

## ORIGINAL ARTICLE

# An experimental investigation of the influence of loneliness on changes in belongingness and desire to escape

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## Abstract

**Objective:** Loneliness is a well-established risk factor for suicide in young adults, but the mechanisms involved are still unclear. Drawing on the Interpersonal Theory of Suicide, the Evolutionary Model of Loneliness, and Prospect Theory, we examined if high and low levels of loneliness are associated with different patterns of response to losses or gains of belongingness.

**Methods:** A sample of 188 students completed the UCLA-Loneliness scale (version 3) and measures of suicide risk. Participants in the top and bottom tertiles of loneliness scores completed a computerized task designed to induce changes (gains, losses) or consistency in risk factors for suicide (belongingness, burdensomeness) over time, and examined the effect on desire to quit the task.

**Results:** The results showed that the high loneliness group exhibited a larger magnitude of effect on desire to quit from *gaining* belongingness than for losing belongingness. In contrast, the low loneliness group showed a larger change in desire to quit from *losing* belongingness than gaining belongingness.

**Conclusion:** The findings provide preliminary experimental support for distinct profiles of suicide risk based on prevailing levels of loneliness. The findings are discussed in relation to a need for increased precision in theoretical models of suicide and loneliness.

## KEYWORDS

belongingness, Interpersonal Persistence Task, loneliness, suicidal ideation

## INTRODUCTION

Limited progress in the ability to prevent suicide has focussed increased attention on theory-driven studies of the processes underlying suicidal thoughts (Chu et al., 2017; Franklin et al., 2017; Roeder & Cole, 2019). One avenue for improved precision in suicide prediction uses subtyping,

as a means of discerning distinct profiles of suicidal thinking and related risk factors (Bagge et al., 2017; Kleiman et al., 2018; Mou et al., 2020). However, subtyping of theorized proximal causal risk factors for suicidal ideation has received limited investigation. The multifaceted construct of thwarted belongingness presents a prime opportunity for subtyping of its underlying components (loneliness

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and an absence of reciprocal care; Joiner, 2005; Van Orden et al., 2010). Indeed, recent research has argued against treating belongingness and loneliness synonymously (Gratz et al., 2020; Leary et al., 2013; Mellor et al., 2008; Vanhalst et al., 2015), as doing so fails to consider their unique facets, and that each may have separable effects on suicide risk. Here, we examine whether the experience of loneliness is associated with a distinct profile, or subtype, of risk for suicide by examining the response to changes in the sense of belongingness in an experimental task.

A thwarted sense of belongingness has been identified in the Interpersonal Psychological Theory of Suicide (hereafter Interpersonal Theory; Joiner, 2005), as one element necessary for suicidal ideation (alongside the perception of being a burden—which is not a focus of the present paper; Joiner, 2005; Van Orden et al., 2010). Recent research has identified different profiles of suicidal ideation over time, based on temporal trajectories of risk factors such as belongingness (Bagge et al., 2017; Kyron et al., 2018; Kyron, Badcock, et al., 2019; Kyron, Hooke, et al., 2019; Rogers & Joiner, 2019; Wolford-Clevenger et al., 2020). Importantly, these studies explored these profiles in a variety of age groups, clinical, and community cohorts, and largely focused on the dual contribution of belongingness and perceived burdensomeness. However, no prior studies have examined whether these profiles of suicide risk vary for those experiencing high versus low levels of loneliness.

The Evolutionary Model of Loneliness (Cacioppo et al., 2014) highlights that loneliness can be adaptive. For example, loneliness can be positive, motivating efforts to regain social bonds (termed the reaffiliation motive; Qualter et al., 2015). Alternatively, a high level of loneliness has also been associated with hypervigilance for social threats and a tendency to social withdrawal and escape (Cacioppo et al., 2018; Spithoven et al., 2017). Indeed, longitudinal studies have consistently highlighted the maladaptive role of loneliness on suicide outcomes across various developmental stages (Bennardi et al., 2019; Schinka et al., 2012, 2013). Accordingly, we might expect that high levels of loneliness would be associated with a heightened sensitivity to losses of belongingness in social interactions. Conversely, at low levels of loneliness, we might expect that brief losses (or gains) of belongingness would have relatively little emotional impact—since overall social needs are being adequately met.

Alternatively, the concept of loss aversion from Prospect Theory (Kahneman & Tversky, 1979) has recently been used to improve our understanding of suicide risk in adolescents (Hadlaczky et al., 2018). Loss aversion describes a general tendency in human behavior to experience losses of prized commodities as more severe than

gains, even if the actual size of the loss and gain are equal (e.g., losing and gaining \$5; Kahneman, 2011), resulting in attempts to minimize this experience of loss. As social connectedness is highly prized for human survival, it may also be subject to this loss aversion effect. Thus, it might be expected that social interactions involving losses of belongingness would have a greater effect on desire to escape than gains in belongingness, at both high and low levels of loneliness. However, this proposal has not yet been empirically tested.

To investigate these theoretically derived predictions it may be useful to employ an experimental task that allows for the controlled manipulation of key variables. The Interpersonal Persistence Task (Collins et al., 2016; George et al., 2020) is an experimental paradigm designed to assess causal risk factors for suicide that can be readily adapted to examine whether changes in belongingness lead to different profiles of suicide risk, at high and low levels of loneliness based on the theoretical models discussed above. The task is grounded in multiple theories of suicide, each sharing the basic premise that psychological pain promotes a desire to quit or escape social defeat (Baumeister, 1990; Joiner, 2005; O'Connor, 2011; O'Connor & Kirtley, 2018; Van Orden et al., 2010). Using constructs derived from Interpersonal Theory (Van Orden et al., 2010), the Interpersonal Persistence Task experimentally manipulates the sense of belongingness (a loss, a gain, or consistency), and perceived burdensomeness (high or low) by providing varied interpersonal feedback to participants and measures the desire to escape interpersonal adversity in terms of desire to quit the task.

Here, our goal was to determine if high and low levels of loneliness have distinct profiles of influence on the causal contributors to suicidal ideation, by measuring manipulated changes in belongingness and resulting desire to quit. To determine any selective effect of changes in belongingness on desire to quit, the design of the study ensured that perceived burdensomeness was held constant (consistently high or low throughout each phase). Several hypotheses were generated based on the theoretical models described above. The Evolutionary Model of Loneliness predicts that (1) at high levels of loneliness losses in belongingness will have a relatively larger effect on desire to quit than gains in belongingness, while (2) at low levels of loneliness social needs are well-regulated, consequently, losses and gains of belongingness will have a similar magnitude of influence on desire to quit. However, Prospect Theory predicts that (3) losses of belongingness would have a greater influence on desire to quit than gains in belongingness, at both high and low levels of loneliness.

## METHOD

### Participants

One hundred and eighty-eight undergraduate psychology students took part in the study in exchange for partial course credit ( $M_{\text{age}} = 20.70$ ,  $SD = 6.25$ , 64.9% female, 70.7% Caucasian). Participants were screened into the study based on their loneliness scores assessed during class time at the University of California Los Angeles, Loneliness Scale Version 3 (see measures section, Russell, 1996). Those scoring in the upper (scores above 47) and lower (scores below 37) thirds of the distribution were invited to attend a subsequent testing session. A tertile split was used in order to maximize the likelihood that participants experienced different (i.e., “high” and “low”) levels of loneliness, while preserving a sufficient sample size in both groups. Importantly, this method yielded similar cut-off criteria for high and low levels of loneliness to that reported elsewhere (APS, 2018) and was consistent with the design of the loneliness measure that scores above 40 represent the experience of being lonely. Ethics approval was granted by the Human Research Ethics Committee at the University of Western Australia.

### Experimental task and procedure

A variation of the Interpersonal Persistence Task (Collins et al., 2016; Kyron, Badcock, et al., 2019) was used to investigate the nature of change in belongingness on the outcome variable “desire to quit.” The task simulates a three-player team game, in which participants judge whether two shapes are alike or different over a series of trials. Participants believe they can gain points for quick and accurate responses and lose points for slow or incorrect responses, with the aim of the game being to beat a target score by accumulating points as a team. The task consists of six blocks, each comprised of fifteen trials of shape pairs to be differentiated. To facilitate the change in belongingness halfway through the task, these blocks were split into Phase One (blocks 1–3) and Phase Two (blocks 4–6). At the end of each block of trials, participants were presented with the feedback for the concurrent manipulation of perceived burdensomeness and belongingness.

### Perceived burdensomeness manipulation

To manipulate perceived burdensomeness, score tables were presented at the end of each block of trials designed to lead participants to believe that they are either a burden

or an asset to the team. Specifically, in the high perceived burdensomeness condition, participants were told that they were substantially less accurate than their teammates (40% vs. 60%), while in the low perceived burdensomeness condition participants were told that their performance was similar to their co-players.

### Belongingness manipulation

Belongingness was manipulated using interpersonal feedback. Following presentation of the score tables, participants were given the opportunity to send and receive feedback about performance with their fellow players. Participants were told that they could be playing with two fellow students but in reality these “co-players” were computer-controlled. To maintain the appearance of the task being a group game, participants were tested simultaneously, with another researcher acting as confederate when this was not possible. For the high belongingness conditions, the pre-generated statements were supportive and encouraging to foster a sense of belonging to the team (e.g., “Good job, this next round is yours!”). In the low belongingness conditions, the statements were exclusionary and critical to promote a feeling of separation from the team (e.g., “if you aren’t trying your best why play at all?”). Feedback was written in an informal chat style to promote the face validity of the task as a computer game.

In the current version of the task, two conditions received consistent belongingness feedback (either high or low), and two conditions received switching belongingness feedback between the two phases of the task (either losing belongingness or gaining belongingness). Each of these four conditions was also given high perceived burdensomeness feedback, thereby allowing for comparison of change and stability in belongingness in combination with a consistent high degree of burdensomeness. These comparison (consistent belongingness) conditions allowed us to examine whether *change* in belongingness was important for desire to quit, compared to stability in belongingness. A fifth condition acted as a control condition, receiving consistent high belongingness and low perceived burdensomeness feedback across the two phases of the task.

### Participant ratings

Following presentation of the score table and feedback statements, participants were asked to rate, on a scale from 0 to 6, how much they felt like (1) they belong to the team (belongingness; 0 = “like an outsider,” 6 = “like I

belong on the team”), (2) they were an asset to the team (burdensomeness; 0 = “like an asset to the team,” 6 = “like a burden on the team”), and (3) how much they would like to drop out of the game (desire to quit; 0 = “not at all true for me,” 6 = “very true for me”). For each question, higher numbers indicate a stronger endorsement of the statement. In total, ratings of belongingness, burdensomeness, and desire to quit the task were obtained six times.

## Measures

### Loneliness

The *University of California: Los Angeles—Loneliness Scale (Version 3)*, (UCLA-LS3; Russell, 1996) was used to assess loneliness. The UCLA-LS3 is a 20-item self-report measure designed to assess the subjective experience of loneliness, including items such as “how often do you feel that you are no longer close to anyone?” and “how often do you feel that no one really knows you well?” Responses are given on a 4-point scale ranging from 1 = “Never” to 4 = “Always.” Responses are summed to achieve a total score; hence, higher numbers reflect elevated loneliness. Consistent with previous studies, the measure showed good internal consistency in the current sample (Cronbach’s  $\alpha = .95$  (Vassar & Crosby, 2008). Likewise, good convergent and construct validity have also been established, including college student populations (Russell, 1996).

### Interpersonal risk factors

The 15-item *Interpersonal Needs Questionnaire (INQ-15)*; Van Orden et al., 2012) was used to assess thwarted belongingness (nine items) and perceived burdensomeness (six items) traits. The thwarted belongingness scale includes items assessing the degree to which people feel that they belong in a social context (e.g., “I often feel like an outsider in social gatherings,” and the perceived burdensomeness scale includes items assessing different facets of the perception of burden (e.g., “I think my death would be a relief to the people in my life”). Responses are provided on a 7-point scale from 0 = “Not at all true for me” to 6 = “Very true for me,” with higher scores on each subscale reflecting a higher degree of each trait. For ease of interpretation and consistency with the experimental task the thwarted belongingness subscale was reverse scored, such that higher scores reflect a higher degree of the positive characteristic: belongingness. Both subscales of the INQ-15 have demonstrated good internal consistency in

previous samples, which was maintained in the current study (thwarted belongingness  $\alpha = .92$ ; perceived burdensomeness  $\alpha = .94$ ). Likewise, this measure has demonstrated good construct validity in similar student samples (Van Orden et al., 2012).

## Suicide risk

To provide representative information on participants’ level of suicide risk, five items adapted from the *Self-Injurious Thoughts and Behaviours Inventory (SITBI)*; Nock et al., 2007) were included. To assess frequency of suicidal ideation, the item: “How many times in the past year have you thought about suicide?” was used with responses recorded on a 6-point scale ranging from 0 = “Not at all” to 5 = “Almost every day.” Likewise, frequency of non-suicidal self-injury ideation was assessed via the item “how many times in the past year have you *thought* about purposely hurting yourself without wanting to die?” with responses provided on a 6-point scale from 1 = “Never” to 6 = “Almost every day.” Three items (1) “How many times in your lifetime have you made an actual attempt to kill yourself in which you had at least some intent to die?” (2) “how many times in your lifetime have you purposely *attempted* to hurt yourself without wanting to die?” and (3) “how many times in your lifetime have you done something to lead someone to believe that you wanted to kill yourself when you really had no intention of doing so?” were used to assess lifetime incidents of suicidal ideation, non-suicidal self-injury, and suicide gestures. Responses for these three items were recorded on the same 5-point scale from 1 = “Never” to 5 = “Five or more times.”

## Procedure

Participants were briefed, provided informed consent, and then completed the experimental task, which took approximately 20 min. Next, participants completed the questionnaires, delivered in a computerized format using Qualtrics.<sup>1</sup> Three written questions were then administered, to probe the degree to which participants suspected that their teammates were computer-controlled. Following completion of the suspicion probe questions, participants were individually debriefed, which included informing participants that they had been playing with computer generated teammates and that their scores had not been a true reflection of their performance. Participants were also given the

<sup>1</sup>A copy of the protocol is available on request.



opportunity at this stage to ask any further questions about the study that they may have had. Participants were then provided with information on the availability and how to access local support services (e.g., university psychological services and relevant crisis support lines). In line with the approved protocol, if participants disclosed distress following debriefing to the true nature of the study, they were given additional support in accessing follow-up services and were later contacted by a senior researcher on the project. In addition, participants were fully debriefed as to the nature of the study and any remaining questions were answered.

## Data analytic strategy

First, a check was conducted to identify participants who were suspicious of the procedure. Next, the manipulations of belongingness and burdensomeness were assessed to check that the conditions operated as intended. The effects of changes in belongingness, in high versus low loneliness groups, on desire to quit ratings were then examined using 2 (loneliness groups)  $\times$  5 (task conditions)  $\times$  2 (phases) mixed-design analyses of variance (ANOVAs). Significant effects were clarified with follow-up contrasts, conducted separately for each loneliness group. Finally, to assess the magnitude of effect of losses/gains in belongingness, paired sample *t*-tests and effects sizes were examined for each target experimental condition, separately for the high and low loneliness groups.

## RESULTS

### Participant characteristics

The average UCLA-LS3 total score was 44.59 ( $SD = 12.26$ ). As expected, the high loneliness group had higher UCLA-LS3 scores ( $M = 53.90$ ,  $SD = 5.8$ ) than the low loneliness group ( $M = 31.46$ ,  $SD = 4.35$ ). A summary of suicide risk statistics is presented in [Table 1](#). There were high rates of suicidal ideation, suicide attempts, suicide gestures, and ideation and action of non-suicidal self-injury reported across the full sample. The high loneliness group reported markedly higher rates of all suicide risk variables compared to the low loneliness group. Importantly, further exploration of these differences found that the binomial probability of obtaining the scores returned by the high loneliness group, if the expected incidence rate is the same as the low loneliness group, was less than .0001. Thus, for each of the markers of risk, the scores reported by the high loneliness group were significantly different from those reported by the low loneliness group. Notably,

the high loneliness group reported almost double the rate of suicidal ideation in the last year, along with higher rates of both single and multiple lifetime suicide attempts.

### Manipulation checks

Two independent researchers examined the suspicion probe questions, on which there was 100% inter-rater reliability. In total, 31 participants were deemed to be suspicious about the nature of the task and were excluded from subsequent analyses. Most of these suspicious participants were from the high loneliness group ( $n = 24$ ; Fisher's exact test  $p = .03$ ),<sup>2</sup> leaving  $n = 71$  in the high loneliness group and  $n = 86$  in the low loneliness group.

### Belongingness manipulation

A 2 (loneliness groups)  $\times$  5 (task conditions)  $\times$  2 (phases) mixed-design ANOVA examined the effects of condition (switching or consistent) over time (phase 1 and phase 2) on belongingness ratings. As expected, there was a significant condition by phase interaction confirming that there was a change in belongingness over time depending on task condition,  $F(4, 147) = 32.64$ ,  $p < 0.001$ , partial  $\eta^2 = 0.47$  ([Figure 1](#)). The two conditions with switching belongingness feedback showed a significant and large decrease (losing belongingness:  $t(31) = 8.09$ ,  $p < 0.001$ ,  $d = 1.05$ ) and increase (gaining belongingness:  $t(29) = -4.67$ ,  $p < 0.001$ ,  $d = 1.06$ ) in belongingness across phases, respectively, confirming that the change in belongingness manipulation was successful. Those who experienced consistent belongingness feedback across phases reported comparatively more consistent belongingness over the task (high belongingness:  $t(32) = -1.54$ ,  $p = 0.13$ ,  $d = 0.14$ ; low belongingness:  $t(31) = 5.08$ ,  $p < 0.001$ ,  $d = 0.53$ ; control:  $t(29) = -4.32$ ,  $p < 0.001$ ,  $d = 0.52$ ). While the effect of the manipulation for the low belongingness and control conditions grew across phases with the consistent feedback, the overall interaction detected in the three-way ANOVA arose from the switching conditions.

### Perceived burdensomeness manipulation

Descriptive statistics for perceived burdensomeness are shown in [Table 2](#). A successful manipulation of feelings

<sup>2</sup>Qualitative information gathered during the debriefing procedure highlighted that many of the high loneliness participants who were suspicious of the computerized task manipulation were also avid online gamers and were used to a harsher level of criticism than the study used.

	Total sample (%) <i>N</i> = 188	High loneliness (%) <i>n</i> = 110	Low loneliness (%) <i>n</i> = 78
Suicidal ideation	51.7	60.0	34.7
Suicide attempts (1)	7.5	10.9	2.6
Suicide attempts (2+)	4.3	7.2	0
Suicide gesture	28.7	35.5	19.2
Non-suicidal self-injury ideation	38.3	44.5	29.5
Non-suicidal self-injury	36.2	39.9	30.8

Note: Suicidal ideation and non-suicidal self-injury ideation were measured “in the last year.” Suicide attempts, suicide gestures, and non-suicidal self-injury were measured based on lifetime incidents.

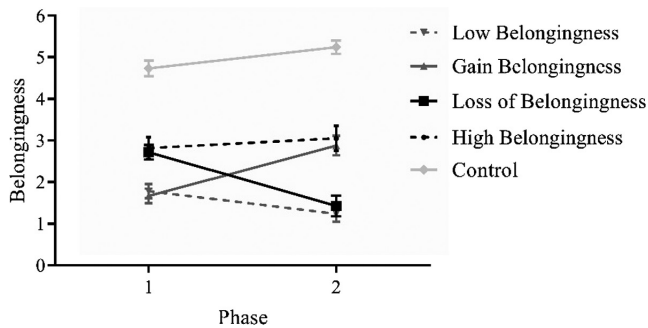


FIGURE 1 Group means (SEMs) for the belongingness manipulation check for each experimental task condition. The control condition received feedback consistent with high belongingness and low perceived burdensomeness

TABLE 2 Mean and standard deviation perceived burdensomeness values for each of the experimental task conditions across the two phases of the task

Condition	Phase 1 <i>M</i> ( <i>SD</i> )	Phase 2 <i>M</i> ( <i>SD</i> )
Losing belongingness	4.07 (0.91)	4.88 (1.09)
Gaining belongingness	4.71 (8.2)	4.03 (1.20)
Consistent high belongingness	4.01 (1.01)	4.09 (1.21)
Consistent low belongingness	4.54 (0.93)	4.88 (1.07)
Control	1.73 (1.46)	1.21 (1.38)

Note: Scores for perceived burdensomeness were rated on a scale from 0 to 6.

of burdensomeness required perceived burdensomeness to remain high for four conditions across phases, and low for the control condition across both phases of the task. A 2 (loneliness groups)  $\times$  5 (task conditions)  $\times$  2 (phases) mixed-design ANOVA examined the effect of condition over time on ratings of perceived burdensomeness. The main effect of phase was not significant,  $F(1, 147) = 0.019$ ,  $p = 0.89$ , partial  $\eta^2 < 0.001$ ; however, there was a significant task condition by phase interaction,  $F(4, 147) = 14.19$ ,  $p < 0.001$ , partial  $\eta^2 = 0.28$ .

TABLE 1 Suicide risk statistics for the total sample, and separately for high and low loneliness groups

Follow-up analyses revealed that over time burdensomeness ratings did not change in the high belongingness condition,  $t(32) = -0.54$ ,  $p = 0.59$ ,  $d = 0.07$ . However, burdensomeness increased in the consistent low belongingness condition,  $t(31) = -2.57$ ,  $p = 0.02$ ,  $d = 0.33$ , and the losing belongingness condition,  $t(31) = -5.16$ ,  $p < 0.001$ ,  $d = 0.80$ , and decreased in both the gaining belongingness condition,  $t(29) = 3.73$ ,  $p = 0.001$ ,  $d = 0.66$ , and control condition. Despite this variability inspection of Table 2 shows that across both phases mean scores were significantly lower in the control condition compared to all other conditions, confirming that the manipulation of burdensomeness was successful.<sup>3</sup>

## Test of hypotheses: Desire to Quit

To determine the influence of high and low levels of loneliness and change or consistency in belongingness on desire to quit, a 2 (loneliness groups)  $\times$  5 (task conditions)  $\times$  2 (phases) mixed-design ANOVA was conducted.

Overall, there was no change in desire to quit from Phase One to Phase Two,  $F(1, 147) = 0.88$ ,  $p = 0.35$ , partial  $\eta^2 = 0.006$ . However, the main effect of loneliness group was significant,  $F(1, 147) = 4.19$ ,  $p = 0.04$ , partial  $\eta^2 = 0.03$ . Inspection of the mean values showed that desire to quit was higher in the high compared to the low loneliness group (see Table 3). In addition, there was a significant three-way interaction between loneliness group, task condition, and phase,  $F(4, 147) = 3.00$ ,  $p = 0.02$ , partial  $\eta^2 = 0.08$ , indicating that the profile of response on desire to quit varied across conditions, and by loneliness group (Table 3). Consequently, follow-up analyses were conducted separately for each loneliness group.

<sup>3</sup>When perceived burdensomeness was entered as a covariate in the following analyses the pattern of results remained unchanged.

**TABLE 3** Mean and standard deviation desire to quit values in high and low loneliness groups for each task condition, across the two phases of the task

Condition	High loneliness <i>M</i> ( <i>SD</i> )	Low loneliness <i>M</i> ( <i>SD</i> )
Losing belongingness		
Phase 1	2.29 (1.67)	1.51 (1.31)
Phase 2	2.92 (2.35)	2.13 (1.28)
Gaining belongingness		
Phase 1	3.20 (1.77)	3.08 (1.43)
Phase 2	2.55 (1.28)	2.64 (1.46)
Consistent high belongingness		
Phase 1	2.35 (1.55)	1.27 (1.68)
Phase 2	2.71 (1.92)	1.19 (1.53)
Consistent low belongingness		
Phase 1	3.13 (1.40)	2.62 (1.44)
Phase 2	3.02 (1.87)	3.86 (1.83)
Control		
Phase 1	1.84 (1.55)	1.13 (0.99)
Phase 2	1.27 (1.53)	0.95 (0.90)

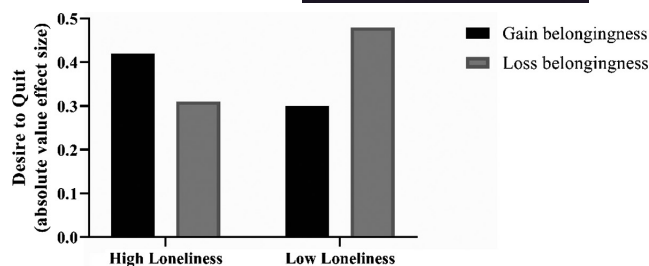
### High loneliness group

For the high loneliness group, there was a significant change in desire to quit from Phase One to Phase Two depending on task condition,  $F(4, 81) = 4.14$ ,  $p = 0.004$ , partial  $\eta^2 = 0.17$ . Follow-up analyses showed that the condition gaining belongingness exhibited a significant decrease in desire to quit from Phase One to Phase Two,  $t(16) = 2.33$ ,  $p = 0.03$ , with a moderate effect size,  $d = 0.42$  (see Figure 2). In contrast, the condition losing belongingness showed no significant change in desire to quit across phases,  $t(16) = -1.97$ ,  $p = 0.07$ , and a small effect size,  $d = -0.31$ . Thus, contrary to hypotheses, for those high in loneliness only gaining belongingness had a significant effect on desire to quit.

Additionally, neither the consistent high nor consistent low belongingness condition showed a significant change in desire to quit across both phases of the task,  $t(16) = -1.13$ ,  $p = 0.27$ ,  $d = -0.20$ , and  $t(17) = 0.42$ ,  $p = 0.68$ ,  $d = 0.07$ , respectively. However, the control condition showed a small, significant decrease in desire to quit between Phase One and Phase Two,  $t(16) = 3.48$ ,  $p = 0.003$ ,  $d = 0.37$ .

### Low loneliness group

For the low loneliness group, there was a significant change in desire to quit from Phase One to Phase Two depending on task conditions,  $F(4, 66) = 6.36$ ,  $p < 0.001$ ,



**FIGURE 2** Effect sizes for desire to quit values in high and low loneliness groups, for switching belongingness conditions. Effect sizes are presented as absolute values for ease of comparison between losses and gains of belongingness on desire to quit

partial  $\eta^2 = 0.28$ ; however, the specific pattern of effects for the switch conditions differed from the high loneliness group. The condition gaining belongingness exhibited a small but significant decrease in desire to quit from Phase One to Phase Two,  $t(12) = 2.34$ ,  $p = 0.04$ ,  $d = 0.30$ , while the condition losing belongingness showed a moderate increase in desire to quit from Phase One to Phase Two,  $t(14) = -2.14$ ,  $p = 0.05$ ,  $d = -0.48$  (see the absolute values depicted in Figure 2).

Finally, when assessing the consistent belongingness conditions, the consistent high belongingness condition showed no change in desire to quit, which remained low and unchanging from Phase One to Phase Two,  $t(15) = 0.58$ ,  $p = 0.57$ ,  $d = 0.05$  (see Table 3). In comparison, the consistent low belongingness condition showed a large increase in desire to quit from Phase One to Phase Two,  $t(13) = -2.70$ ,  $p = 0.02$ ,  $d = -0.75$ , while the control condition showed a small trend toward decreasing desire to quit,  $t(12) = 2.21$ ,  $p = 0.05$ ,  $d = 0.19$ .

## DISCUSSION

We aimed to investigate whether experiencing loneliness modifies how changes in belongingness affect desire to quit. Overall, the results showed that (1) on average, the high loneliness group has higher levels of desire to quit than the low loneliness group, and (2) the relative importance of loss and gains of belongingness differed for those high in loneliness versus those low in loneliness. Together these findings broadly suggest that it may be useful for clinicians to assess the level and time course of loneliness and belongingness when establishing risk for suicidal ideation. On a theoretical level, neither the predictions grounded in the Evolutionary Theory of Loneliness nor Prospect Theory were fully supported, suggesting further nuance to theories integrating loneliness and suicide is required. The main findings and some potential reasons underlying the pattern of effects observed are considered below.

Our first hypothesis, drawing on the Evolutionary Model of Loneliness (Cacioppo et al., 2018), was that high levels of loneliness would result in overattentiveness to signs of social threat (Bangee & Qualter, 2018), leading to the prediction that in the high loneliness group *losses* of belongingness would have a larger effect on desire to quit than gains in belongingness. Instead, the results showed that *gains* in belongingness had a relatively larger influence on the desire to escape interpersonal adversity than losses. These findings suggest that participants who felt lonely had a greater sensitivity to opportunities for social reaffiliation than to further rejection, implying that the reaffiliation motive (to regain social bonds; see Qualter et al., 2015) remained intact.

We considered several potential explanations for why the predicted pattern of results was not obtained. Our findings cannot be explained simply as a failure to differentiate the high and low loneliness groups: the results showed a robust elevation in UCLA-LS3 scores in the high, compared to the low, loneliness group. One possibility is that the decision to use a tertile split for allocating loneliness may have meant that the high loneliness group captured a broader range of “high” loneliness scores, and results may differ if an alternative grouping strategy (e.g., a quartile split on pre- and post-test loneliness, or continuous momentary assessment of loneliness throughout the task) had been used that specified more extreme scores on the UCLA-LS3. However, it is important to note that scores on the UCLA-LS3 refer to the *frequency* of feeling lonely. Thus, it is also possible that our predictions were not supported because the experience of loneliness was not sufficiently enduring or intense to bias participant’s attention to the threat of losing belongingness—at least in this experimental context. This line of reasoning highlights a lack of precision in the Evolutionary Model of Loneliness, which limits the development of specific predictions about suicide risk. Similar concerns have recently been discussed in the suicide literature (Millner et al., 2020). Future research needs to better identify those characteristics of loneliness related to the harmful effects predicted by the Evolutionary Model and their precise relationship to suicidal desire. Another potential explanation is that the Interpersonal Persistence Task involves manipulating belongingness with “strangers,” whereas the Evolutionary Model may prompt hypervigilance to loss of *existing* social ties. Thus, the current results may point to boundary conditions for applying the Evolutionary Model of Loneliness in the context of suicide risk, which warrant further investigation.

A lack of precision in models of loneliness and suicide may also have contributed to the unexpected findings observed for our second hypothesis. Drawing on the Evolutionary Model of Loneliness, we posited that

people do not feel lonely when their social needs are well-regulated. We therefore predicted that in the low loneliness group losses and gains of belongingness would have a similar magnitude of effect on desire to quit. In contrast, the results showed that *losses* of belongingness had a somewhat larger (negative) effect on desire to quit than (the positive effect of) gains in belongingness. These findings suggest that at low levels of loneliness there is a greater sensitivity to losses than gains of belongingness, as described in Prospect Theory, and illustrates the potential value of theories from broader psychological science for suicide research (Millner et al., 2020). However, our third hypothesis, based on Prospect Theory was not fully supported. Specifically, we predicted that losses in belongingness would have a greater impact on desire to quit than gains in belongingness at high (as well as low) levels of loneliness—which was not observed. Taken together, our findings suggest that the application of Prospect Theory to studies of suicide risk is context dependent. That is, our data show that when considering changes in belongingness, the influence of loss aversion appears to depend on the prevailing level of loneliness, since as noted above the influence of gains in belongingness on desire to quit outweighed losses in the high loneliness group.

The differing profiles of response observed in the high and low loneliness groups have some interesting implications for Interpersonal Theory (Joiner, 2005; Van Orden et al., 2010). Specifically, Interpersonal Theory posits that the combined presence of lacking belongingness and high perceived burdensomeness is particularly detrimental, causing increases in the active desire for death. In keeping with this theory, the current findings showed that *consistent* feedback signaling low belongingness and high perceived burdensomeness (as manipulated for the consistent low belongingness condition) over time was associated with a significant and large increase in desire to quit, but only in the low loneliness group. Instead, the high loneliness group showed a small easing in desire to quit caused by the combined beneficial presence of high belongingness and low perceived burdensomeness. Thus, those low in loneliness appeared to have a strong reaction to feelings of lacking belongingness and being a burden over time, while those high in loneliness appeared to respond more strongly to feeling like they belong and like they are contributing to the group. These differing profiles of response suggest a more nuanced application of Interpersonal Theory, based on prevailing levels of loneliness. Additionally, future research may benefit from further exploration of age-related differences in the mechanisms of change, in order to specify within existing theories if the causal mechanisms that contribute to suicide risk differ across developmental periods.



These current findings for differing profiles of response for those high and low in loneliness also have potential clinical implications. Indeed, the overall frequency of suicidal ideation and behaviors in the current sample of young adults was markedly higher in those with high, compared to low, levels of loneliness (Calati et al., 2019), pointing to a need for personalized suicide interventions based on co-occurring levels of loneliness. The most promising psychological approach for reducing loneliness involves changing maladaptive cognitions, such as negative attention and interpretive biases (Cacioppo et al., 2015; Mann et al., 2017). Further, findings derived from a recent meta-analysis suggest that tailoring psychosocial interventions to the needs and preferences of individuals may improve their potency for reducing loneliness (Eccles & Qualter, 2021), and by extension may also provide more effective means of suicide reduction. In keeping with this proposal, the current findings suggest that psychological interventions may be useful for young people at risk of suicidal ideation and attempts, but who are currently *low* in loneliness, as a means of reducing sensitivity to potential losses of belongingness. However, our findings suggest that interventions targeting loneliness by means of increasing opportunities to belong (e.g., through social prescribing, or social programs such as Groups4Health) may be beneficial in reducing suicidal ideation (Haslam et al., 2019).

The current study has both strengths and limitations. Experimental studies provide a powerful tool in determining causality, leading to calls for greater adoption of these methods in suicide research (O'Connor & Nock, 2014). While the Interpersonal Persistence Task was successful in manipulating belongingness, some variability in induced burdensomeness was observed, which may suggest that more nuanced and reactive feedback systems are required to hone the current study design. However, as belongingness and burdensomeness are highly related, this pattern may also mirror how these factors change naturalistically. A further limitation arises from our focus on non-help-seeking student samples, consequently, the generalizability of the current findings to clinical samples is unknown. In keeping with this limitation, the results of the current study are based on (1) desire to quit an experimental task, and (2) risk statistics based on self-reported measures of suicidal thoughts and behaviors. Future research would benefit from investigating the generalizability of the present results with larger sample in real-world settings, exploring the unique influence of loneliness frequency, intensity, and duration, and using various direct methods of ascertaining risk (e.g., clinician interview, or hospital presentations) to connect the current findings with suicide-specific outcomes. However, the current study highlights the value of distinguishing loneliness from belongingness, and tracking

multiple risk factors for suicide over short periods of time, since rapid increases and decreases in these factors can significantly influence acute risk (Franklin et al., 2017).

In sum, the current study shows that loneliness modifies the influence of belongingness as a risk factor for suicidal ideation, in young adults. Future research should determine the generalizability of these findings in community and clinical cohorts, and across the lifespan. Likewise, future research may benefit from examining potential gender differences in responses to loneliness, belongingness, and desire to escape that may alter the results. Importantly, a key part of determining the generalizability of the present results will be to determine if the experimentally induced patterns of change observed here also emerge in naturalistic settings. In doing so, it may be possible to implement specific treatment strategies for suicidal ideation tailored to each individual's experience of loneliness.

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