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Suicide and Life-Threatening BEHAVIOR

ORIGINAL ARTICLE

Attachment, loneliness, and social connection as prospective predictors of suicidal ideation during the COVID-19 pandemic: A relational diathesis-stress experience sampling study

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Abstract

Introduction: Concerns about the impact of the COVID-19 pandemic on mental health have led to efforts to understand how pandemic-specific factors, such as decreased social contact during periods of social distancing, may relate to suicide risk. The present study evaluated personality-based risk factors and frequency of social contact as prospective predictors of suicidal ideation (SI) during the pandemic.

Methods: We tested a relational diathesis-stress model of suicide focusing on insecure attachment, trait loneliness, and social contact as predictors of SI, using twice-weekly survey data collected via smartphone from a community sample ($n = 184$) over 8 weeks.

Results: Multilevel modeling showed that both trait loneliness and anxious attachment predicted the prospective development of SI during the study period. Reduced in-person contact, but not remote contact, was proximally associated with increased SI. Participants with high attachment avoidance were more likely to develop SI in the context of reduced daily in-person contact compared to participants without these traits.

Conclusion: Findings support a relational diathesis-stress model of suicide risk during the pandemic, showing that dispositional traits related to emotional connection with others predicted the relative salience of reduced social contact as a proximal risk factor for SI.

KEYWORDS

attachment, experience sampling, general population, loneliness, SARS-CoV-2, social contact, suicide

The data that support the findings of this study are available from the corresponding author upon reasonable request.

INTRODUCTION

The toll of the COVID-19 pandemic on mental health has been a major focus of empirical study since the pandemic was declared in the United States in March of 2020 (Holmes et al., 2020). While early position papers raised concerns about potential increases in suicide rates during the pandemic (Gunnell et al., 2020; Sher, 2020), recent reports have instead indicated that overall rates of death by suicide declined in 2020 compared to prior years, though understanding of this trend remains complicated and differs based on certain demographic factors (Ahmad & Anderson, 2021). Despite evidence of an overall decline in suicide-related deaths, several studies have reported increased rates of suicidal ideation (SI) and calls to crisis centers since the start of the pandemic compared to prior years (Ammerman et al., 2021; Czeisler et al., 2020; Jackson, 2020). Risk factors for suicide during the pandemic have included those that are at least superficially related to the pandemic itself (e.g., preoccupation with news about COVID-19 [Lee, 2020]), as well as those with prior empirical support that may have been exacerbated by pandemic-related circumstances (e.g., increased depression and loneliness following prolonged separation from friends and loved ones [Killgore et al., 2020]).

In part due to its status as a well-known risk factor for suicide, loneliness was identified during the early stages of the pandemic as a major public health concern (Holmes et al., 2020). Evidence emerging from large multinational studies has shown that experiences of loneliness increased substantially during the pandemic (Varga et al., 2021), though individual differences in personality traits and pre-pandemic social connectedness are thought to play an important role in vulnerability to loneliness during this period (Kovacs et al., 2021; Rosenstreich et al., 2020). Rosenstreich et al. (2020) found that individuals with high trait loneliness at the start of the pandemic were more likely to prospectively report greater loneliness than those initially reporting low to moderate levels. In consideration of diathesis-stress models of psychopathology, such findings raise interesting questions regarding the interactive role of pandemic-related conditions (such as reduced social contact) and more enduring dispositional factors, such as personality traits, in predicting risk for adverse mental health outcomes such as suicidal ideation.

Loneliness has long been associated with suicide risk, either directly as a dispositional factor (Stickley & Koyanagi, 2016) or indirectly as a mediator of other risk indicators, such as attachment style (Levi-Belz et al., 2013), trauma history (Cao et al., 2020), and severity of psychopathology (Gallagher et al., 2014). Surprisingly, evidence supporting the relevance of loneliness as a "state" or precipitating factor for suicidality has been less robust (e.g., Kleiman et al., 2017; McClelland et al., 2020). Most contemporary scholarship on the construct of loneliness distinguishes it from more objective measures of social connectedness, such as frequency of social contact (Weiss, 1987), emphasizing its primary role as an affective signal that emotional needs are not being met through current relationships (e.g., Cacioppo & Hawkley, 2009). The association between social contact and feelings of loneliness is thought to be impacted by dispositional factors such as attachment style (Allbaugh et al., 2018; Bowlby, 1980; Weiss, 1987), suggesting that general preferences and attitudes regarding ones' social environment may influence the degree to which an absence of social contact contributes to feelings of loneliness and distress.

Attachment theory provides a comprehensive and widely used framework for understanding how early developmental experiences influence later relational attitudes, motivations, and interpersonal behaviors. Attachment theory posits that the quality of early relational bonds with caregivers interacts with infant temperament to support the development of emotion regulation capacities and social behaviors in adolescence and adulthood. Insecure attachment emerges when caregivers are inconsistent or absent in their emotional availability (Bowlby, 1980), with insecure traits manifesting behaviorally through excessive reassurance-seeking or overreliance on relationships for emotional stability (as in anxious attachment, representing an over-activation of the attachment system), or through avoidance of emotional intimacy in close relationships (as in avoidant attachment, representing an under-activation of the attachment system; Mikulincer & Shaver, 2007). Like loneliness, both anxious and avoidant attachment dynamics emerge within the context of unmet emotional needs in primary relationships, though this conceptualization is extended in attachment theory to include both behavioral and motivational considerations for how individuals navigate their relational environment to achieve emotional security and self-regulation, particularly during periods of adversity and stress (Shaver & Mikulincer, 2009).

Both anxious and avoidant attachment traits have been associated with higher trait loneliness as well as increased risk for suicidal thoughts and behaviors (Falgares et al., 2017; Green et al., 2020; Levi-Belz et al., 2013; Sheftall et al., 2014). More recently, loneliness and insecure attachment have each been found to predict a range of adverse mental health outcomes during the COVID-19 pandemic. Anxious attachment traits, for example, have been found in multiple studies to predict greater psychological distress during the early stages of the pandemic (Moccia et al., 2020; Segal et al., 2021). Using a large multinational sample, Kafetsios (2021) found that culture-level avoidant and anxious attachment traits predicted differential trajectories of pandemic-related health outcomes, with the

former predicting higher initial COVID-19 infection and mortality rates and the latter predicting higher growth rates of infections and deaths over time. In the context of social distancing during the COVID-19 pandemic, it is possible that both higher trait loneliness and insecure attachment may serve as dispositional risk factors ("diatheses") that increase the salience of low social contact as a precipitating factor ("stress") for suicidal ideation (Rubinstein, 1986; Van Heeringen, 2012). Individuals with more prominent anxious attachment traits, for example, may find that the limitations placed on interpersonal contact due to social distancing exacerbate suicidal distress, as typical coping strategies involving proximity-seeking become less available (Green et al., 2020; Shaver & Mikulincer, 2009). To our knowledge, despite substantial evidence suggesting the detrimental effects of low social support on mental health during the COVID-19 pandemic, few studies to date have examined how reduced social contact and enduring personality characteristics together have impacted suicide risk in the context of the COVID-19 pandemic. Achieving a greater understanding of how dispositional factors related to social-environmental needs, such as anxious attachment and trait loneliness, interact with the precipitating circumstances of social isolation to increase suicide risk during the COVID-19 pandemic may support efforts to understand and develop effective and patient-centered prevention and intervention strategies.

In the present study, we sought to examine the role of anxious and avoidant attachment, loneliness, and frequency of social contact as prospective predictors of SI during the first 6 months of the COVID-19 pandemic using a relational diathesis-stress framework. We first examined cross-sectional differences in trait loneliness and anxious and avoidant attachment in individuals with versus without a prior history of suicide attempts, seeking to replicate past findings that showed associations between these dispositional factors and past suicidal behavior. A measure of general psychological distress was included as a covariate, to account for the potential impact of pandemic-related elevations in stress, depression, and anxiety symptoms on our primary outcome variable of suicide (van der Velden et al., 2021). Next, during a follow-up period involving twice-weekly assessments of loneliness and social behaviors over the course of 8 weeks, we evaluated the predictive value of anxious and avoidant attachment traits and experiences of loneliness for the prospective emergence of SI. We predicted that both anxious and avoidant attachment and loneliness would serve as general (between-participant) predictors of SI, while reduced daily social contact would serve as a proximal (within-participant) predictor of SI. Finally, we explored interactions between anxious and avoidant attachment traits and loneliness (as dispositional risk factors for suicide) and the precipitating factor of low social contact for predicting the prospective emergence of SI, hypothesizing that individuals reporting greater feelings of loneliness and anxious attachment would be most likely to develop SI in the context of low social contact.

MATERIALS AND METHODS

Participants and procedures

Recruitment was conducted entirely online through social media posts and email listserv invitations. Individuals were invited to join a study examining experiences of loneliness during the COVID-19 pandemic and were eligible to participate whether they were 18 years of age or older, currently residing in the United States, and whether they had access to an Internet-connected smartphone or tablet. Enrollment occurred between April and June 2020, with 78% of the sample completing baseline measures by May 1. The final sample included 184 participants, of which 112 participants provided at least two experience sampling entries (total unique rating entries = 1124). All study protocols and procedures were approved by the Institutional Review Board of the Austen Riggs Center.

Data collection

Participants completed the protocol remotely, with responses collected using a secure smartphone app hosted by *LifeData* (www.LifeDataCorp.com). Participants provided informed consent prior to participating. After completing baseline measures, participants were sent automated prompts through the app twice per week (occurring on consistent days but randomized times) for a total of 16 responses over 8 weeks ($M = 10.45$, $SD = 5.84$). Because participant enrollment in the study ranged from early April to late June 2020, experience sampling responses were entered between April and September 2020. Participants were given the option of being entered into a gift card raffle worth either $10 (for completing baseline measures) or $20 (for completing all 16 experience sampling ratings). The average length of time spent in the study was 46 days ($SD = 27$ days).

Psychometric assessment

A demographic form was used to collect information about age, gender, marital status, ethnicity, state of residence, number of people currently living in the participant's household, and current employment status at baseline. Participants were also asked about social distancing requirements in their community at the time of

their participation. The demographic form also included a single item asking whether participants had ever made a suicide attempt, with response options of *No* (0), *Yes*, *once* (1), and *Yes*, *more than once* (2). For the present study, responses were recoded into binary categories indicating whether the participant either endorsed (1) or did not endorse (0) a history of suicide attempt(s).

Psychological distress

The Mental Health Inventory-5 (MHI-5; Berwick et al., 1991), a five-item self-report measure assessing psychiatric symptom severity, was used at baseline to evaluate current psychological distress. The MHI-5 is derived from the Medical Outcomes Study Short Form Health Survey (Ware & Sherbourne, 1992). A transformed total score ranging from 0 to 100 was calculated, with higher scores representing greater psychological distress. Internal consistency fell in the good range ($\alpha = 0.86$).

Adult attachment style

The Experiences in Close Relationships Scale—Short Form (ECR-SF; Wei et al., 2007), a 12-item self-report measure, was used at baseline to evaluate anxious and avoidant attachment traits. Participants use a 7-point Likert scale to indicate their level of agreement with items representing a range of attitudes about close relationships, with higher ratings representing greater attachment insecurity. Six items each are used to evaluate anxious and avoidant attachment traits; internal reliability estimates fell in the acceptable range ($\alpha = 0.75$ and 0.77 for attachment avoidance and anxiety, respectively).

Loneliness

The UCLA Loneliness Scale—6-item version (ULS-6; Neto, 2014) was used to assess loneliness both at baseline and during the experience sampling period. Participants rated items based on how frequently they experienced feelings of loneliness using a 4-point scale, with higher scores representing greater loneliness. Internal reliability estimates for the baseline loneliness assessment fell in the good range, $\alpha = 0.84$.

Social contact and suicidal ideation

During the experience sampling period, participants were asked how many people they interacted with "on average each day since [their] last entry," with separate categories for in-person interactions, interactions via text messaging, or interactions via phone or videoconferencing. The text and phone/videoconference categories were then combined into an overall "remote contact" category. Occurrences of SI were evaluated during the experience sampling period using a single categorical response item asking, "Since your last entry, have you had any suicidal thoughts?" (*Yes* = 1 and *No* = 0).

Data analysis

We tested our hypotheses using binary logistic regression in IBM SPSS Statistics 23 for baseline data analysis, and a series of multilevel models using PROC GLIMMIX implemented in SAS 9.2. For the experience sampling data, endorsement of suicidal ideation during the experience sampling period was entered as the outcome. Model 1 tested whether several fixed-effect covariates (region of the country, calendar date, time since being in the study) were associated with higher endorsement of suicidal ideation.

Model 2 (a and b) examined how suicidality was associated with type of contact during the experience sampling period. For Model 2a, we person-centered in-person contact (containing only within-person [level-1] variance), so that 0 represented the average amount of in-person contact for each participant within a given assessment period, while positive and negative scores represented more versus less in-contact than usual for that participant, respectively. We also calculated the mean within-person contact for each individual (containing only between-person [level-2] variance). We sample-centered this so that 0 represented the average in-person contact for the sample within a given assessment period (positive scores indicating a person with more in-person contact than the average person in the study, and negative scores representing less frequent in-person contact). We then entered both level-1 and level-2 in-person contact variables to examine their impact on endorsement of suicidal ideation. Due to convergence difficulties, in-person contact at level 1 was entered as a fixed effect (without random variance). We used the same scoring and modeling approach for remote contact (Model 2b), except that modeling permitted the level-1 remote-contact variable to have fixed and random effects.

Model 3 examined whether suicidal ideation during the experience sampling period was associated with attachment anxiety and avoidance, loneliness, and lifetime suicide attempt history. Attachment anxiety and avoidance were sample-centered to facilitate interpretation. Suicide attempt history was entered as a binary variable. While the ICC for loneliness (0.80) during the experience sampling period indicated that the majority of variance was between-person, we examined loneliness as both a

within- (level 1) and between-person (level 2) variable. As before, level-2 loneliness was sample-centered to facilitate interpretation.

Model 4 (a and b) combined Models 2 and 3 to examine within- and between-person associations with suicidality, as well as their interaction. These models enabled us to examine how static or trait-like personality features (including suicide attempt history status, attachment style, and trait loneliness) interacted with social environmental context (in-person and remote social contact) and fluctuations in emotional functioning (state loneliness) to predict the emergence of suicidal ideation. Specifically, Model 4a included both level-1 (person-centered) and level-2 (sample-centered) in-person contact, attachment anxiety and avoidance, level-1 (person-centered) and level-2 (sample-centered) loneliness, and suicide attempt history status. In-person contact (level 1 and level 2) was interacted with attachment anxiety, attachment avoidance, and both state and trait (level 1 and level 2) loneliness. Our approach to Model 4b was similar except that remote contact was included rather than in-person contact. For clarity of interpretation, in-person and remote social contact variables were conceptualized as representing social contact "habits" when examined as a level-2 variable (e.g., the average frequency of contact on a given day during the experience sampling period), while level-1 social contact was interpreted as representing dynamic fluctuations at a higher temporal granularity.

RESULTS

Means and standard deviations for baseline measures are reported along with participant characteristics in Table 1. Most participants reported their current residence as being in the Northeast of the United States (57.1%), followed by the West (17.4%), South (13.6%), and Midwest (10.9%). All but three participants reported that social distancing guidelines were being implemented in their local community at the time of their participation. A total of $n = 29$ (15.8%) participants reported a lifetime history of suicide attempt(s). During the experience sampling period, most participants did not report any occurrence of suicidal ideation ($n = 96$). Of those participants who did report ideation during this period, the average endorsement was 50% of all entries. Six participants reported SI in 25% of their entries or fewer, with the following breakdown in frequency: endorsement of SI in 1%–25% of records (6 participants), 26%–50% of records (4 participants), 51%–75% of records (1 participant), 75%–99% of records (2 participants), and 100% of records (3 participants). Suicide attempt history at baseline showed a small but significant positive

TABLE 1 Sample characteristics and baseline measure means and standard deviations

	N	%	*M*	*SD*
Age			44.07	16.20
Household size[a]			2.26	1.11
Gender				
Female	144	78.30		
Male	33	17.90		
Non-binary/ other	7	3.80		
Ethnicity				
Eastern/ Western European	144	78.30		
Latino/a	5	2.70		
African/Afro-Caribbean	4	2.20		
Other/decline to state	31	16.90		
Marital Status				
Married	80	43.50		
Partnered	23	12.50		
Single	62	33.70		
Divorced	9	4.90		
Other	10	4.40		
Employment Status				
Full time	102	55.40		
Part time	19	10.40		
Unemployed	38	20.70		
Other	25	13.60		
Region of Residence				
Northeast	105	57.00		
Midwest	21	11.30		
South	25	14.00		
West	33	17.70		
Psychological Distress			42.65	18.16
Loneliness			13.63	4.30
Anxious Attachment			20.81	7.66
Avoidant Attachment			15.80	5.91

Note: $N = 184$. Psychological distress = MHI-5 total transformed score (potential score range 0–100); Loneliness = ULS-6 total item score (potential score range 6–24); Anxious attachment = ECR-SF anxious attachment subscale (potential score range 6–42); Avoidant attachment = ECR-SF avoidant attachment subscale (potential score range 6–42).

[a]Including participant.

association with prospective reports of suicidal ideation during the experience sampling period, both when SI was coded as a binary (i.e., present versus absent, $r = 0.29$) and continuous variable ($r = 0.27$).

Regarding social contact, the average participant reported 2.20 in-person contacts between experience sampling entries ($SD = 2.91$) and 8.07 remote contacts between entries ($SD = 4.34$). Participants reported more frequent interactions via text messaging ($M = 5.30$, $SD = 3.12$) than phone or videoconferencing contact ($M = 2.80$, $SD = 2.09$). The average participant loneliness score during the experience sampling period was 13.31 ($SD = 3.85$).

All continuous variables at baseline showed normal distribution and were centered prior to analyses. There were no demographic differences in participants based on their suicide attempt history status or endorsement of suicidal ideation during the experience sampling period. At baseline, household size was significantly negatively correlated with avoidant attachment traits ($r = 0.21$, $p = 0.01$), while anxious attachment, trait loneliness, and suicide attempt history were not.

To examine any potential demographic differences in social contact, several multilevel models were tested (PROC MIXED, SAS 9.4). First, for each type of social contact (in person, remote, phone/video, text), the social contact variable was entered as the outcome, and each demographic variable was entered separately as a predictor. Categorical variables were coded to compare the category that occurred the most frequently to all others: gender (women vs. other categories), ethnicity (Western or eastern European vs. other categories), marital status (married vs. other categories), and employment (32 h or more working vs. other categories), while age was entered directly.

Ethnicity, marital status, and age were not related to differences in social contact. In-person contact was associated with gender differences. Relative to women, in-person contact was greater for men (beta = 1.85, $p = 0.02$) and participants identifying as non-binary (beta = 4.97, $p < 0.001$). Employment status was related to social contact, with participants who endorsed full-time (32 or more hours working per week) employment reporting greater phone/video contacts compared to individuals who were unemployed (beta = 1.45 $p = 0.004$) or in the "other" category (beta = 1.68, $p = 0.01$).

Psychological distress, loneliness, and insecure attachment predicting history of suicidality at baseline

Zero-order correlations showed that lifetime suicide attempt history was significantly and positively associated with anxious attachment traits ($r = 0.29$, $p = 0.00$) and loneliness assessed at baseline ($r = 0.36$, $p = 0.00$). A binary logistic regression analysis was conducted to evaluate baseline associations between loneliness and insecure attachment traits (anxious and avoidant) with suicide attempt history, controlling for current psychological distress (MHI-5). Psychological distress was entered in Step 1, followed by loneliness and the two insecure attachment trait variables in Step 2. Model results are presented in Table 2. Participants who reported a lifetime history of suicide attempt reported significantly higher rates of loneliness upon entry to the study compared to those with no attempt history; contrary to expectations, neither anxious nor avoidant attachment traits were associated with prior suicide attempt history.

Predictors of SI during the 2-month experience sampling period

Model 1 indicated that region of the country, calendar date, and time in the study were not significantly associated with suicidality, indicating that participant reports of suicidal ideation did not increase over time or in relation to geographic location. As such, we did not control for these potential factors moving forward.

Model 2a revealed that having less in-person contact than usual (level 1) was related to proximal increases

TABLE 2 Psychological distress, loneliness, and attachment traits predicting lifetime history of suicide attempt

	Lifetime history of suicide attempt		
Variable	***B***	***SE***	**exp *b* [95% CI]**
Model 1			
Constant	−1.78	0.24	0.17
Psychological distress	**0.05**	**0.01**	**1.05 [1.02–1.07]**
Model 2			
Constant	−1.99	0.28	0.14
Psychological distress	0.03	0.02	1.03 [1.00–1.06]
Loneliness	**0.18**	**0.07**	**1.20 [1.05–1.37]**
Anxious attachment	0.03	0.04	1.03 [0.96–1.10]
Avoidant attachment	−0.02	0.04	0.98 [0.90–1.05]

Note: Lifetime suicide attempt $R^2 = 0.16$ (Cox & Snell), 0.26 (Nagelkerke), Model $\chi^2 = 13.88$. Past year SI $R^2 = 0.26$ (Cox & Snell), 0.37 (Nagelkerke), Model $\chi^2 = 15.92$. Psychological distress = MHI-5 total transformed score. Loneliness = ULS-6 total score. Anxious attachment = ECR-SF anxious attachment subscale. Avoidant attachment = ECR-SF avoidant attachment subscale. All variables were centered prior to analysis. Bold = $p < 0.05$.

in suicidal ideation (estimate = −0.12, p = 0.016, OR = 0.89, 95% CI [0.81–0.98]). The between-person (level 2) effect was not significant. For Model 2b, remote contact was not significantly related to suicidality at either level 1 or level 2.[1] Together, these findings suggest that participants were more likely to report suicidal ideation on days in which they had less in-person contact than usual, while daily changes in remote contact and more general social contact habits overall (whether in-person or remote) were unrelated to the prospective emergence of suicidal ideation.

For Model 3, when all variables were entered simultaneously (attachment anxiety, attachment avoidance, loneliness at level 1 and 2, and suicide attempt history), none were associated with suicidal ideation. When entered separate, there were significant associations for attachment anxiety (estimate = 0.20, p = 0.003, OR = 1.22, 95% CI [1.07–1.39]), loneliness at level 2 (estimate = 0.35, p = 0.008, OR = 1.42, 95% CI [1.10–1.85]), and suicide attempt history (estimate = 2.70, p = 0.008, OR = 14.82, 95% CI [2.09–105.26]).

The results of Model 4a and 4b are presented in Table 3. Main effects were found for higher attachment anxiety and endorsement of prior suicide attempt(s) predicting greater SI during the experience sampling period; in Model 4b, state (level 1) loneliness also showed a significant main effect for predicting SI. As in Model 2a, a main effect was found showing a negative association between in-person contact and proximal increases in suicidal ideation. This effect was then found to be amplified in the context of higher attachment avoidance (relative to lower attachment avoidance) (Figure 1). Marginal effects were found for interactions between reduced in-person contact (level 1) with higher trait (level 2) loneliness and with lower attachment anxiety.[2] In Model 4b, main effects were found for state (level 1) loneliness, attachment anxiety, and suicide attempt history predicting SI; however, no significant interactions with remote contact were found. To summarize, while Model 4 overall revealed that attachment anxiety functioned as a dispositional risk factor for the prospective development of SI when factors such as social contact and experiences of loneliness were accounted for, in Model 4a the specific context of reduced in-person contact was found to serve as a significant precipitating factor for SI only in individuals with high attachment avoidance.

TABLE 3 Associations between suicidality, dispositional risk factors for suicide, and social contact

Model 4a	Estimate	SE
Main effects		
Intercept	**−6.84**	**0.69**
In-person contact (level 1)	**−0.24**	**0.10**
Loneliness (level 1)	**0.36**	**0.04**
In-person contact (level 2)	−0.11	0.32
Loneliness (level 2)	0.19	0.17
Attachment anxiety	**0.18**	**0.08**
Attachment avoidance	−0.02	0.09
Suicide attempt history	1.75	1.21
Interactions with level 2 variables		
In person (level 1) × attachment anxiety	0.02	0.01
In person (level 1) × attachment avoidance	**−0.03**	**0.01**
In person (level 1) × loneliness	−0.03	0.02
In person (level 2) × attachment anxiety	0.02	0.03
In person (level 2) × attachment avoidance	−0.03	0.05
In person (level 2) × loneliness	0.06	0.11
Random effects		
Intercept variance	**13.69**	**2.79**
Residual variance	**0.16**	**0.01**
Model 4b		
Main effects		
Intercept	**−7.18**	**0.80**
Remote contact (level 1)	−0.05	0.17
Loneliness (level 1)	**0.34**	**0.05**
Remote contact (level 2)	−0.30	0.21
Loneliness (level 2)	0.16	0.21
Attachment anxiety	**0.19**	**0.09**
Attachment avoidance	−0.00	0.10
Suicide attempt history	**2.55**	**1.28**
Interactions		
Remote (level 1) × attachment anxiety	0.01	0.02
Remote (level 1) × attachment avoidance	−0.02	0.03
Remote (level 1) × loneliness	−0.05	0.05
Remote (level 2) × attachment anxiety	0.00	0.03
Remote (level 2) × attachment avoidance	−0.02	0.03
Remote (level 2) × loneliness	0.08	0.06

DISCUSSION

The onset of the COVID-19 pandemic brought with it concerns of a secondary wave of mental health adversity and suffering, as individuals across the world faced conditions

TABLE 3 (Continued)

Model 4a	Estimate	SE
Random effects		
Intercept variance	**13.97**	**3.01**
Remote-contact variance	**0.32**	**0.13**
Residual variance	**0.15**	**0.01**

Note: Bold = $p < 0.05$. For both models, we attempted to model loneliness level 1 as a random effect, but the models would not converge. So instead, loneliness at level 1 was treated as a fixed effect (no random variance modeled).

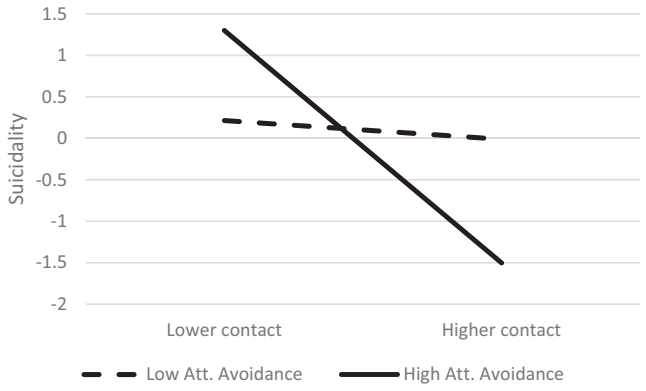

FIGURE 1 Interactions between attachment avoidance and in-person social contact in predicting suicidal ideation. Att. Avoidance = ECR-SF attachment avoidance subscale. Contact = Average daily frequency of in-person contact (level 1). Lines plotted at ±1 SD.

of reduced social contact and elevated distress. In such situations, diathesis-stress frameworks would predict that individuals carrying dispositional risk factors for psychiatric impairment would be most at risk for poor mental health outcomes as the conditions of the pandemic endured. While current data suggest that suicide rates in the United States have not increased overall thus far since the start of the pandemic (Ahmad & Anderson, 2021), achieving an understanding of both predisposing and situational factors affecting suicide risk remains an important public health priority.

Several pandemic-era studies have confirmed cross-sectional associations between previously well-established risk factors for suicide, as well as novel situational and environmental factors more directly related to the COVID-19 pandemic (Killgore et al., 2020; Lee, 2020). The present study is the first to our knowledge to utilize a relational diathesis-stress approach and experience sampling methodology to achieve a clearer understanding of the interplay between stable and dynamic factors predicting suicide risk during the pandemic (Rubinstein, 1986; Van Heeringen, 2012). Our analyses provided no evidence to suggest that rates of suicidal ideation increased over the course of time (at least during the study period, which spanned the first 6 months of the pandemic in the United States), though participants did show fluctuations in ideation that were associated with dispositional factors, precipitating contexts, and the interaction between these variables over time.

At baseline, contrary to our expectations, participants who reported a suicide attempt history did not report greater attachment insecurity on either avoidant or anxious dimensions compared to those participants with no prior attempts. These findings are inconsistent with pre-pandemic studies which have shown relatively consistent cross-sectional associations between attachment insecurity (particularly anxious attachment) and prior suicide attempt(s) (e.g., Adam et al., 1996; Lessard & Moretti, 1998; Stepp et al., 2008). Although multicollinearity coefficients were within normal range for the variables included in the baseline model (all VIFs < 1.5), it is possible that differences in insecure attachment traits in attempters versus non-attempters were obscured or rendered less relevant after related affective experiences (such as loneliness and distress) were held constant. When we re-evaluated the baseline regression model with only the two attachment variables included, anxious attachment emerged as significantly associated with prior attempt history,[3] and was found to prospectively predict SI during the experience sampling period. Such findings are more in keeping with prior literature and point to the continued importance of insecure attachment as a dispositional risk factor for suicidal thoughts and behaviors in the context of the COVID-19 pandemic.

Associations between trait loneliness and suicidality were found to follow a similar pattern, with individuals who reported more chronic feelings of loneliness being more likely to report greater suicidality both retrospectively (at baseline) and concurrently (when assessed as a level-1 variable) during the experience sampling period. Along with anxious attachment traits, these findings provide support for our hypothesis that factors related to disruptions in interpersonal connectedness would predict greater vulnerability to suicidal thoughts during the study period.

We found that less frequent in-person contact was proximally associated with reports of SI, suggesting that the loss of in vivo socialization opportunities served as a general precipitating context for the emergence of SI. Similar effects were not found for social contact occurring via text, phone, or videoconferencing, suggesting that certain aspects of in-person contact potentially yielded unique protective benefits. This would be consistent with pre-pandemic studies showing that in-person interactions aimed at providing interpersonal support led to increased positive affect and decreased negative affect compared to those occurring via remote means (Holtzman et al., 2017).

An examination of interactions between attachment and frequency of social contact further revealed that having fewer in-person interactions was a particularly high-risk context for participants with greater avoidant (but not anxious) attachment traits. These findings are somewhat surprising, as prior studies of adult attachment have emphasized the importance of proximity seeking as an emotion regulation strategy associated with attachment anxiety rather than avoidance (Shaver & Mikulincer, 2009). It may be that anxious individuals were better able to manage the temporary loss of in-person contact through other (remote) modalities, or through relationships with others residing in the same household. Our preliminary analyses indeed showed that avoidant attachment traits were related to smaller household size, suggesting that for avoidant individuals the opportunity to engage in in-person social contact may have been more negatively affected by social distancing requirements. Additionally, the extent to which the emotional quality of in-person interactions related to suicide risk in individuals with different attachment styles remains unclear. In the case of anxious attachment, emotional closeness rather than frequency of contact may have served as a more relevant protective factor, while for avoidant individuals the regularity and availability of access to in-person social opportunities may have carried greater importance for reducing suicide risk. Future studies are needed that explore how relationship context and emotional quality of interactions may contribute to the protective influence of in-person contact on suicide risk.

In sum, in the context of the pandemic and widespread implementation of social distancing requirements, individuals carrying underlying vulnerabilities related to emotional closeness and intimacy in relationships were at elevated risk for developing suicidal ideation over a 2-month period, in some cases specifically within the context of fewer opportunities for in-person interactions. Through an examination of how these trait and situational factors interacted dynamically over time, our findings illustrate how underlying dispositions help to clarify the specific situational contexts in which suicidal thoughts were most likely to emerge, revealing connections that bear clear implications for clinical intervention and future empirical study.

LIMITATIONS

Our study had several limitations which may impact the generalizability of our findings. First, our sample was relatively homogeneous in terms of demographic characteristics, and so findings may not be applicable to other demographic groups characterized by greater diversity. Similarly, since the study required participants to have access to a web-enabled smart device for participation, our findings may not represent the experiences of individuals with less access to communication technology or to those with lower digital literacy. Additionally, our study evaluated constructs such as attachment and loneliness that are presumed to carry trait-like stability; however, given that these traits and features were only assessed after the onset of the pandemic, we cannot be certain that our assessment of these traits reflects their typical levels of functioning, rather than an elevation related to the COVID-19 pandemic. Finally, although our study was framed within a diathesis-stress model which presumed that dispositional traits would influence the precipitating contexts in which suicidal ideation would emerge, the assessments collected during the experience sampling period should nonetheless be interpreted cautiously with regard to direction of effect. We were unable to determine, for example, whether decreased in-person contact during a given rating period contributed to the emergence of suicidal ideation, or if experiencing suicidal ideation on a given day led a participant to withdraw from further in-person contact that they may otherwise have chosen to engage in.

CONCLUSION

In summary, the present study provided evidence supporting a relational diathesis-stress model of suicide risk during the COVID-19 pandemic, identifying important relationships between dispositional risk factors for suicide and specific precipitating contexts that together may aid future prevention efforts. As pandemic conditions persist, further studies aimed at evaluating the long-term impact of its effects on mental health using longitudinal approaches and diathesis-stress frameworks will be essential both for guiding intervention efforts and expanding understanding of factors relevant to long-term health outcomes for both suicide risk and resilience.

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ENDNOTES

[1] Findings remained the same when the frequency of text interactions and those occurring via phone/videoconferencing were analyzed separately.

[2] The initial analyses were run without loneliness modeled at level-1. Based on reviewer suggestion, loneliness at level 1 was added, and led to two initially significant interaction effects changing from

0.05 significance to trends of 0.06 and 0.08. While marginal interaction effects should be interpreted with extreme caution, we present these findings in Table S1 and Figure S1, since the earlier analyses were consistent with our original hypotheses. Furthermore, loneliness at level 1 was not significant as a main effect, and only became significant when put into the full model (4a/b) and when modeled as a fixed effect. Thus, there is a statistical argument to not include this variable, though its inclusion is plausible on theoretical grounds. If an interaction effect is lost when adding a variable or due to a modeling decision (fixed vs. random), we recommend viewing that result as tentative, and in need of replication.

[3] Anxious attachment predicting suicide attempt history: $B = 0.11$, $SE = 0.03$, exp $(B) = 1.11$, $p = 0.00$.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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