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ORIGINAL ARTICLE

Dynamic Changes in a Desire to Escape from Interpersonal Adversity: A Fluid Experimental Assessment of the Interpersonal Theory of Suicide

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Abstract
Given suicide risk is dynamic, research needs to identify the factors responsible for these changes. This can be achieved through experimentally manipulating putative causal risk factors. Two studies experimentally manipulated a change in interpersonal risk factors (thwarted belongingness and perceived burdensomeness) to assess the influence on participants' desire to escape. Study 1 ($N=74$) found manipulating simultaneous changes in burdensomeness and belongingness rapidly changed participants' desire to escape. In Study 2 ($N=54$), a change in only thwarted belongingness was still effective in quickly changing participants' desire to escape from the task, even in the presence of heightened feelings of burdensomeness. The findings speak to the causal role that changes in the levels of interpersonal risk factors may play in influencing a desire to escape from adverse life circumstances.

Keywords Interpersonal theory of suicide · Belongingness · Perceived burdensomeness · Experimental psychopathology

Suicide risk fluctuates over time. Consequently, dynamic changes in suicide risk cannot be fully captured by static measurements which have dominated suicide research and clinical assessments. This variability is a key premise of the Fluid Vulnerability Theory of Suicide (Rudd 2006), which proposes that dynamic interplay between various risk factors (e.g., social support, insomnia, life events) can cause short-term periods of heightened suicide risk. Exploring these periods allows for an understanding of *when*, in addition to *why*, an individual will begin to think about and attempt suicide (Bryan and Rudd 2016). However, recent research has found suicidal ideation to vary over a matter of hours (Kleiman et al. 2017) and on a day-to-day basis (Kyron et al. 2018). Building on these studies, two further areas warrant investigation: firstly, the short-term impact of changes in risks factors; and secondly, experimental studies that isolate and manipulate risk factors to determine causality. The current study looks to implement an experimental design to assess how changes in risk factors can influence a desire to escape from adversity.

Recent developments in experimental research designs have provided important steps in assessing the causal effects of changes in risk factors. Collins et al. (2016) developed a laboratory-based paradigm capable of manipulating interpersonal circumstances, and assessing effects on the desire to escape from the task. This design is grounded in theories of suicide which suggest that suicide is a mechanism to escape from intolerable life circumstances and painful self-awareness (Baumeister 1990; O'Connor 2011). Building on this position, the Interpersonal Theory of Suicide (ITS; Joiner 2005) suggests that an increase in interpersonal adversity generates significant psychological pain and distress, and as a result increases the risk of attempting suicide. Two interpersonal factors are believed to be important in the developments of suicidal thoughts: thwarted belongingness, when an individual's innate desire to feel socially connected is not met; and perceived burdensomeness, when an individual feels they are a burden on those around them. In addition, they are believed to partly influence suicide through affective pathways, encompassing factors such as shame, self-esteem, and a depressed mood (Van Orden et al. 2010). In early studies using this experimental paradigm, the task has found higher levels of manipulated thwarted belongingness and

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perceived burdensomeness to be associated with a higher desire to escape from adversity (Collins et al. 2016, 2017; George et al. 2017; Hartley et al. 2018). Thus, the task is able to test the causal predictions of a prominent theory of suicide through the direct manipulation of interpersonal circumstances and assessing a desire to escape.

The Dynamic Nature of Interpersonal Risk Factors

The interpersonal theory of suicide defines thwarted belongingness and perceived burdensomeness as dynamic constructs which are prone to change over time. However, few ecological studies have routinely tracked how interpersonal factors change, and their association with a desire to escape through the use of suicide. For instance, Kleiman et al. (2017) tracked psychiatric inpatients' suicidal ideation, hopelessness, thwarted belongingness and perceived burdensomeness every few hours for several weeks. Ideation was found to vary frequently over a matter of hours for many patients, which was correlated with changes in risk factors. Likewise, Kyron et al. (2018) found perceived burdensomeness and thwarted belongingness were strongly associated with day-to-day changes in suicidal ideation in a psychiatric inpatient sample. Consistent with prominent theories of suicide, these studies suggest that as interpersonal adversity increases, there may be associated increases in a desire to suicide as a means to escape from intolerable life circumstances.

Using the lens of the interpersonal theory of suicide, both non-suicidal self-injury (i.e., self-harm without an intent to die) and suicide attempts are methods of self-harm used to escape or diminish feelings of distress, which may be caused by interpersonal adversity (Joiner et al. 2012). Consistent with this stance, Turner et al. (2016) tracked individuals with a history of non-suicidal self-injury (NSSI) on a daily basis, finding self-injury was more common on days in which interpersonal difficulties were experienced. In addition, Bagge et al. (2013) asked psychiatric patients who had recently attempted suicide to recall any negative events that had occurred in the 48 h prior. Negative life events were commonly reported in the hours prior to an attempt, and were predominantly interpersonal in nature. In a study using a similar retrospective recall design over the same time period, Bagge et al. (2017) found dramatic increases in fear, guilt, sadness, and hostility occurred in the hours prior to a suicide attempt. Taken together, these studies suggest that as an individual's interpersonal adversity and associated distress increases, the more likely they are to use self-harming behaviours to escape from intolerable life circumstances (i.e., suicidal thoughts and self-injury).

Rationale of the Current Research

While ecological research has noted that a propensity to escape from life is heightened when experiencing increases in interpersonal adversity, there are still important limitations. Firstly, it is unclear whether interpersonal factors are causally related to changes in a desire to escape due to an absence of experimental research. Secondly, research to date has largely focused on which factors are involved in heightening risk, rather than resolving episodes. That is, experiencing negative interpersonal relationships for a period may heighten a desire to escape from adversity, while a positive change could effectively diminish these desires. Likewise, a negative change may override prior positive interpersonal experiences. Such findings reflect key predictions of the fluid vulnerability theory (Rudd 2006), which suggests increases in risk factors, including those interpersonal in nature, are sufficient in causing brief but intensive periods of suicidality, and a removal of these factors can resolve a high-risk episode. However, this notion has not been assessed empirically.

Building on Collins et al. (2016), the interpersonal persistence task used in their study can be modified to manipulate changes in interpersonal feedback. To test key predictions of the fluid vulnerability and interpersonal theories of suicide, some participants will see interpersonal feedback turn from positive to negative to determine whether a desire to escape increases as a result. Likewise, other participants will experience a change in interpersonal feedback from negative to positive to determine whether a desire to escape from adversity can be minimized by a positive turn in circumstances. Study 1 will assess a rapid and dramatic change in both perceived burdensomeness and belongingness and assess effects on a desire to escape. In addition, Study 2 will assess a change in belongingness while keeping burdensomeness constantly high to determine the effects of experiencing a change in only one interpersonal factor. We expect two outcomes in both studies: (i) an increase in interpersonal adversity halfway through the task to be associated with an increase in a desire to escape over the subsequent rounds; and (ii) a decrease in interpersonal adversity halfway through the task to result in a decrease in a desire to escape.

Study 1

Method

Participants

Seventy-four introductory psychology students (M_{age} = 20.06, SD = 4.44, 57% female) participated in the study in exchange for course credit points. Of the available 538

participants in the cohort, those that had burdensomeness and belongingness scores in the middle two quartiles of the distribution of all students on the Interpersonal Needs Questionnaire were invited to participate ($N = 271$). This was done in an attempt to recruit participants with relatively comparable interpersonal circumstances prior to commencing the task. Participants were randomly allocated to a high or low perceived burdensomeness and thwarted belongingness (PB-TB) condition. All participants completed the task in its entirety. All procedures were approved by the University's Human Research Ethics Committee.

Measures

Interpersonal Factors

The Interpersonal Needs Questionnaire (INQ; Van Orden et al. 2012) is a 15-item measure with two subscales assessing perceived burdensomeness and thwarted belongingness. It has excellent psychometric properties (Van Orden et al. 2008). Participants rate their agreement with statements such as "The people in my life would be better off if I were gone" (perceived burdensomeness) and "I rarely interact with people who care about me" (thwarted belongingness) 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 perceived burdensomeness and thwarted belongingness. Internal consistency in the current sample was high for both burdensomeness ($\alpha = 0.95$) and belongingness ($\alpha = 0.93$) scales.

Experimental Task and Procedure

The interpersonal persistence task is a three player team-based task, whereby participants score points by correctly and quickly indicating whether two stimuli (i.e., Ý and Ü), displayed on a computer screen, were the same or different. Participants were informed that one point is awarded for a rapid and correct response, with a point deducted for a slow or incorrect response. The aim for each team member was to score as many points as possible, with individual scores contributing to a total team score. The goal of the task was for the team to beat a target score, which was presented as an average of prior teams partaking in the task at prior points in time. Not beating the target score resulted in the team losing the game.

Structure of the Task

There were six rounds of testing to complete in the task, with each round comprising of 15 trials. That is, each round a participant was required to differentiate between stimuli on 15 occasions per round. At various stages throughout each round, participants were provided with a team score summary table, which presented their score, their teammates' scores, and the total team score. In addition, a target score for the team to beat was presented to all participants. Therefore, participants were made aware as to whether they were performing better or worse than their teammates, and whether the team was winning or losing the task at various stages.

The current study was interested in comparing stable and changing interpersonal experiences. To do so, there was a change in interpersonal conditions for some participants halfway through the task. That is, some participants remained in the high or low PB-TB condition for the duration of the experiment, and some transitioned between the two conditions. Thus, the task was broken into two phases or halves: Phase 1, which consisted of the three rounds prior to a change in interpersonal conditions (Rounds 1–3); and Phase 2, which included the rounds following a change in conditions (Rounds 4–6). There were no breaks between rounds, with the task taking roughly half an hour to complete.

Manipulating Burdensomeness

Perceived burdensomeness was induced using performance related feedback delivered each round. As discussed, the situation presented to the participant was for the team to beat a target score to 'win' the game. Therefore, a poor individual score affected whether the team was successful in task. The success a participant had in each condition, and the performance of the team more generally was pre-determined, and therefore their actual performance was not reflected in the score. In the high PB-TB condition, the participant had a much lower chance of success, while in the low PB-TB condition they had a much higher chance of success. For instance, in the high PB-TB condition, odds were that a participant scored correctly four out of 10 times regardless of how they were performing. This aimed to ensure that participants in the high PB-TB condition always performed worse than their teammates, and the team were unable to meet their target. On the other hand, in the low PB-TB condition the participant performed equal to or better than their teammates, with the team always beating the target score. Thus, participants in the high PB-TB condition were encouraged to perceive that they were not effectively contributing to their team and burdening the team's success in the task.

Manipulating Belongingness

Thwarted belongingness was manipulated through the use of interpersonal feedback statements from teammates. At the end of each round the participants were given the

opportunity to provide and receive feedback to and from their teammates. Unbeknownst to the participant, teammates were computer-controlled and the comments sent to the participant predetermined. This allowed for uniform interpersonal experiences for each participant. To reduce suspicions of the computer-generated nature of teammates, other participants were tested at the same time in adjacent computer booths and presented as being part of the same team. As such, participants could see, but not communicate with each other. The participants in the high PB-TB condition consistently did worse than their teammates, and the team failed to reach the target. Thus, the participants' teammates provided negative and critical feedback that they were letting down the team. Participants in the high PB-TB condition received comments such as "u sure ur hitting the right keys?" and "If you aren't playing your best why play at all :(". In the low PB-TB condition the participants performed better than their teammates, and the team performed well overall. To compliment their performance, participants received positive feedback, such as "well done, keep it up!" and "good job, keep going like that".

Experimental Design

The current study was interested in whether a single interpersonal change was sufficient in affecting a desire to quit or escape from the task. Participants were randomly assigned to begin the experiment in either a high or low PB-TB condition (i.e., Starting Condition). Half way through the experiment, participants either continued in the same PB-TB condition (i.e., Stable) or they changed to the other PB-TB condition (i.e., Switch). Therefore, the study used a 2 (Starting Condition: Low or High PB-TB) × 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds Per Phase) Mixed-Design. In total, there were four experimental conditions: two *stable* control groups, who had a uniform experience for the duration (Low–Low or High–High PB-TB) and two *switch* groups who experienced changes in interpersonal adversity from high PB-TB to low PB-TB, or from low PB-TB to high PB-TB (High–Low or Low–High PB-TB, respectively). This allowed for an assessment of changes in interpersonal circumstances, and a comparison to stable conditions.

Measuring Burdensomeness, Belongingness and a Desire to Quit

At the end of each round, participants were asked a series of questions to assess their feelings of burdensomeness, belongingness and desire to quit (or escape). For burdensomeness, participants were asked, *"at the moment I feel like…"* providing their response on a 7 point Likert scale ranging from 0 = *"an asset on the team"* to 6 = *"a burden on the team"*. For belongingness, participants were asked "*at the moment I feel like…*" providing their response on a 7 point Likert scale ranging from 0 = *"an outsider"* to 6 = *"I belong on the team"*. Scores on this item were reversed so that higher scores indicate greater feelings of thwarted belongingness. Desire to quit was measured by responses to a single question "*if I had the option, I would rather drop out of the game"* on a 7 point Likert scale *(0 = not at all true for me, 6 = very true for me)*.Responses were required in order for participants to complete the task to ensure there was no missing data.

Results and Discussion

Suspicion Check

In total, two participants indicated they were suspicious of the nature of the task and were removed from the analyses; leaving 72 participants (although leaving them in the analysis did not change the pattern of results). Suspicion was identified by explicitly asking participants at the end of the task as to whether they believed they were playing within a computer generated team, and also by evaluating their written comments to teammates. For instance, the two participants removed from the task had asked questions during their opportunity to write comments to teammates in between rounds, and became suspicious when receiving an out of context response.

Assessing the Manipulation

Perceived Burdensomeness

To assess the effects of a switch in PB-TB condition on feelings of burdensomeness, a 2 (Starting Condition: Low or High PB-TB) × 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA, was performed (Fig. 1a). The efficacy of the manipulation on burdensomeness was indicated by a significant three-way interaction between starting condition and whether conditions changed over the two experimental phases (i.e., Phase 1: Rounds 1–3 and Phase 2: Rounds 4–6), $F(1, 68) = 33.02$, $p < .01$, $\eta^2_{\text{partial}} = 0.36$.

Follow up contrasts revealed that for participants who remained in either high or low PB-TB conditions for the duration of the experiment, feelings of burden did not significantly change from phase 1 to phase 2, $F(1, 44) = 3.85$, $p > .05$, $\eta^2_{\text{partial}} = 0.08$. In contrast, for the participants who switched from low to high PB-TB (or vice versa) half way

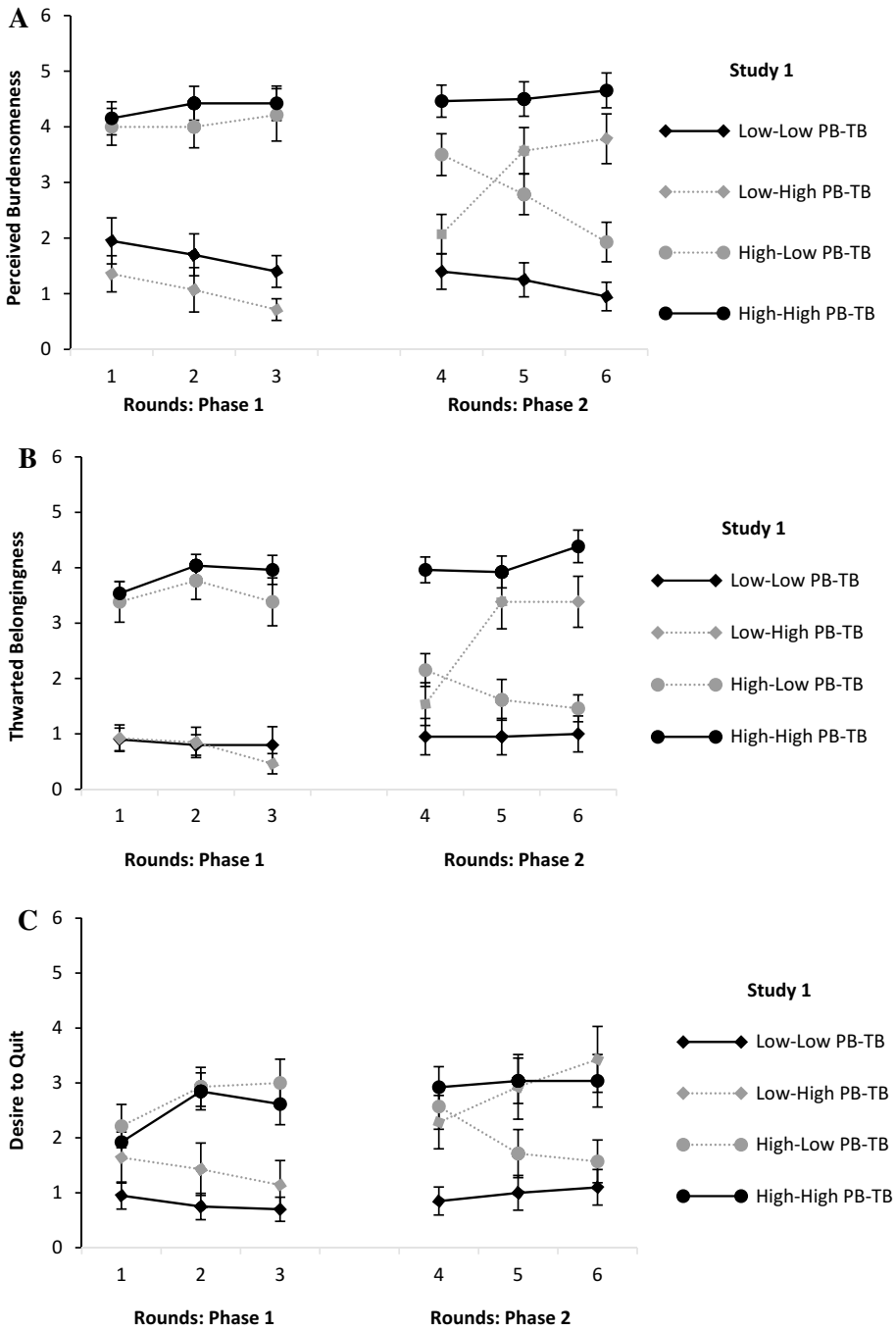

Fig. 1 Self-reported ratings across Phase 1 (Rounds 1–3) to Phase 2 (Rounds 4–6) for all four groups in Study 1. **a** Changes in perceived burdensomeness, **b** changes in thwarted belongingness and **c** changes in a desire to quit

through the experiment, there was a significant interaction, $F(1, 24) = 23.93$, $p < .001$, $\eta^2_{\text{partial}} = 0.53$. That is, when there was a negative change in interpersonal conditions halfway through the task, there was a corresponding increase in perceived burdensomeness. Further, when there was a positive change, there was a decrease in perceived burdensomeness. Therefore, the task was successful in manipulating perceived burdensomeness as intended.

Thwarted Belongingness

In addition to changes in burdensomeness, a successful manipulation required a similar pattern of changes in belongingness (Fig. 1b). A 2 (Starting Condition: Low or High PB-TB) × 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA was run, with thwarted belongingness as the dependent variable. There was a significant three-way

interaction, indicating that the groups who changed PB-TB condition across the two phases of the experiment had different patterns of belongingness, $F(1, 68) = 58.75$, $p < .001$, $\eta^2_{partial} = 0.46$. That is, feelings of thwarted belongingness did not change over the two experimental phases (i.e., rounds 1–3 versus 4–6) for participants who remained in either high or low PB-TB conditions for the duration of the experiment, $F(1, 44) = 0.15$, $p > .05$, $\eta^2_{partial} = 0.00$. For switch conditions, a positive change in interpersonal feedback caused decreases in thwarted belongingness, while a negative change caused an increase in thwarted belongingness, $F(1, 24) = 70.28$, $p < .001$, $\eta^2_{partial} = 0.75$. Therefore, the manipulation was successful in changing belongingness as desired.

Evaluating Effects of a Change in Interpersonal Circumstances on a Desire to Quit

Our main interest was whether a short-term change in burdensomeness and belongingness would change the desire to quit or escape the task. Results indicated a significant three-way interaction between starting condition and whether or not a change in conditions occurred throughout the task, from phase 1 to phase 2, $F(1, 68) = 24.89$, $p < .01$, $\eta^2_{partial} = 0.27$ (Fig. 1c). Follow-up contrasts revealed that participants who were exposed to the same high or low levels of burdensomeness and belongingness for the duration of the experiment did not report a significantly different desire to quit, $F(1, 44) = 1.42$, $p > .05$, $\eta^2_{partial} = 0.03$. Importantly, desire to quit immediately changed from Phase 1 to Phase 2 for those who switched conditions midway through the task, $F(1, 24) = 25.47$, $p < .001$, $\eta^2_{partial} = 0.52$. Therefore, significant changes in the desire to quit or escape from the task occurred in response to changes in interpersonal circumstances.

While the results indicate a change in a desire to quit occurred through a change in interpersonal feedback, it was not clear whether this occurred for both change. Follow-up tests showed that for participants who switched from the low PB-TB condition in Phase 1 ($M = 1.41$, $SD = 1.69$) to the high PB-TB condition in Phase 2 ($M = 2.88$, $SD = 2.00$), there was as significant increase in desire to quit, $t(13) = -4.11$, $p < .001$, Cohen's $d = 0.79$. In the high-low PB-TB condition there was also a significant drop in desire to quit from Phase 1 ($M = 2.71$, $SD = 1.27$) to Phase 2 ($M = 1.95$, $SD = 1.38$), $t(13) = 2.90$, $p < .01$, Cohen's $d = 0.57$. These two results taken together suggest that changes in interpersonal circumstances, in either direction, result in significant changes in a desire to quit or escape from the task.

We also wanted to determine whether changes in burdensomeness or belongingness had the strongest association with changes in a desire to quit for switch conditions ($N = 26$). To do so, a linear regression was performed, with differences in thwarted belongingness and perceived burdensomeness regressed on changes in a desire to escape. Differences were assessed from Round 3 to Round 6, to capture the full effects of the interpersonal manipulation at the end of each phase. The model accounted for 59% of variance in changes in a desire to escape, $F(2, 23) = 21.03$, $p = .001$, with perceived burdensomeness ($\beta = 0.55$, $p = .01$), but not thwarted belongingness ($\beta = 0.28$, $p = .17$), being a significant predictor. This suggests that perceived burdensomeness may have been a stronger driver of change in a desire to escape than belongingness.

A secondary research question was whether a change in an interaction between interpersonal factors had a significant relationship with a change in a desire to escape. To this end, an interaction term was calculated by multiplying the standardised burdensomeness and belongingness scores. Given the limited sample size when conducting a regression with only switch conditions, a correlational analysis was conducted between this interaction term and a desire to escape. The relationship between factors was non-significantly different to zero ($r = .28$, $p = .15$), indicating that only the individual effects of burdensomeness may have had a particularly strong effect on changes in a desire to escape in the current study.

The current study experimentally manipulated a change in feelings of belongingness and burdensomeness through changes in comments from teammates and feedback about performance on the task, respectively. Both groups that experienced a switch in conditions reported significant changes in desire to quit or escape. A rise in interpersonal risk factors raised the desire to quit the task, while a removal of these risk factors caused a decline in desire to quit. Therefore, despite experiencing interpersonal success or adversity early in the experiment, these effects were effectively reversed with a change of interpersonal circumstances.

Study 2

Having demonstrated that changes in a desire to escape from interpersonal adversity was a function of the levels of perceived burdensomeness and thwarted belongingness, Study 2 aimed to assess the influence of interpersonal factors when varied independently. While cross-sectional assessments indicate the combined presence of perceived burdensomeness and thwarted belongingness has a greater effect on suicide risk than either factor alone, the transition between these states has not been explored (Van Orden et al. 2008). Therefore, the manner in which suicide risk varies due to a change in only one interpersonal variable is unclear. Knowing whether a single interpersonal factor can offset the pernicious effects of another provides an indication of how it could enhance an individual's persistence through adverse life situations.

Similar to the previous study, two groups experienced stable positive or negative interpersonal feedback, while other groups experienced a change halfway through the task. However, Study 2 focused on changes in only belongingness, rather than both factors. This method was used due to difficulties in plausibly manipulating burdensomeness while keeping high thwarted belongingness stable. That is, as a participant begins to do better, it is unlikely that teammates would keep providing negative interpersonal comments. Thus, in Study 2, performance feedback (i.e., perceived burdensomeness) would be manipulated to remain poor for all individuals, and interpersonal comments (i.e., thwarted belongingness) would change. Participants in all conditions would always score worse than their teammates, and the team would fail to score above the target as a result. With perceptions of burdensomeness remaining high, the study can investigate the degree to which thwarted belongingness can independently affect a desire to quit in the face of interpersonal adversity.

Method

Participants

Fifty-four first year psychology students, scoring in the middle 50% of the INQ measure, participated in the study in exchange for course credit points (M_{age} = 19.67 years, SD = 4.02, 63% female). All participants completed the task in its entirety.

Materials

The INQ measure outlined in Study 1 was used to ensure pre-existing high or low levels of interpersonal factors were not evident.

Procedure

The procedure was identical to Study 1, with the exception that burdensomeness remained high for the duration while levels of belongingness during the task were varied. That is, all participants would score poorly on the task, with predetermined comments from teammates remaining positive or negative, or transitioning between the two over the experiment. For example, the high-low thwarted belongingness (TB) condition would receive feedback like "why can't everyone pull their weight in this, its really not that hard" in phase 1 of the task, but will experience more supportive comments in phase 2, such as "I'm sorry for being rude earlier, keep trying" or "you seem to be improving!". As the study aimed to keep burdensomeness stable for all groups, some participants were excluded if they reported greater than a two standard deviation change in burden from the beginning (Round 1) to the end of the experiment (Round 6). This was done to ensure changes in a desire to escape could be attributed to changes in thwarted belongingness.

Results and Discussion

Suspicion and Stable Burdensomeness Check

In total, four participants indicated they were suspicious of the nature of the task and were removed from the analyses (although including these participants did not change the pattern of results). In addition, four participants were removed from analyses due to reporting significant variation in burdensomeness over the experiment, leaving 46 participants in total.

Assessing the Manipulation

Thwarted Belongingness

For the manipulation to be successful, a significant change in belongingness was required for groups experiencing a change in TB condition, but not for stable groups. A 2 (Starting Condition: Low or High TB) × 2 (Stable or Switch: whether TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups, with thwarted belongingness as the dependent variable (Fig. 2a). Participants that remained in the same TB condition for the duration of the experiment did not report a change in belongingness, $F(1, 27) = 2.97$, $p > .05$, $\eta^2_{\text{partial}} = 0.10$. Participants that experienced a positive change in comments from teammates mid-way through the task reported a decrease in thwarted belongingness, while those who experienced a negative change in comments indicated an increase in thwarted belongingness, $F(1, 19) = 28.19$, $p = .00$, $\eta^2_{\text{partial}} = 0.61$. Therefore, the manipulation was successful in changing thwarted belongingness in the switch conditions, and keeping belongingness consistent in the stable conditions.

Perceived Burdensomeness

As the study was interested in the comparison between stable levels of burdensomeness, analysis was required to identify whether burdensomeness remained relatively stable for four conditions. A 2 (Starting Condition: Low or High TB) × 2 (Stable or Switch: whether TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups (Fig. 2b). Feelings of burdensomeness did not significantly change over time

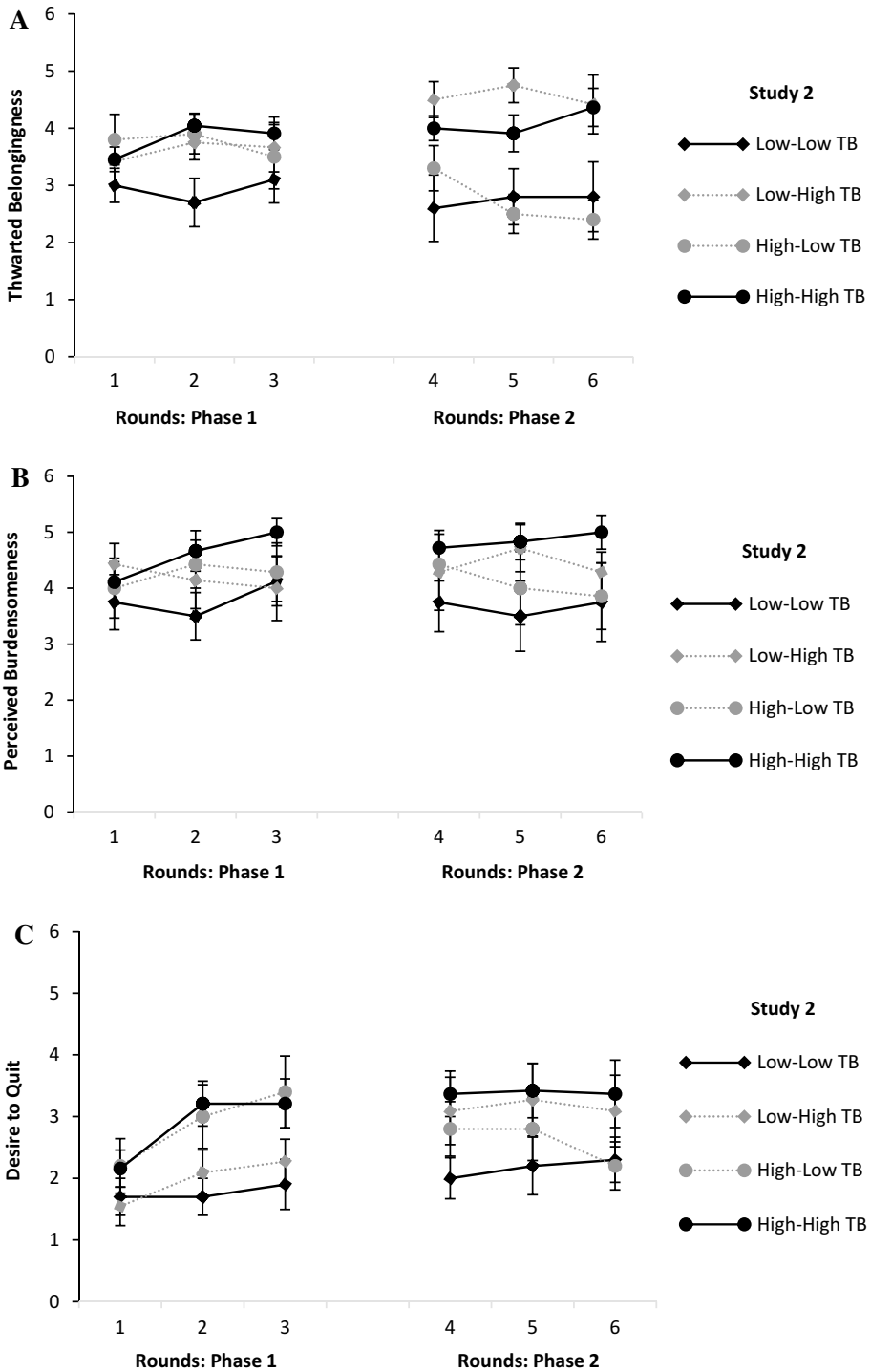

Fig. 2 Self-reported ratings across Phase 1 (Rounds 1–3) to Phase 2 (Rounds 4–6) for all four groups in Study 2. **a** Changes in belongingness **b** changes in perceived burdensomeness and **c** changes in a desire to quit

for participants who remained in either a Low or High TB condition for the duration of the experiment, $F(1, 27) = 3.46$, $p > .05$, $\eta^2_{\text{partial}} = 0.11$. In addition, feelings of burdensomeness did not significantly change over time for participants who experienced a change in conditions over the experiment, $F(1, 19) = 3.75$, $p > .05$, $\eta^2_{\text{partial}} = 0.17$. Therefore, the study was successful in manipulating changes in thwarted belongingness over the experiment, while keeping perceived burdensomeness stable.

Evaluating Effects of a Change in Thwarted Belongingness on a Desire to Quit

Similar to Study 1, we were interested as to whether the experimental condition in Phase 1 (i.e., Starting Condition)

would interact with whether a change in conditions occurred in Phase 2. Only switch groups would experience a change in thwarted belongingness, and a significant change in desire to quit for these groups was expected. A 2 (Starting Condition: Low or High TB) × 2 (Stable or Switch: whether TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups (Fig. 2c). Participants who remained in the same TB condition for the duration of the experiment did not report a change in desire to quit over time, $F(1, 27) = 0.05$, $p > .05$, $\eta^2_{partial} = 0.00$. As expected, participants in the High TB condition for the duration reported a greater desire to quit than those in the Low TB condition, $F(1, 27) = 4.82$, $p < .05$, $\eta^2_{partial} = 0.15$, indicating consistent support from teammates reduced desire to quit even in the presence of heightened feelings of burden. Participants who experienced a change in interpersonal conditions reported a change in desire to quit the task, $F(1, 19) = 14.44$, $p < .001$, $\eta^2_{partial} = 0.45$. Therefore, a change in only thwarted belongingness was still sufficient in causing changes in participants' desire to quit.

Similar to Study 1, a linear regression was performed to determine whether changes in burdensomeness or belongingness had the strongest association with changes in a desire to escape from Round 3 to Round 6 for participants in switch conditions ($N = 19$). Changes in both thwarted belongingness and perceived burdensomeness accounted for roughly 37% of variance in the dependent variable, $F(2, 17) = 3.57$, $p = .04$. Changes in thwarted belongingness ($\beta = 0.74$, $p = .01$), but not perceived burdensomeness ($\beta = -0.25$, $p = .34$), was a significant predictor of changes in a desire to escape. This is expected, given only thwarted belongingness was manipulated in the current task, and points to the effectiveness of changes in a single interpersonal variable in affecting a desire to quit over time.

A correlational analysis was also conducted similar to Study 1 to assess the relationship between changes in an interaction between interpersonal factors and a desire to escape, given the small number of participants assessed in the prior analysis. An interaction was significantly correlated with changes in a desire to escape ($r = .45$, $p < .03$). However, when taking into account the individual effects of thwarted belongingness and perceived burdensomeness with a partial correlation, the relationship with changes in a desire to escape became non-significant ($r = .10$, $p = .69$). Therefore, as in Study 1, individual effects appeared to have a stronger effect on a desire to escape than an interaction between factors.

In sum, a single (albeit abrupt) change in support from teammates resulted in significant changes in desire to quit or escape from the task, despite all participants experiencing poor performance on the task for its duration. Positive changes in interpersonal feedback caused a significant decrease in desire quit, while a negative change caused a significant increase. As expected, stable groups did not experience significant changes in desire to quit over the experiment.

General Discussion

The current studies investigated the dynamic effects of a change in interpersonal risk factors. As predicted, Study 1 showed that a rapid change in interpersonal feedback was sufficient to immediately change a desire to quit or escape the task. That is, as the two interpersonal risk factors were elevated, participants wanted to escape, but if they were reduced, the desire to escape declined. Thus, the data points to the pernicious effects of a decline in interpersonal circumstances and also the protective effects of a rise in these factors. The findings from the current research are consistent with those from ecological assessments, that shows a desire to escape through suicidal behaviours is prone to changes over short-periods over time (Kleiman et al. 2017). Further, an increased desire to escape in the face of increasing interpersonal adversity in the current study is consistent with findings from prior research, whereby a desire to escape from life is often preceded by a negative change in interpersonal circumstances (Bagge et al. 2013, 2017; Kleiman et al. 2017; Kyron et al. 2018; Turner et al. 2016). The results provide causal evidence to the potentially adverse or protective effects of changes in interpersonal circumstances, and future research can investigate whether these patterns continue to be seen within a naturalistic setting with regard to a desire to escape from life (i.e., suicide, NSSI).

Study 2 used a similar structure to Study 1, aiming to assess whether a change in only belongingness could affect a desire to escape, even when burdensomeness remained heightened. An experience of high thwarted belongingness and perceived burdensomeness (i.e., poor performance and negative comments) resulted in a greater desire to quit than perceived burdensomeness alone (i.e., poor performance and supportive comments). Over time, a change in interpersonal comments from teammates was sufficient in altering participants' desire to escape from the task. Thus, there were notable negative effects from an increase in only thwarted belongingness, while a decrease in thwarted belongingness acted to protect against the effects of high burdensomeness. This is consistent with patterns of change in ecological assessments, which have found a desire to escape from life through suicide to be more likely following interpersonal conflict (Kleiman et al. 2017; Kyron et al. 2018). While the controlled manipulation of thwarted belongingness was shown to affect a desire to escape, further investigation is needed to identify whether its pernicious effects are evident within short-term ecological assessments.

Clinical and Theoretical Implications

There are several theoretical implications from the current studies. Firstly, both thwarted belongingness and perceived burdensomeness were prone to change over time with manipulations of feedback, which is consistent with theoretical positions that interpersonal factors are dynamic (Joiner 2005). Second, both studies suggest the experimental manipulation of interpersonal risk factors is causally related to changes in a desire to quit or escape. This is consistent with the premise of the Interpersonal Theory of Suicide that increases in thwarted belongingness and perceived burdensomeness are causally related to a desire to escape or give up on life. Third, if perceived burdensomeness and thwarted belongingness are causally related to a desire to escape, then experiencing both concurrently, rather than individually, should result in a greater desire to quit in the face of adversity. The findings from Study 2 support this stance, with the manipulation of thwarted belongingness in addition to stable perceived burdensomeness conditions causing a greater desire to escape than perceived burdensomeness alone. However, changes in an interaction between interpersonal factors did not have significant relationships beyond individual effects, although this may partly be due to the limited sample size. Fourth, the findings that an increase in risk factors is associated with an increased desire to escape, and a removal of these factors is associated with a decrease, is consistent with theoretical positions from the Fluid Vulnerability Theory of Suicide (Rudd 2006).

There are also notable clinical implications. First, the current studies have shown how effectively an increase or a reduction in interpersonal adversity can alter a desire to escape. While the effects of a negative change in interpersonal conditions are rapid, they fortunately appear to be remediable in an efficient manner. In a clinical setting it may therefore be important to bolster interpersonal factors to reduce the level of distress, which may otherwise result in self-injury as a means to escape. Second, the findings from the current studies, coupled with those from ecological research, stress the importance of consistently tracking risk factors. Swift changes in a desire to escape both in experimental and ecological settings can occur. This indicates the need for consistent monitoring systems to identify high-risk episodes at an early stage to prevent harmful coping behaviours (i.e., suicide attempts, NSSI). Isolated risk assessments in a clinical setting may incorrectly identify some individuals as low risk, and miss heightened periods. Even if a suicide attempt is not successful, it may increase the likelihood that an individual further habituates to pain and a fear of dying, potentially making a future attempt more likely (Joiner 2005).

Limitations and Directions for Future Studies

There are notable limitations of the manipulation utilized in both studies. Firstly, the change in interpersonal circumstances was quite sudden. Although this may emulate the vulnerability of interpersonal environments to abrupt changes, it also may have heightened suspicion of the computerized nature of the participants' teammates. Some participants noted that they were surprised and confused by the sudden change in the supportiveness of their teammates. Despite its sudden nature, most participants reported being convinced and affected by the change in interpersonal feedback. Future studies could aim to use more subtle manipulations of interpersonal circumstances.

Another limitation was that only changes in belongingness were independently manipulated in Study 2. This was done due to difficulties in plausibly maintaining some interpersonal conditions. Specifically, receiving stable negative comments from teammates, while the participant was performing well in the task, would be hard to achieve with the current paradigm. As such, this may arouse more suspicion from participants or be ineffective in altering a desire to quit. Future studies should look to expand the paradigm to assess the unique roll changes in burdensomeness may play in the face of low levels of belongingness.

Future studies should look to assess at-risk individuals within a naturalistic setting for interpersonal variables and associated effects on suicidal thoughts and behaviours. Several ecological assessments discussed in the current paper indicate the importance of consistent measurement of suicidal thoughts and interpersonal risk factors. However, future studies could build on the findings from the current studies in several ways. First, it can determine the ability of interpersonal factors to predict adverse outcomes in an ecological setting over short-term periods. Second, it could assess the effects of heightened levels of either thwarted belongingness or perceived burdensomeness in absence of the other (i.e., as per Study 2). Whether one factor could offset another provides targets for clinical intervention in minimizing a suicidal episode, particularly when the malleability of either factor is identified. Third, the theoretical position that heightened levels of both factors concurrently act as a particularly pertinent condition for the development of suicidal ideation can be tested within a naturalistic setting in a fluid manner.

In conclusion, the current study is the first to assess the dynamic nature of interpersonal risk factors experimentally. Results suggested rapid changes in a desire to escape as a result of a single change in interpersonal circumstances. More adverse interpersonal conditions resulted in a significantly greater desire to escape. The malleability of both interpersonal factors and the associated changes in a desire

to escape suggest they may be appropriate areas for clinical intervention. The dynamic nature of a desire to escape in the current studies suggests the need for continuous clinical assessment to monitor the effects of adverse changes in interpersonal circumstances. Dynamic measurement of suicide and interpersonal risk factors is in its early stages, and future research in this domain would assist in increasing our understanding of this complex phenomenon.

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Compliance with Ethical Standards

Conflict of Interest Michael J. Kyron, Anna C. Badcock, Elliot Baker-Young, Werner G. K. Stritzke, and Andrew C. Page declare that there is no conflict of interest.

Animal Rights No animal studies were carried out by the authors for this article.

Ethical Approval All procedures were approved and conducted in accordance with the University of Western Australia Human Research Ethics Committee's ethical guidelines.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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