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**Neuroticism Confers Vulnerability in Response to Experimentally Induced
Feelings of Thwarted Belongingness and Perceived Burdensomeness: Implications for
Suicide Risk**

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Abstract

Objectives: This study investigated the role of individual differences in neuroticism in conferring increased reactivity to the interpersonal antecedents for suicide proposed by the interpersonal theory of suicide.

Method: Undergraduate students ($N = 113$) were screened and selected to form high ($n = 58$) and low ($n = 55$) neuroticism groups and an experimental computer task was used to manipulate participants' experience of thwarted belongingness and perceived

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burdensomeness. Participants' self-reported desire to persist in the face of this induced interpersonal adversity was measured.

Results: Results indicate that high neuroticism confers increased reactivity to the experimental induction of the interpersonal antecedents of suicidal ideation; thwarted belongingness and perceived burdensomeness. Furthermore, this vulnerability corresponds to a diminished desire to persist with the task in the face of interpersonal adversity.

Conclusions: Neuroticism confers vulnerability for suicidal desire via an increased reactivity to the proximal, causal risk factors proposed by the interpersonal theory of suicide. This has implications for considering how personality risk factors such as neuroticism may interact with proximal interpersonal risk factors to increase suicidal ideation.

Key words: Neuroticism, Interpersonal Theory of Suicide, Vulnerability, Suicide ideation, Experimental psychopathology.

Neuroticism Confers Vulnerability in Response to Experimentally Induced Feelings of Thwarted Belongingness and Perceived Burdensomeness: Implications for Suicide Risk.

Neuroticism has been conceptualised as an increased reactivity towards negative stimuli (Eysenck, 1985) and is linked to higher rates of suicide ideation and attempts (Brezo, Paris, & Turecki, 2006; Enns, Cox, & Inayatulla, 2003; Farmer et al., 2001; Velting, 1999).

Individuals who die by suicide tend to be higher in neuroticism than non-suicidal controls (Duberstein, Conwell, & Caine, 1994; Tsoh et al., 2005; Useda et al., 2007), although attempters are higher in neuroticism than completers (Tsoh et al., 2005; Useda et al., 2007).

While there is considerable evidence that neuroticism is associated with greater suicide risk, the mechanisms by which neuroticism might influence suicide risk are unknown. Neuroticism is defined as a relatively stable personality pattern of increased emotional responsivity to

threat, frustration, or loss (Costa and McCrae, 1992a; Goldberg, 1993). One possibility is that people high in neuroticism are more susceptible to perceiving threats to their interpersonal needs to belong and contribute being met. According to the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), the thwarting of these fundamental interpersonal needs increases suicidal desire.

Studies have shown that individuals with high levels of neuroticism are more vulnerable to experiencing negative emotion in response to minor stressors and have a more reactive sympathetic nervous system (Eysenck, 1985). Further, individuals with this enhanced reactivity often experience emotional responses that are frequent and out of proportion to the circumstances (McCrae & Costa, 2003). Such individuals are vulnerable to self-criticism, increased sensitivity to criticism, and feelings of personal inadequacy (Watson, Clark, & Harkness, 1994). The increased emotional reactivity associated with high neuroticism may confer vulnerability towards experiencing the interpersonal precursors for suicidal desire; and may offer a partial explanation for the association between neuroticism and suicidal ideation.

The interpersonal theory of suicide posits that the joint influence of thwarted belongingness and perceived burdensomeness is the key causal and proximal antecedent of suicidal desire (Joiner, 2005; Van Orden et al., 2010; Ma, Batterham, Calear & Han, 2016; Chu et al., 2017). Thwarted belongingness refers to feeling isolated and alienated from friends, family, and other social networks, and perceived burdensomeness refers to one's perception of being ineffective to the point of being a burden on others and that one's death will benefit others more than one's continued life. People high in neuroticism may be particularly vulnerable to experience the thwarting of these fundamental interpersonal needs to belong and to contribute. For example, neuroticism is associated with low levels of perceived social inclusion and greater sensitivity to cues of social exclusion (Denissen &

Penke, 2008b), as well as with feelings of being a burden on others (Chochinov et al., 2007).

The aim of the present study was to experimentally manipulate feelings of thwarted belongingness and perceived burdensomeness (Collins, Best, Stritzke, & Page, 2016; Collins, Stebbing, Stritzke, & Page, 2017) and test if neuroticism moderates the effects of induced thwarted belongingness and perceived burdensomeness on the desire to escape from this interpersonal adversity.

Neuroticism and Thwarted Belongingness

Neuroticism may influence the experience of thwarted belongingness. A recent cross-sectional study found that neuroticism is positively associated with thwarted belongingness (DeShong, Tucker, O'Keefe, Mullins-Sweatt, & Wingate, 2015). More generally, neuroticism is also linked to elevated distress in response to interpersonal conflicts such as arguments, tensions, or criticism (Bolger & Zuckerman, 1995; Zautra, Affleck, Tennen, Reich, & Davis, 2005), and to greater reactivity in situations involving perceived social or interpersonal threat (Denissen & Penke, 2008a, 2008b). That is, individuals high in neuroticism tended to report lower levels of social inclusion such as relationship closeness, meaningful communication, availability of emotional support, understanding and acceptance, and they also exhibited greater negative reactivity in response to imagined scenarios of social exclusion, such as interpersonal conflict and rejection (Denissen & Penke, 2008b). Thus, neuroticism represents a predisposition to react vigilantly to interpersonally threatening cues including cues of diminished belongingness. Consequently, individuals high in neuroticism would be more sensitive and reactive to the experience of experimentally induced thwarted belongingness.

Neuroticism and Perceived Burdensomeness

Neuroticism may also influence the experience of perceived burdensomeness. DeShong and colleagues (2015) reported that neuroticism was positively associated with perceived burdensomeness. Similarly, neuroticism correlated positively with feelings of

burdensomeness to others amongst a group of terminally ill inpatients (Chochinov et al., 2007) and male prison inmates (Cramer et al., 2012). More generally, neuroticism is associated with a higher sensitivity to the experience of losses and failure to meet expectations (Proto & Rustichini, 2015), negative feedback (Larsen & Ketelaar, 1989; 1991), and increased feelings of guilt and disappointment (Trnka, Balcar, Kuška, & Hnilica, 2012). Joiner (2005) proposed that such feelings are motivators for suicidal behaviour through their influence on perceived burdensomeness. Since neuroticism represents a vulnerability to experience disappointment, guilt, failure, and burdensomeness more intensely, people high in neuroticism would be expected to be particularly sensitive to the experience of experimentally induced perceived burdensomeness.

The Present Study

Previous research examining the relationship between neuroticism and the interpersonal risk factors of thwarted belongingness and perceived burdensomeness has primarily been correlational (Brezo et al., 2006; DeShong et al., 2015). The current study is novel because it is the first experimental test of the hypothesis that people high in neuroticism, when faced with interpersonal adversity, may be more vulnerable to experiencing heightened levels of thwarted belongingness and perceived burdensomeness than people low in neuroticism. Consequently, people high in neuroticism may also exhibit a greater tendency of wanting to escape from such interpersonal adversity, whereas people low in neuroticism would exhibit greater resilience. Escape theory (Baumeister, 1990) posits that the primary motivation for suicide is to escape from painful self-awareness, and according to the integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011) perceptions of defeat and humiliation give rise to feelings of entrapment, with suicide being contemplated as a means to escape these intolerable feelings. Joiner (2005) argues that high

levels of thwarted belongingness and perceived burdensomeness could constitute this 'psychological pain' and could prompt such escape-seeking behaviours.

In the present study we used an interpersonal persistence task designed to experimentally induce high or low feelings of thwarted belongingness and perceived burdensomeness and observe the effects of this manipulation on the desire to escape this interpersonal adversity (Collins et al., 2016; 2017). Escape is operationalised as the desire to drop out of the team activity measured at various time intervals throughout the persistence task. A decline in persistence is a potential antecedent of various self-defeating behaviours (Deci & Ryan, 2000) including suicide risk (Van Orden et al., 2010).

It is well established that neuroticism is associated with a general increased reactivity to negative stimuli and emotional states (Eysenck, 1985; Watson, Clark, & Harkness, 1994; McCrae & Costa, 2003; Costa and McCrae, 1992a; Goldberg, 1993; Larsen & Ketelaar, 1991; Rusting & Larsen, 1997; Zautra, Affleck, Tennen, Reich, & Davis, 2005). However, this reactivity is considered in the current study in the context of the specific interpersonal risk factors thought to be proximal to suicidal desire. The interpersonal theory of suicide posits that it is the interpersonal nature of feeling disconnected and unable to make meaningful contribution that results in the desire to escape which motivates suicidal behaviour (Ma et al., 2016). It is important that these proposed interpersonal risk factors are distinguished from a more general sense of sadness, failure or disappointment which has also been shown to motivate suicidal behaviour (Baumeister, 1990). Similarly, it is important in an experimental manipulation of perceived burdensomeness and thwarted belongingness to ensure that their adverse effects are due to their interpersonal nature, rather than attributable to general negative feedback or stimuli. The interpersonal persistence task was designed to achieve this aim. Recent evidence showed that when contrasting the standard interpersonal variant of this task, where negative reactivity is induced via specifically interpersonally

adverse experiences of failure and inadequacy, with an intra-personal condition, where negative feedback occurs in a competitive rather interpersonally collaborative context, deficits in persistence were much greater among participants in the interpersonal condition (George, Collins, Cao, Stritzke, & Page, 2017). Therefore, the interpersonal persistence task was used in the present study to test whether the increased reactivity associated with high neuroticism specifically confers sensitivity to the experimental induction of the *interpersonal* risk factors for suicide.

We selected individuals who were either high or low in neuroticism, and within each group, participants were randomly assigned to either a high or low perceived burdensomeness and thwarted belongingness (PB-TB) condition. We tested the following hypotheses:

(1) There will be a main effect of PB-TB condition with participants in the high PB-TB condition reporting higher levels of thwarted belongingness and perceived burdensomeness than participants in the low PB-TB condition. If neuroticism is associated with increased reactivity to the experience of these interpersonal stressors then there will also be a PB-TB condition by neuroticism group interaction, such that the effect of PB-TB condition will be greater in people high in neuroticism compared to people low in neuroticism.

(2) If hypothesis (1) is supported with people high in neuroticism being more reactive to the induction of thwarted belongingness and perceived burdensomeness, and this vulnerability detrimentally affects persistence, then there would also be a PB-TB condition by neuroticism group interaction effect on the desire to drop out of the interpersonal team task. That is, in the high PB-TB condition, participants high in neuroticism would have a greater desire to drop out compared to participants low in neuroticism, whereas in the low PB-TB conditions there would be no difference in the desire to drop out between the neuroticism groups.

Methods

Participants

Power analysis was calculated for repeated measures ANOVA, with six within subjects levels, two between subjects factors; each with two levels (neuroticism group and task condition) using G*Power (Faul, Erdfelder, & Lang, 2013). Based on a power of 0.80, an alpha level of .05, and a small to medium interaction effect size ($\eta^2_{\text{partial}} = .05$), the required sample size to reliably detect a significant interaction between neuroticism group and task condition was estimated at 72. Thus, the current sample provided sufficient statistical power.

Participants ($N = 116$; 80 females, aged between 17 and 59; $M = 19.38$, $SD = 5.23$) were recruited based on scores on the neuroticism subscale of the Eysenck Personality Questionnaire Brief Version (EPQ-BV; Sato, 2005) completed by 1092 first year undergraduate students enrolled in an introductory psychology unit. Those scoring in the upper 15% (high neuroticism; $N = 160$) or lower 15% (low neuroticism; $N = 159$) of the distribution were invited to participate in the experimental task. Of the students who met these criteria, 60 and 55 were recruited to form the high and low neuroticism groups, respectively. Participants from each neuroticism group were randomly allocated to either a high PB-TB condition or a low PB-TB condition, resulting in four groups: high neuroticism, high PB-TB; high neuroticism, low PB-TB; low neuroticism, high PB-TB; and low neuroticism, low PB-TB. The study was approved by the UWA Human Research Ethics Committee and all participants provided written informed consent and received partial course credit.

Experimental Task

The Interpersonal Persistence Task (Collins et al., 2016) is an experimental procedure that was presented to participants as a three-player computer reaction time task requiring players to work as a team to achieve a goal; each making a judgment on whether two characters (e.g., Ý and Ü) presented on a computer screen were alike or different as quickly and as accurately as possible. Participants were told that they were playing with two fellow students, one situated in the testing room opposite, and the other in a separate laboratory down the hall. However, these ‘co-players’ were computer-controlled, and the student seated in the opposite testing room was either another participant scheduled at the same time or a confederate. Participants were informed that they would win and lose points on the basis of both speed and accuracy. They were instructed that points won and lost by the individual would contribute to a cumulative team total score, and that as a team they were aiming to beat a target score. They were told this target score is based on the average performance of teams who have previously completed the task. An experimental manipulation is used to simultaneously induce perceptions of burdensomeness and thwarted belongingness. This manipulation produces two conditions; a high PB-TB condition, and a low PB-TB condition

Perceived Burdensomeness Manipulation. Performance feedback was used to manipulate the experience of perceived burdensomeness. At the end of each block of trials, participants were presented with a score summary table displaying their score, their teammate’s scores, the total score for the team, and the team target score. These scores do not reflect the player’s actual performance, but are instead manipulated to induce feelings of perceived burdensomeness. That is, in the high PB-TB condition participants always score lower than their teammates, while in the low PB-TB condition participants always score equivalent to or better than their teammates. This manipulation ensures that participants in the

high PB-TB conditions are not able to effectively contribute to their team's overall performance and are therefore likely to consider themselves a burden.

Thwarted Belongingness Manipulation. Interpersonal feedback statements from the participant's teammates were used to manipulate belongingness. After every block of trials participants are given the opportunity to send a short feedback message to each of their "teammates". Prior to commencing the task, they are informed that this feedback may comment on an individual player's performance, or the performance of the team more generally, and that this feedback may assist the team's performance. After the participant has provided feedback messages they receive comments from each of their "co-players", including spelling and grammatical errors, as well as colloquialisms intended to be consistent with a student population. In the high PB-TB condition comments are increasingly critical, while in the low PB-TB condition the comments are supportive. Thus, participants in the high PB-TB condition were made to feel as though they are not valued by their "co-players" and therefore their need to belong within the team may have been thwarted.

The task began with the on-screen instructions and participants were given the opportunity to complete a practice round. The task then ran for six blocks, comprising three rounds of five trials each. Following each of the six blocks participants were asked to rate their experience of thwarted belongingness, perceived burdensomeness and their desire to drop out of the task using the following statements: (1) *I feel like a burden to my team* (2) *I feel as though I belong in the team*; and (3) *If given the opportunity, I would rather drop out of the task* on a 7-point Likert scale ranging from 0 (*not at all true for me*) to 6 (*very true for me*). After completing the task, participants were also asked to rate the extent to which they tried to do well and were interested in the task, also on 7-point scales.

Questionnaires

The Eysenck Personality Questionnaire Brief Version (EPQ-BV; Sato, 2005). The 12-item neuroticism subscale of the EPQ-BV personality questionnaire measured individuals' level of trait neuroticism. Participants responded to statements indicating how true each statement was for them, ranging from 1 (*Not at all*) to 5 (*Extremely*), with higher scores indicating greater levels of neuroticism. The questionnaire has good psychometric properties (Sato, 2005). In the current study, internal consistency for the EPQ was high ($\alpha = 0.97$).

Interpersonal Needs Questionnaire (INQ; Van Orden, Gordon, Bender & Joiner, 2008). The 15-item INQ contains two subscales (1) thwarted belongingness: measuring the extent to which individuals feel connected to others and (2) perceived burdensomeness: measuring the extent to which individuals feel a burden on others. Responses are made on a 7-point Likert scale, ranging from 0 (*Not at all true for me*) to 6 (*Very true for me*), with higher scores indicating greater perceptions of burdensomeness and thwarted belongingness. Example items are "*The people in my life would be happier without me*" (perceived burdensomeness) and "*I often feel like an outsider in social gatherings*" (thwarted belongingness). The scale has good internal consistency across multiple samples (Conner, Britton, Sworts, & Joiner, 2007; Hill et al., 2015; Van Orden et al., 2008). In the current sample the internal consistency was good for both burden ($\alpha = .93$) and belongingness ($\alpha = .88$) subscales.

Self-Injurious Thoughts and Behaviours Items. Five items from the Self-Injurious Thoughts and Behaviours Interview (SITBI; Nock, Holmberg, Photos, & Michel; 2007) were used to measure suicidal thoughts, suicidal gestures, previous suicide attempts, non-suicidal self-injury ideation, and non-suicidal self-injury attempts. Responses were made on a 5-point Likert scale, with higher scores indicating higher levels of the above suicidal behaviours. The

SITBI has been found to have strong inter-rater reliability, test-retest reliability, and concurrent validity (Nock et al., 2007).

Intent, Likelihood, and Readiness for Suicide. Suicide outlook was assessed using three items that measured an individual's readiness (*If I wanted to kill myself, I feel ready to do so*), intent (*I have no intention of killing myself in the near future*) and likelihood (*It is unlikely that I would die by suicide anytime soon*) of suicide, with responses ranging from 0 'Not at all' to 8 'Very strongly'. The two latter items were reversed scored, such that higher scores indicated greater risk for suicidal behaviour.

The Kessler Psychological Distress Scale (K10; Kessler et al., 2002). The 10-item K10 is a non-specific measure of psychological distress in the past four weeks. Responses are made on a 5-point Likert scale, ranging from 1 (*None of the time*) to 5 (*All of the time*), with higher scores indicating greater levels of psychological distress (Kessler et al., 2002). Internal consistency reliability in the current sample was good ($\alpha = .95$). The normative bands for K10 scores in the Australian population are: low distress (10-15), moderate distress (16-21), high distress (22-29), and very high distress (30-50) (Cvetkovski, Reavley, & Jorm, 2012).

Procedure

After arriving, participants were seated in individual testing rooms with a standard desktop computer. If there was no other participant scheduled at that time, a confederate was used. Both participants (or participant and confederate) were then briefed on the task requirements, given an information sheet, and asked to sign a consent form while the experimenter 'checked on the third player in the laboratory down the hall'. The experimenter emphasised that to be correct, responses needed to be both *accurate* and *fast*. This was incorporated to minimise suspicion that the scoring system was pre-determined, since participants could not be sure that their responses were fast enough to be classified as correct.

The task presented on-screen instructions which explained the aim of the task, how to play, as well as the scoring system. Participants first played a practice round, with stimuli pairs appearing on screen followed by feedback indicating whether the response was correct or incorrect. After the practice round, the message '*waiting for other players to finish the practice*' was displayed on the screen, to maximise plausibility that participants were actually playing with real teammates. The task then ran for a total duration of 30 minutes.

After completing the task, participants filled out the questionnaire measures which were presented in a fixed order using online software. Participants were then asked to fill out written feedback sheets asking if they had any comments about the experiment, followed by any comments about their 'teammates'. These questions were included to determine whether participants were suspicious about their teammates or the interpersonal feedback they received. Finally, participants were debriefed on the aims of the study and provided with details for counselling and other support services available on campus.

Results

Design

First, the effects of the experimental manipulation on burdensomeness and belongingness ratings were examined using a 2 (low PB-TB, high PB-TB) $\times$ 2 (high neuroticism, low neuroticism) $\times$ 6 (Time Blocks 1-6) mixed-design analyses of variance (ANOVA). The effects of the experimental procedure on the desire to drop out of the task was also examined using a 2 (low PB-TB, high PB-TB) $\times$ 2 (high neuroticism, low neuroticism) $\times$ 6 (Time Blocks 1-6) mixed-design ANOVA. A significant interaction between neuroticism group and PB-TB condition for each dependent variable would support the hypotheses that neuroticism would confer increased sensitivity to the induction of thwarted belongingness and perceived burdensomeness, and that this would confer increased desire to drop out of the task.

Data Screening and Descriptive Statistics

There were no univariate or multivariate outliers and skewness and kurtosis were within acceptable limits. To ensure consistency in the criteria for allocation to high and low neuroticism groups, three participants whose EPQ-BV scores changed between pre-recruitment screening and the time of the experimental session to such an extent that they no longer were at least below or above the median consistent with their low or high neuroticism group allocation were removed, leaving a final total sample size of 113. For six participants the second administration of the EPQ-BV was not available due to computer malfunction.

Descriptive statistics for the high and low neuroticism groups are shown in Table 1. As intended, the high and low groups were significantly different on neuroticism $F(1, 105) = 496.64, p < .001 \eta^2_{\text{partial}} = .83$. The high neuroticism group also reported significantly higher levels of thwarted belongingness and perceived burdensomeness than the low neuroticism group. Therefore, scores on trait-level thwarted belongingness and perceived burdensomeness as measured by the INQ were included as covariates in subsequent analyses of task induced thwarted belongingness and perceived burdensomeness. High neuroticism individuals also reported higher levels of non-specific psychological distress, suicide ideation, intention, likelihood and readiness for suicide (see Table 1).

Manipulation Checks

Those participants who indicated on the feedback sheets that they were suspicious of the task or their teammates were identified. Two researchers examined the feedback sheets and made independent judgments about whether participants were suspicious or not. Interrater reliability was 95%. Eleven participants (9.73%) indicated suspicion; two from the low PB-TB condition and ten from the high PB-TB condition. These participants were excluded from further analyses, although it is noteworthy that there were no significant

differences in levels of desire to drop out between those participants who reported suspicion ($M = 1.95, SD = 1.88$) and those who did not ($M = 1.82, SD = 2.04$); $F(1, 112) = .04, p = .835, \eta^2_{\text{partial}} = .001$.

Thwarted belongingness

A $2 \times 2 \times 6$ ANOVA examining the effects of neuroticism group, PB-TB condition, and time on belongingness revealed a significant main effect of experimental condition; $F(1, 98) = 168.35, p < .001, \eta^2_{\text{partial}} = .63$, confirming that participants in the high PB-TB condition reported lower levels of self-reported belongingness than those in the low PB-TB condition. This suggests that the experimental manipulation of thwarted belongingness was effective (see Figure 1).

There was also a condition by time interaction $F(4.33, 424.07) = 30.09, p < .001, \eta^2_{\text{partial}} = 0.24$. To investigate this interaction, the effect of time was examined separately for each condition. In the high PB-TB condition, belongingness ratings were lower at Time 1 and continued to decrease during the task, $F(4.03, 185.23) = 36.49, p < .001, \eta^2_{\text{partial}} = .44$ whereas, in the low PB-TB condition belongingness ratings did not change over time, $F(4.71, 244.88) = .74, p = .73, \eta^2_{\text{partial}} = .01$ (Figure 1). Thus, the manipulation was successful in inducing reduced feelings of belongingness and this effect extended over time.

Consistent with the primary hypothesis that, compared to individuals low in neuroticism, individuals high in neuroticism would exhibit greater sensitivity to the induction of thwarted belongingness, there was a significant interaction between neuroticism group and PB-TB condition $F(1, 98) = 5.25, p < .05, \eta^2_{\text{partial}} = .05$. To follow up this interaction, the effect of neuroticism was examined separately for each condition. In the low PB-TB condition, the high and low neuroticism groups did not differ significantly in their perception of belongingness, $F(1, 52) = .123, p = .73, \eta^2_{\text{partial}} = .002$. But as predicted, in the high PB-TB condition, people high in neuroticism reported lower levels of belongingness than people

low in neuroticism $F(1, 46) = 8.03, p < .01$ partial $\eta^2_{\text{partial}} = .15$ (see Figure 1). This is consistent with the hypothesis that individuals high in neuroticism are more sensitive to the experimental induction of thwarted belongingness. The potential effects of pre-existing trait levels of thwarted belongingness as measured by the INQ were controlled for, but did not significantly contribute to the model.

Perceived Burdensomeness

A $2 \times 2 \times 6$ ANOVA examining the effects of neuroticism group, PB-TB condition, and time on burdensomeness revealed a significant main effect of experimental condition $F(1, 98) = 165.88, p < .001, \eta^2_{\text{partial}} = .63$, whereby the high PB-TB condition induced higher levels of perceived burdensomeness (Figure 2).

This main effect was qualified by an interaction between condition and time $F(4.39, 430.15) = 3.09, p < .05$, partial $\eta^2_{\text{partial}} = .03$. To follow up this interaction, each condition was examined separately. In the high PB-TB condition, burdensomeness was higher at Time 1 and continued to increase over time $F(4.19, 192.82) = 2.98, p < .05, \eta^2_{\text{partial}} = .06$, while in the low PB-TB condition, there was no significant effect of time $F(3.64, 189.41) = 1.14, p = .34, \eta^2_{\text{partial}} = .02$. This indicates that the manipulation was also successful in inducing increased feelings of burdensomeness and that this effect was maintained over time.

It was hypothesised that compared to individuals low in neuroticism, individuals high in neuroticism would exhibit greater sensitivity to the induction of perceived burdensomeness. Consistent with this, there was a significant interaction between neuroticism group and PB-TB condition $F(1, 98) = 5.48, p < .05, \eta^2_{\text{partial}} = .05$. To investigate this interaction, the effect of neuroticism on burdensomeness was examined separately for each experimental condition. In the low PB-TB condition, the high and low neuroticism groups did not differ significantly in terms of their perception of burdensomeness, $F(1, 52) = .05, p = .82, \eta^2_{\text{partial}} = .001$. In contrast, in the high PB-TB condition, the high neuroticism group

reported greater feelings of burdensomeness than the low neuroticism group $F(1, 46) = 7.26$, $p < .01$, $\eta^2_{\text{partial}} = .14$ (Figure 2). This suggests that high neuroticism individuals are more sensitive to the induction of perceived burdensomeness, such that they report higher levels of burdensomeness in response to the induction, relative to those who are low in neuroticism. The potential effects of pre-existing trait levels of perceived burdensomeness as measured by the INQ were controlled for, but did not significantly contribute to the model.

Neuroticism and Desire to Drop Out of the Task

Given the experimental procedure had successfully manipulated burdensomeness and belongingness, a $2 \times 2 \times 6$ ANOVA examining the effects of neuroticism group, PB-TB condition, and time on desire to drop out of the task found a significant main effect of condition $F(1, 98) = 71.11$, $p < .001$, $\eta^2_{\text{partial}} = 0.42$, where those in the high PB-TB condition had higher desire to drop out of the task than those in the low PB-TB condition (Figure 3). There was also a main effect of time $F(3.79, 371.79) = 3.44$, $p < 0.01$, $\eta^2_{\text{partial}} = .03$ and a significant interaction between time and PB-TB condition, $F(3.79, 371.79) = 9.81$, $p < .001$, $\eta^2_{\text{partial}} = .09$. To follow up this interaction, each experimental condition was examined separately. In the high PB-TB condition, the desire to drop out of the task significantly increased over time $F(3.66, 168.48) = 9.64$, $p < .001$, $\eta^2_{\text{partial}} = .17$, whereas in the low PB-TB condition there was no significant effect of time $F(3.34, 173.45) = 1.58$, $p = .22$, $\eta^2_{\text{partial}} = .03$.

As hypothesised, there was also a significant interaction between condition and neuroticism, $F(1, 98) = 6.99$, $p < 0.01$, $\eta^2_{\text{partial}} = .07$. To follow up this interaction, each experimental condition was examined separately. In the high PB-TB condition, people higher in neuroticism reported a higher desire to drop out of the task than people lower in neuroticism $F(1, 46) = 17.52$, $p < .001$, $\eta^2_{\text{partial}} = .28$. Similarly, in the low PB-TB condition people higher in neuroticism reported a greater desire to drop out of the task than those low in neuroticism $F(1, 52) = 4.96$, $p < .05$, $\eta^2_{\text{partial}} = .09$. However, the effect of neuroticism was

about three times larger in the high PB-TB condition. This supports the hypothesis that high neuroticism is associated with increased sensitivity to the induction of thwarted belongingness and perceived burdensomeness such that the presence of these interpersonal risk factors will confer additional desire to drop out of the task. The potential effects of pre-existing trait levels of thwarted belongingness and perceived burdensomeness as measured by the INQ were controlled for, but did not significantly contribute to the model.

To further investigate the relative contribution of burdensomeness and belongingness in the high PB-TB condition on desire to drop out of the task, a hierarchical multiple regression analysis was conducted. The influence of self-reported effort and interest in the task was accounted for by including these variables in step one of the analysis. Mean levels of self-reported belongingness and burdensomeness were entered simultaneously at step two.

At step one, the model was significant, $F(2, 45) = 3.50, p < .05$, adjusted $R^2 = .24$, indicating that interest ($\beta = -.50, p < .05$), but not effort ($\beta = .01, p > .05$), accounted for a significant proportion of the variance in desire to quit, such that higher levels of interest were associated with lower levels of desire to quit (see Table 2). At step two, after entering mean burdensomeness and belongingness ratings into the model simultaneously, the model explained an additional 39.4% of variance in desire to quit over and above interest, R^2 change $= 0.39, p < 0.01$, with both thwarted belongingness ($\beta = -.36, p < .01$) and perceived burdensomeness ($\beta = .41, p < .01$), significantly predicting desire to drop out (see Table 2). Following the addition of thwarted belongingness and perceived burdensomeness, neither interest nor effort was a significant predictor.

Finally, the desire to drop out of the task was significantly positively correlated with suicidal thoughts ($r = .23, p < .05$), intent ($r = .22, p < .05$), and readiness ($r = .26, p < .01$). In addition, desire to quit the task positively correlated with non-suicidal self-injury ideation ($r = .28, p < .01$), non-suicidal self-injury behaviours ($r = .29, p < .01$), and general

psychological distress as reported on the K10 ($r = .44, p < .01$). Adding further to the ecological validity of the persistence task, there were moderate correlations between the interpersonal constructs measured by the INQ and the same constructs measured as momentary states in the specific context where those constructs are experimentally induced. That is, in the high PB-TB condition, $r = .312, p = .031$, between INQ perceived burdensomeness and task burdensomeness ratings; and $r = -.396, p = .005$, between INQ thwarted belongingness and task belongingness ratings. But in the condition where those constructs were not experimentally induced (i.e., low PB-TB condition), those correlations were weaker or non-significant ($r = .274, p = .047$, between INQ perceived burdensomeness and task burdensomeness ratings, and $r = -.061, p = .663$, between INQ thwarted belongingness and task belongingness ratings). Similarly, neuroticism was associated with task ratings in the high condition, when PB and TB were induced ($r = .335, p = .025$ for task burdensomeness ratings, and $r = -.444, p = .002$, for task belongingness ratings), but not in the low condition when PB and TB were not induced ($r = .052, p = .719$, and $r = -.038, p = .793$, respectively).

Discussion

We examined whether neuroticism would confer increased vulnerability for experiencing the interpersonal risk factors posited by the interpersonal theory of suicide (Joiner, 2005) to be causal and proximal antecedents of suicidal desire. Specifically, we experimentally induced feelings of thwarted belongingness and perceived burdensomeness and measured their impact on the desire to escape this interpersonal adversity. As hypothesised, high levels of neuroticism were associated with increased reactivity to the induction of interpersonal adversity, with these individuals reporting higher levels of perceived burdensomeness and lower levels of belongingness than those low in neuroticism. Furthermore, in the high PB-TB condition both high and low neuroticism groups showed

increased desire to drop out of the task, but this increase was significantly greater for those high in neuroticism. These results highlight how distal risk factors such as individual differences in neuroticism may interact with more proximal interpersonal risk factors to confer increased vulnerability for suicide risk.

Previous research found a positive association between neuroticism and suicidal ideation (Brezo et al., 2006; Enns et al., 2003; Farmer et al., 2001), and studies found higher levels of neuroticism in those who died by suicide compared to non-suicidal controls (Duberstein et al., 1994; Tsoh et al., 2005; Useda et al., 2007). This is consistent with findings from the present sample where people high in neuroticism reported significantly higher levels of suicide ideation, intent, and perceived likelihood of suicide occurring in the future. Furthermore, recent cross-sectional evidence suggested that neuroticism may increase suicide risk via its positive association with perceived burdensomeness and thwarted belongingness (DeShong et al., 2015). The results of the current study suggest that the increased emotional responsiveness associated with high neuroticism may confer increased risk for suicide via an increased sensitivity to the interpersonal stressors of thwarted belongingness and perceived burdensomeness. This was also evident in the high neuroticism group's significantly higher scores on these constructs, as measured by the Interpersonal Needs Questionnaire (Van Orden et al., 2008), compared to the low neuroticism group. This study makes a novel contribution in that it provides experimental evidence that one mechanism by which neuroticism may increase suicide risk is by heightened responsiveness to interpersonally adverse situations that specifically induce feelings thwarted belongingness and perceived burdensomeness. Here we found that individual differences in neuroticism confer vulnerability for experiencing the proximal interpersonal risk factors for suicidal desire more intensely. This is consistent with previous literature demonstrating that neuroticism confers vulnerability for experiencing negative emotional reactions (Eysenck,

1985; Larsen & Ketelaar, 1989; Larsen & Ketelaar, 1991; Rusting & Larsen, 1997, Watson, Clark & Harkness). However, to our knowledge this is the first experimental evidence to support the positive associations recently reported by DeShong et al. (2015) of neuroticism with thwarted belongingness and perceived burdensomeness, and also with current and historical suicidal ideation. Furthermore, the current study identifies an association between neuroticism and increased emotional reactivity specific to the *interpersonal* risk factors for suicide, as distinct from more general negative reactivity.

The interpersonal persistence task (Collins et al., 2016; 2017) provides an opportunity to safely manipulate the interpersonal risk factors thought to be proximal and causal antecedents to suicidal desire to observe the effect on the desire to escape this adversity. Consistent with previous research using this task, we found reliable and large effects of PB-TB condition on participants' desire to escape from this interpersonal adversity. Although the interpersonal distress is of course milder and only fleeting in the experimental context, it is plausible to assume that this adversity simulates similar processes as those underlying intolerable psychological pain and self-awareness that according to escape theory (Baumeister, 1990) increase the risk of contemplating suicide as a means to escape this pain. Likewise, the successful experimental induction of feeling that one's efforts to contribute meaningfully to a collective goal do not appear to measure up, are increasingly futile, and are not appreciated by the other team members is akin to the perception of defeat and entrapment hypothesised by the integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011) to be a key pathway to increased suicide risk. While the desire to escape from the task is clearly not equivalent to the desire for suicide, a decline in persistence has been identified as a potential antecedent of various self-defeating behaviours (Deci and Ryan, 2008) including suicide (Van Orden et al., 2010). Furthermore, desire to escape operationalised here as the desire to drop out of the task had some external validity by being

positively correlated with measures of suicidal thoughts, intention, readiness, and measures of non-suicidal self-injury thoughts and behaviours, as well as general psychological distress.

This offers support for the notion that one mechanism through which neuroticism may confer vulnerability for suicide is via an increased susceptibility to the interpersonal risk factors thought to predicate a desire to escape. These results are encouraging and suggest that this experimental paradigm could be useful for further examining how individual differences in personality may interact with more proximal interpersonal risk factors to confer risk or resilience for suicide.

Limitations

A possible limitation of the present experimental paradigm is that it required participants to self-report the extent to which they felt a burden on their teammates, as well as their feelings of belongingness to the team, and their desire to quit throughout. These variables were assessed via explicit questioning throughout the task. This may have influenced the way participants responded to these items; resulting in possible demand effects. However, the large effect of PB-TB condition is evident by the first rating interval, before familiarity with the explicit questioning might have created demand effect, which mitigates concerns about demand characteristics.

One potential limitation in the design is that we did not include indices of general negative affect measured across the task to demonstrate specificity of the changes in belongingness and burdensomeness. However, previous research using this paradigm found that the desire to drop out of the task is attributable to the specific interpersonal adversity rather than negative affect associated with a general failure experience (George et al., 2017), and when levels of general negative affect were tracked throughout the task, it was the interpersonal adversity of perceived burdensomeness and thwarted belongingness that predicted the desire to drop out of the task, and not general distress (Collins et al., 2017).

Another limitation is that, by investigating neuroticism as a single personality trait, it did not take into account the possibility that some specific facets of trait neuroticism may be more predictive of this vulnerability than others. For example, DeShong and colleagues (2015) found that the neuroticism facets of depressiveness, self-consciousness, and vulnerability were significantly associated with perceived burdensomeness, but only depressiveness and self-consciousness were associated with thwarted belongingness. Future research may investigate the relationship between individual facets of neuroticism and the components of the interpersonal theory of suicide to better understand the specific characteristics associated with a vulnerability for experiencing the interpersonal risk factors underlying suicidal desire. A related limitation of the current study is the use of a brief screening measure for neuroticism which does not account for individual facets of neuroticism (EPQ-BV; Sato, 2005). While the EPQ-BV had good internal consistency in the current sample and has demonstrated sound psychometric properties, longer measures of neuroticism, such as the NEO-PI-3 (McCrae & Costa, 2010) are considered the gold standard for personality assessment, and would permit thorough examination of the individual contribution of each of the facets of neuroticism to the vulnerability effect identified in this study. The use of a more comprehensive personality inventory in subsequent studies would also provide the opportunity to account for the potential moderating effects of the remaining Big Five Factors (i.e., extraversion, openness to experience, agreeableness, and conscientiousness) on vulnerability and resilience to the interpersonal risk factors underlying suicidal desire.

While the interpersonal theory of suicide identifies thwarted belongingness and perceived burdensomeness as precursors of the development of a desire for suicide, it also states that desire alone is not sufficient for suicidal action. Taking one's own life is not easy and individuals also need to have acquired the capability to act on their suicidal desire.

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Acquiring capability involves greater pain tolerance and fearlessness of death, and may include active behavioural (e.g., attempts, self-harm) and mental (e.g., mental rehearsal and planning) practice (George, Page, Hooke, & Stritzke, 2016; Van Orden et al., 2010). The current study did not investigate the relationship between neuroticism and the acquired capability for suicide. It is possible that the neuroticism facets of angry hostility and impulsiveness may confer vulnerability for acquiring a capability for suicide in that they permit habituation to pain, a sense of fearlessness about death, and increase the likelihood of impulsive suicidal action (Cramer et al., 2012). Alternatively, other characteristics of neuroticism, such as characteristics of emotional dysregulation, low distress tolerance and high negative urgency (Anestis, Bagge, Tull, & Joiner, 2011), higher harm avoidance (De Fruyt, Van De Wiele, & Van Heeringen, 2000), and increased sensitivity to physiological pain (Goubert, Crombez, & Van Damme, 2004) may be protective against the acquisition of a capability for suicidal action. Further investigations of the relationship between personality variables such as neuroticism, and all three components of the interpersonal theory of suicide would permit better understanding of the role of neuroticism in both suicidal desire and the transition to imminent and lethal suicidal behaviour.

The finding that neuroticism confers increased reactivity to the interpersonal antecedents of suicidal ideation has clinical implications for how an individual's personality predisposition might interact with more acute and transient interpersonal stressors to increase suicide risk. Mindfulness interventions have been shown to enhance persistence in the face of thwarted belongingness and perceived burdensomeness and may confer resilience by enhancing the capacity for emotional regulation (Collins et al., 2016; 2017). Given high neuroticism is associated with diminished emotional regulation (Anestis et al., 2011), mindfulness interventions may be effective in enhancing these individuals' capacity to recognise, tolerate, and accept negative emotion induced by interpersonal stressors. This is

consistent with studies that have shown that while high neuroticism is associated with increased negative reactivity and poorer emotional outcomes, this effect may be mitigated by mindfulness (Feltman, Robinson, & Ode, 2009; Fetterman, Robinson, Ode, & Gordon, 2010). In this way mindfulness interventions may be effective in ameliorating the vulnerability to interpersonal stressors associated with suicidal desire conferred by neuroticism (Chesin & Jeglic, 2016; Forkmann et al., 2014)

In conclusion, the current study provides the first experimental evidence that neuroticism confers increased sensitivity to acute experiences of thwarted belongingness and perceived burdensomeness, promoting diminished persistence. This complements prior evidence of a positive association between neuroticism and individual differences in perceived burdensomeness and thwarted belongingness (DeShong et al., 2015). Thus, distal risk factors such as personality traits may interact with more proximal interpersonal risk factors to increase vulnerability to suicidal desire.

Declaration of Conflicting Interests

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Table 1

Descriptive Statistics for the Questionnaire Variables by High and Low Neuroticism Groups.

	Low neuroticism		High neuroticism		<i>F</i>
	M	SD	M	SD	
Neuroticism	20.69	4.55	46.40	7.13	496.64***
Thwarted belongingness	1.84	0.81	3.37	1.09	71.47***
Perceived burdensomeness	1.25	0.40	2.76	1.28	72.38***
Suicide ideation	1.33	0.55	2.22	1.12	28.68***
Suicide intent	0.17	1.07	0.84	1.56	6.87**
Suicide likelihood	0.21	1.10	0.82	1.47	6.19*
Psychological distress	15.47	3.33	30.56	7.52	190.95***

* $p < .05$, ** $p < .01$, *** $p < .001$

Note. $df = 110$ (except for neuroticism; $df = 105$)

Table 2

Hierarchical Multiple Regression Within the High PB-TB Condition, with Desire to Escape as the Outcome Variable, and Interest, and Effort Entered in Step 1, and Burdensomeness and Belongingness Entered in Step 2.

	<i>b</i>	SE <i>b</i>	β	R^2	R^2 Change
Step 1				.135*	
Effort	.09	.22	.058		
Interest	-.41	.16	-.38**		
Step 2				.51***	.37***
Effort	-.01	.18	-.01		
Interest	-.23	.13	-.21		
Burdensomeness	.45	.20	.33*		
Belongingness	-.61	.25	-.37*		

* $p < .05$, ** $p < .01$, *** $p < .001$

$N = 48$

Note: Burdensomeness reflects the perception that one is a burden to one's teammates. Thus, a high score is a detrimental outcome. Belongingness reflects a feeling of inclusion and fitting in with the team, and therefore a low score is a detrimental outcome.

Figure 1. Mean belongingness ratings across the six time intervals; error bars represent standard error.

Figure 2. Mean perceived burdensomeness ratings across the six time intervals; error bars represent standard error.

Figure 3. Mean desire to drop out ratings across the six time intervals (error bars represent standard error).