jpsychires.2022.01.060

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner Jr., T. E. (2010). The interpersonal theory of suicide. *Psychol Rev*, *117*(2), 575–600. https://doi.org/10.1037/a0018697

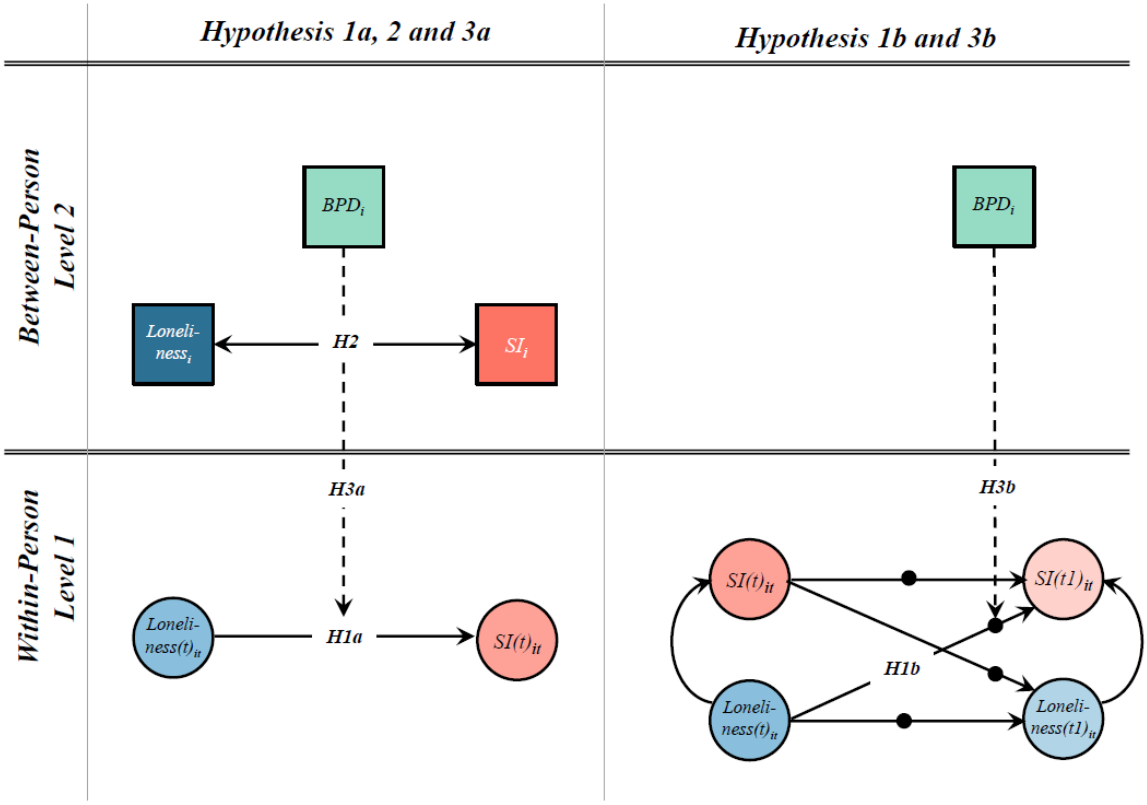
Van Roekel, E., Verhagen, M., Engels, R. C. M. E., Scholte, R. H. J., Cacioppo, S., & Cacioppo, J. T. (2016). *Trait and State Levels of Loneliness in Early and Late Adolescents: Examining the Differential Reactivity Hypothesis*. https://doi.org/10.1080/15374416.2016.1146993

Watson, J., & Nesdale, D. (2012). *Rejection Sensitivity, Social Withdrawal, and Loneliness in Young Adults*. https://doi.org/10.1111/j.1559-1816.2012.00927.x

Wright, A. G. C., Ringwald, W. R., Hopwood, C. J., & Pincus, A. L. (2022). It's time to replace the personality disorders with the interpersonal disorders. *The American Psychologist*, *77*(9), 1085–1099. https://doi.org/10.1037/AMP0001087

Figure 1.

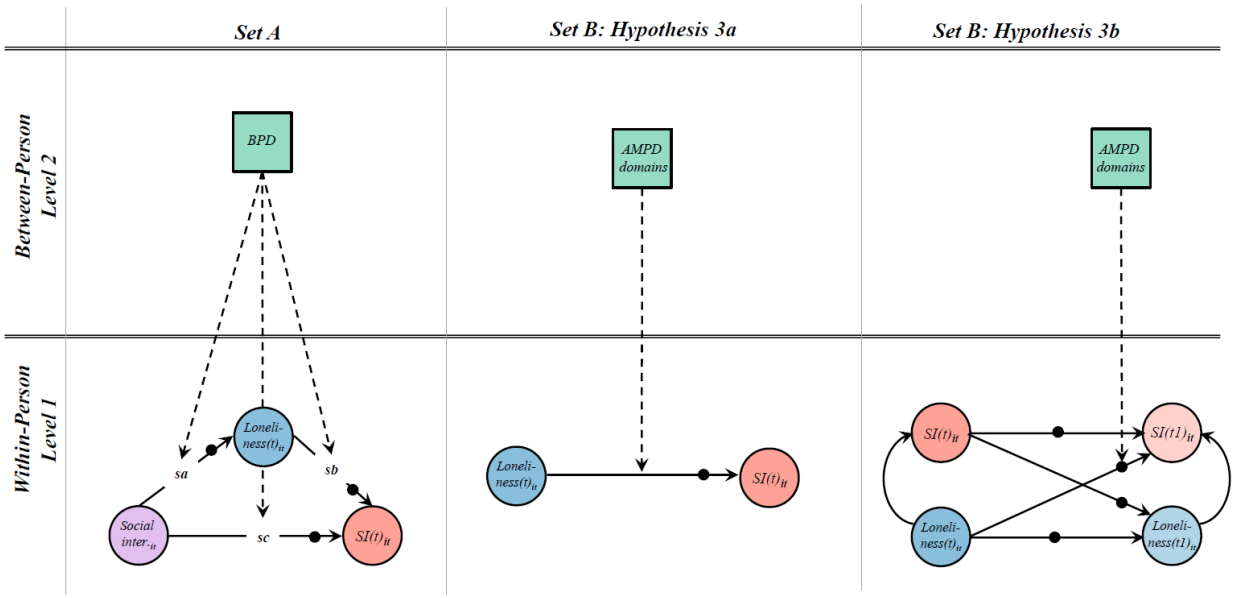
Overview of the Model Specifications for Planned Analyses to Test Preregistered Hypotheses. Including Decomposition of Observed Daily Variables Into Between- (Subscript i) and Within- (Subscript t) Variance.



Note. All models controlled for age and gender at the between-person level, for time and weekday at the within-person level. Filled dots represent random effects. BPD=borderline personality disorder; SI=suicidal ideation; t=same day; t1=next day.

Figure 2.

Overview of the Model Specifications for Both Sets of Planned Exploratory Analyses. Including Decomposition of Observed Daily Variables Into Between- (Subscript i) and Within- (Subscript t) Variance.



Note. All models controlled for age and gender at the between-person level, for time and weekday at the within-person level. Filled dots represent random effects. BPD=borderline personality disorder; AMPD domains=DSM-5 alternative model of personality disorder domains (all of the five domains negative affect, detachment, antagonism, disinhibition, psychoticism were assessed separately in five individual models (i.e., one per domain) as well as in one model,); SI=suicidal ideation; Social inter.=social interaction; t=same day; t1=next day.

Table 1

Correlations Among Study Variables at Within- and Between-Person Levels

	1 loneliness total	**2** lonely	**3** isolated	**4** left out	**5** SI	**6** BPD
1	**1**				**.28**	**.47**
2		**1**	**.93**	**.83**	**.29**	**.45**
3		**.72**	**1**	**.90**	**.23**	**.48**
4		**.55**	**.58**	**1**	**.25**	**.49**
5	**.13**	**.11**	**.13**	**.10**	**1**	.03
6	**-**	**-**	**-**	**-**	**-**	**1**
M	2.82	2.99	2.85	2.62	0.15	49.96
SD	1.00	1.05	1.04	1.08	0.37	9.24
ICC	.59	.54	.53	.55	.54	-

Note. N=153 (*between*), N=2993 (*within*); SI=suicidal ideation; BPD=borderline personality disorder; values below the diagonal represent within-person coefficients, and values above the diagonal represent between-person coefficients. Values in bold are those for which the credibility interval did not contain zero.

Table 2

Key Standardized Coefficients from Multilevel Structural Equation Models Predicting Suicidal Ideation from Loneliness and Prediction by Borderline Personality Traits

	H1a		H1b		H3a		H3b	
within-person	β	CI	β	CI	β	CI	β	CI
loneliness(t)→SI(t)	**.25**	**.06; .43**	**.17**	**.13; .21**	**.22**	**.04;.42**	**.17**	**.12; .21**
loneliness(t+1)→SI(t+1)	-	-	**.13**	**.08; .17**	-	-	**.12**	**.07; .17**
loneliness(t)→SI(t+1)	-	-	**.24**	**.04; .45**	-	-	**.24**	**.03; .43**
SI(t)→loneliness(t+1)	-	-	.00	-.06; .05	-	-	.01	-.04; .06
loneliness(t)→loneliness(t+1)	-	-	**.32**	**.25; .39**	-	-	**.31**	**.24; .38**
SI(t)→SI(t+1)	-	-	**.28**	**.24; .32**	-	-	**.28**	**.23; .31**
between-person								
loneliness(t)↔SI(t)	**.29**	**.11; .43**	**.23**	**.05; .38**	**.30**	**.12; .45**	**.22**	**.05; .38**
BPD→loneliness(t)	-	-	-	-	**.48**	**.33; .60**	**.46**	**.32; .59**
BPD→SI[1]	-	-	-	-	.05	-.11; .20	-.03	-.09; .01
BPD→random slope[2]	-	-	-	-	-.01	-.19; .18	**-.18**	**-.35; -.01**

Note. Total: *N*=153 (*between*), *N*=2993 (*within*); → indicates regression; ↔ indicates association; BPD=borderline personality disorder; SI=suicidal ideation; t=same day; t+1=next day. Model parameter estimates are standardized. Bolded values indicate that 95% credibility interval of parameter estimates (CI) does not contain zero.

[1] SI (t) for Hypothesis 3a; SI (t+1) for Hypothesis 3b.

[2] Loneliness(t)→SI(t) for Hypothesis 3a; Loneliness(t)→SI(t+1) for Hypothesis 3b.

Table 3

Exploratory Model Set A: Moderation of the association between social interaction, loneliness and suicidal ideation by BPD.

	Baseline Model		**Moderation Model**	
	β	CIs	β	CIs
between-person				
social interaction$_i$→SI$_i$	-.08	-.27; .11	-.07	-.26; .13
loneliness$_i$→SI$_i$	**.30**	**.12; .46**	**.30**	**.13; .47**
social interaction$_i$→loneliness$_i$	**-.19**	**-.37; -.01**	-.17	-.35; .02
BPD→SI$_i$	-	-	.04	-.12; .21
BPD→social interaction$_i$	-	-	-.09	-.26; .09
BPD→loneliness$_i$	-	-	**.47**	**.32; .59**
within-person				
sa (social interaction$_{it}$→loneliness$_{it}$)	**-1.07**	**-2.13; -.03**	.09	-1.89; 2.00
sb (loneliness$_{it}$→SI$_{it}$)	.31	-.38; .96	.28	-.99; 1.49
sc (social interaction$_{it}$→SI$_{it}$)	.13	-.72; .96	-.28	-1.97; 1.47
indirect effect (ψab)	-.04	-.18; .04	-.01	-.22; .17
cross-level interaction (moderation)				
BPD→sa	-	-	-.19	-.46; .10
BPD→sb	-	-	-.01	-.19; .18
BPD→sc	-	-	.07	-.19; .33

Note. Except for the indirect effect CIs refer to standardized βs which allow comparability across coefficients, while unstandardized coefficients allow to interpret intercepts of our models. Person-level: *N*=153 (*between*), *N*=2993 (*within*); BPD=borderline personality disorder features; SI=suicidal ideation; Values in bold are those for which the credibility interval did not contain zero.

Table 4

Exploratory Model Set B: Moderation of The Association Between Loneliness and SI (Concurrent and Lagged) by AMPD Domains Assessed Via PID-5.

	NA		DET		ANT		DIS		PSY	
	β	CI	β	CI	β	CI	β	CI	β	CI
H3a										
within-person										
loneliness(t)→SI(t)	**.11**	**.07;.15**	**.11**	**.07;.15**	**.11**	**.07;.15**	**.11**	**.07;.15**	**.11**	**.07;.15**
between-person										
PID5→loneliness(t)	.08	-.10;.25	.13	-.05;.30	-.06	-.24;.10	.12	-.07;.28	.05	-.14;.21
PID5→SI(t)	-.07	-.21;.11	-.05	-.20;.12	-.05	-.19;.12	.07	-.22,.10	-.05	-.20;.12
PID5→random slope	-.05	-.23;.13	-.05	-.19;.15	-.04	-.22;.14	-.01	-.20;.16	-.03	-.22;.15
H3b										
within-person										
loneliness(t)→SI(t+1)	**.06**	**.02;.10**	**.06**	**.01;.10**	**.06**	**.02;.10**	**.06**	**.02;.10**	**.06**	**.02;.10**
between-person										
PID5→loneliness(t)	.12	-.06;.28	.17	-.03;.33	-.04	-.21;.11	.04	-.17;.24	.08	-.11; .23
PID5→SI(t+1)	.00	-.05;.03	.01	-.03;.03	.00	-.04;.03	.16	-.03,.32	.00	-.04; .02
PID5→random slope	.02	-.17;.23	-.02	-.20;.17	.02	-.20;.22	.00	-.04;.03	.03	-.17; .23

Note. Total: *N*=153 (*between*), *N*=2993 (*within*); → indicates regression; NA=AMPD domain negative affect; DET=AMPD domain detachment; ANT=AMPD domain antagonism; DIS=AMPD domain disinhibition; PSY=AMPD domain psychoticism; PID5=AMPD domain assessed via PID-5; SI=suicidal ideation; t=same day; t+1=next day. Model parameter estimates are standardized. Bolded values indicate that 95% credibility interval of parameter estimates (CI) does not contain zero.