ORIGINAL ARTICLE

Psychological mechanisms of the development of suicidal ideation: Longitudinal cohort study

Yiyun Shou PhD[1,2,3] | Amelia Gulliver PhD[4] | Louise M. Farrer PhD[4] | Amy Dawel PhD[1] | Richard Burns PhD[5] | Alison L. Calear PhD[4] | Nicolas Cherbuin PhD[5] | Philip J. Batterham PhD[4]

[1]School of Medicine and Psychology, The Australian National University, Canberra, Australia

[2]Lloyd's Register Foundation Institute for the Public Understanding of Risk, National University of Singapore, Singapore, Singapore

[3]Saw Swee Hock School of Public Health, National University of Singapore and National University Health System, Singapore, Singapore

[4]Centre for Mental Health Research, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, Australia

[5]Department of Health, Economics, Wellbeing, and Society, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, Australia

Correspondence
Yiyun Shou, Saw Swee Hock School of Public Health, National University of Singapore and National University Health System, Tahir Foundation Building, 12 Science Drive 2, Singapore 117549, Singapore.
Email: yiyun.shou@nus.edu.sg

Funding information
Australian National University College of Health and Medicine

Abstract

Introduction: This study aimed to investigate the mechanisms of the development of suicidal ideation and its moderating and protective factors. Drawing on the Interpersonal-psychological theory of suicide, we proposed that disruptions to belongingness, in conjunction with tolerance of health risk, may influence the development of suicidal ideation above and beyond psychosocial changes such as disruptions to finances and work.

Methods: The study involved a longitudinal investigation of an Australian representative sample reporting suicidal ideation fortnightly for 12 weeks between March and June 2020.

Results: The results indicated that participants who reported higher levels of belongingness, mastery, and intolerance of health risk were less likely to experience suicidal ideation and had lower severity of suicidal ideation. Mastery significantly strengthened the negative link between belongingness and the incidence of suicidal ideation, while agreeableness significantly strengthened the negative link between belongingness and the severity of suicidal ideation over time.

Conclusion: The findings suggest that supporting effective social connectedness during times of isolation and promoting self-efficacy, mastery, and regulation of risk tolerance, may be crucial for suicide prevention and therapeutic intervention.

KEYWORDS
belongingness, longitudinal study, risk tolerance, suicide, suicide ideation

INTRODUCTION

Mental health has received increased attention globally, especially since the emergence of COVID-19 has brought about dramatic changes in daily life through lockdowns, isolation, job losses, and financial distress (Dawel et al., 2020; Santomauro et al., 2021). Suicide and self-harm are among the most important public mental health concerns and have been closely monitored over the past several years (Farooq et al., 2021; Pirkis et al., 2021). Proposed factors for suicide risk include isolation and financial distress, both of which have been exacerbated by the COVID-19 pandemic (Batterham et al., 2022; Kawohl & Nordt, 2020). Yet, there remains limited evidence for the mechanisms of the development of suicidal ideation and its moderating and protective factors during public health or other extraordinary crises such as the COVID-19 pandemic. In this study, we aim to longitudinally investigate the mechanisms underlying suicidal ideation by drawing on the Interpersonal-psychological theory of suicide (IPTS). We hypothesize that disruptions to belongingness during the pandemic, in conjunction with tolerance of health risks, may have influenced the development of suicidal ideation above and beyond psychosocial changes such as disruptions to finances and work.

Interpersonal-psychological theory of suicide

The IPTS proposes that suicide desire is driven by thwarted belongingness and perceived burdensomeness (Joiner et al., 2005; Van Orden et al., 2010). Thwarted belongingness refers to a feeling of disconnection with others and lacking social affiliations. Perceived burdensomeness involves the belief that one's existence is a burden or liability to others. A third factor, capacity for suicide, involves elevated fearlessness and tolerance of death and physical pain and is theorized to motivate the transition from suicidal desire to suicide attempt (Van Orden et al., 2010).

There is evidence that perceived burdensomeness has a more pronounced effect on the development of suicidal ideation than thwarted belongingness (Chu et al., 2017; Hatcher & Stubbersfield, 2013; Ma et al., 2016). However, these findings may be an artifact of the content of items used to measure perceived burdensomeness, which more explicitly focuses on suicidal desire than the thwarted belongingness items (Quan et al., 2021), the conflation of belonging with loneliness (Hatcher & Stubbersfield, 2013), interrelations (Ribeiro & Joiner, 2009) including multicollinearity (Mitchell et al., 2017) between thwarted belongingness and perceived burdensomeness. Nevertheless, there is evidence that low perceived levels of belonging, which may be strongly influenced by social or financial disruption, have a direct impact on suicidal thinking (Gratz et al., 2020), and can be a strong independent predictor of suicide-ideation related outcomes (Mitchell et al., 2017). During the COVID-19 pandemic, belongingness could have been disrupted for people with limited capacity to find alternative ways to connect with others due to isolation, adversely interrupting social connections. Research has shown that loneliness and thwarted belongingness are significantly associated with mental health issues, including depression, anxiety, and suicidal ideation (Liu et al., 2021; McCallum et al., 2021; Raifman et al., 2022). Yet, it is unclear if there are any factors that can mitigate or aggravate the negative impact of reduced belongingness on suicide, especially during a pandemic. In this study, we explore the potential moderating effects of risk tolerance, mastery, and personality traits on the relationship between belongingness and suicidal ideation.

Tolerance of health risk

Health risk tolerance involves situations where an individual tolerates possible negative health consequences. Several studies have reported a positive link between positive risk attitudes and suicide (Colbert et al., 2021; Franklin et al., 2019; Huang et al., 2020; Pasculli & Harris, 2018). Franklin et al. (2019) found that people who engaged in suicidal behaviors in virtual reality had significantly increased risk-taking, including risk-taking in the health domain, than those who did not engage in suicidal behaviors. Genome-wide studies have also shown associations between genetic variations that predict increased risk tolerance and those that predict suicide behaviors (Colbert et al., 2021).

The link between risk tolerance and suicide may be explained by the capability for suicide, which involves increased tolerance of negative outcomes, especially health consequences, including pain and death (Van Orden et al., 2010). In the context of the COVID-19 pandemic, Calati et al. (2022) found a significant positive link between fearlessness about death and history of suicide planning or attempts in a cross-sectional student sample. However, our understanding of the longitudinal and potential causal links between health risk tolerance and suicidal ideation remains limited. Several studies have proposed and investigated the interactive relationship between belongingness and capability on suicidal behavior in multiple populations, but results have been mixed (adolescents, [Czyz et al., 2015], college students, [Davidson et al., 2010], young adults, [Joiner et al., 2009], and clinical sample, [Monteith et al., 2013]). Most of the previous studies were based on small sample sizes ($N < 400$)

or cross-sectional designs. In addition, previous studies investigating the link between risk tolerance and suicide (e.g., [Colbert et al., 2021; Franklin et al., 2019]) have not adequately defined the type or domain of risk (Shou & Olney, 2021) and relied on behavioral aspects of risk attitudes (e.g., risk-taking), which may be influenced by factors that are irrelevant to risk tolerance, such as personal relevance and feasibility (Shou & Olney, 2021). Understanding the prospective role of risk tolerance in predicting subsequent suicidal thinking may advance our understanding of the mechanisms of suicide.

Mastery

Mastery is closely related to internal locus of control and refers to one's perceived ability to control and change things in one's life. During the early stages of the COVID-19 pandemic, a high level of mastery may have influenced confidence and perceived ability to navigate uncertainty brought about by the pandemic and thus may have been an essential psychological resource for coping with stress and anxiety.

The literature has demonstrated a robust negative association between mastery/internal locus of control and suicidal ideation in various population groups (Fitzpatrick et al., 2020; Thorne & Ebener, 2018; Vilhjalmsson et al., 1998; Wiebenga et al., 2021). Mastery and internal locus of control in these studies have also been suggested to protect against the negative effects of external stressors on mental health. For example, in the context of COVID-19 pandemic, mastery may buffer the negative effect of reduced belongingness by increasing protection against developing negative feelings relating to increased isolation and improving coping with the associated stressors. In addition, mastery may moderate the link between thwarted belongingness and suicidal ideation via one's perceived ability to change the situation (e.g., temporary disconnection with their community) in the future.

Personality traits

The link between personality and suicide has also been examined in past studies. The finding that suicidal ideation and attempts have positive links with neuroticism and negative links with extroversion are commonly observed and replicated in the literature (Blüml et al., 2013; Brezo et al., 2006). Openness to experience may be negatively related to suicide, especially in older populations (Szücs et al., 2018, 2020). However, the roles of personality traits relating to the core elements of suicide, such as belongingness, have been less extensively researched.

Limited research has examined potential mediating effects of personality traits on perceived burdensomeness and thwarted belongingness. Baertschi et al. (2018) found that although neuroticism and openness were associated with thwarted belongingness and perceived burdensomeness, they did not mediate relationships between IPTS constructs and suicidal ideation. By contrast, Christensen et al. (2014) found that psychoticism was independently associated with thwarted belongingness and capability for suicide, with no significant effects of neuroticism or extroversion. Understanding the potential moderating effect of personality traits on the link between belongingness and suicidal ideation may help identify subgroups of individuals who could be more vulnerable to changes in belongingness during the COVID-19 pandemic.

The current study

The current study investigated the mechanisms by which different psychological factors may influence the development of suicidal ideation through their moderating effects on the link between belongingness and suicidal ideation. Using longitudinal data from a representative sample of Australian adults, we aimed to test the potential mechanisms of belongingness as a key predictor of suicidal ideation using the belongingness subscale of the Interpersonal Needs Questionnaire. We tested for possible direct and moderating effects from psychosocial factors, including risk tolerance, mastery, and personality. According to IPTS and previous studies, we hypothesized that lower belongingness and mastery and higher tolerance of health risk would be significantly associated with greater severity and longitudinal change of suicidal ideation. Mastery would strengthen the protective link between belongingness and suicidal ideation. We also explore the effects of personality traits on both suicidal ideation and the link between belongingness and suicidal ideation. Finally, we explored whether the impact of an impairment related to COVID-19 moderated the link between belongingness and suicidal ideation.

METHOD

Participants and procedure

The study is a part of the Australian National COVID-19 Mental Health, Behaviour and Risk Communication Survey (http://quicklink.anu.edu.au/7mia), which is a longitudinal survey of the impact of COVID-19 on the Australian population commencing 28–31 March 2020. The initial wave of the survey recruited an Australian

nationally representative sample of 1296 adults. The survey had 7 waves, each spaced 2 weeks apart over a 12-week period during the first half of 2020. Table 1 summarizes the characteristics of the participants who were included in each wave of this study. The sample size for the initial survey was determined by power analysis for the entire project (see Dawel et al., 2020 for more details including full sample characteristics) and accounted for attrition over time.

Measures

Demographic variables, risk tolerance, mastery, and personality traits were each measured on a single occasion. The repeated measures were suicidal ideation, belongingness, and COVID-19 impact. Descriptive statistics including internal consistency measured by Cronbach's alpha are in Table 2.

Suicidal ideation

We assessed suicidal ideation at all waves using the last item of the Patient Health Questionnaire-9 (PHQ-9; [Spitzer et al., 1999]). The item is widely used as an indicator for suicidal ideation. Participants responded about how often they had been bothered by "Thoughts that you would be better off dead or of hurting yourself in some way" over the last 2 weeks on a scale on a scale comprising 0 = "not at all", 1 = "Several days", 2 = "More than half the days," and 3 = "Nearly every day".

Belongingness

Belongingness was measured at Waves 1, 3, and 5 using the belongingness subscale of the Interpersonal Needs Questionnaire (INQ; [Van Orden et al., 2012]). The scale consists of nine items, and participants rate the extent to which each item describes them over the last 2 weeks on a 7-point scale from 1 = "Not at all true for me" to 7 = "Very true for me". Scores were averaged, with higher scores reflecting greater feelings of belongingness. The internal consistency of scale across the three waves was high (alphas > 0.9, see Table 2).

Health risk tolerance

Health risk tolerance was assessed at wave 1 using the health domain subscale of the Multi-Domain Risk Tolerance scale (Shou & Olney, 2021). The scale has nine

TABLE 1 Sample characteristics of this study.

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
N	840	840	810	840	765	713	675
Age	49.86 (16.31)	49.86 (16.31)	50.27 (16.13)	49.86 (16.31)	50.62 (16.03)	50.63 (16.01)	50.92 (16.01)
Male	425 (50.6%)	425 (50.6%)	415 (51.2%)	425 (50.6%)	396 (51.8%)	378 (53%)	354 (52.4%)
Female	415 (49.4%)	415 (49.4%)	395 (48.8%)	415 (49.4%)	369 (48.2%)	335 (47%)	321 (47.6%)
Mental disorders							
Past	151 (18%)	151 (18%)	148 (18.3%)	151 (18%)	137 (17.9%)	128 (18%)	126 (18.7%)
Current	200 (23.8%)	200 (23.8%)	193 (23.8%)	200 (23.8%)	183 (23.9%)	173 (24.3%)	159 (23.6%)
Recent life adversity	170 (20.2%)	170 (20.2%)	167 (20.6%)	170 (20.2%)	153 (20%)	145 (20.3%)	136 (20.1%)
COVID-19 impact	255 (30.4%)	221 (26.3%)	188 (23.3%)	183 (21.8%)	133 (17.5%)	137 (19.5%)	111 (16.5%)
Suicide ideation	142 (16.9%)	160 (19%)	159 (19.7%)	153 (18.2%)	142 (18.6%)	126 (17.8%)	122 (18.1%)
New suicide ideation	–	55 (34.4%)	47 (29.6%)	42 (27.5%)	44 (31.0%)	33 (26.2%)	31 (25.4%)

Note: New suicidal ideation were cases that became suicidal (> =1) in a wave from reporting no suicidal ideation (=0) in the previous wave. The proportions are the new cases out of the total suicidal ideation cases.

TABLE 2 Descriptives of predictor variables.

	Wave	N	Mean	SD	Range	Alpha
COVID-19 impairment	Wave 1	840	3.89	1.82	1–9	0.73
	Wave 2	840	3.93	1.81		0.78
	Wave 3	808	3.68	1.84		0.77
	Wave 4	840	3.71	1.88		0.80
	Wave 5	763	3.33	1.77		0.80
	Wave 6	706	3.29	1.98		0.87
Belongingness/INQ	Wave 1/2	840	4.83	1.29	1–7	0.90
	Wave 3/4	808	4.83	1.31		0.91
	Wave 5	761	4.86	1.28		0.91
	Wave 6	681	4.86	1.27		0.91
Risk tolerance (Wave 1)		840	2.31	1.19	1–5.78	0.94
Mastery (Wave 4)		840	4.75	1.25	1–7	0.86
Openness (Wave 2)		840	3.29	0.79	1–5	0.04
Conscientiousness (Wave 2)		840	3.71	0.83		0.31
Extraversion (Wave 2)		840	2.79	0.98		0.44
Agree (Wave 2)		840	3.56	0.80		0.20
Neuroticism (Wave 2)		840	2.83	1		0.53

Note: Belongingness wave 6 values were measured in wave 5, statistics were reported here for a different sample size. Alphas for personality scales are correlations between the two items of each scale.

items assessing a range of daily life health/medical risk situations. Participants rated their feelings towards each situation on a 7-point scale from 1 = extremely unpleasant to 7 = extremely pleasant. Scores were averaged in the current study, with higher scores reflecting greater tolerance of health risk.

Mastery

Mastery was measured at wave 4 with the Pearlin Mastery Scale (Pearlin & Schooler, 1978), which comprises seven items that assess the general level of mastery or the level of control the respondent perceives they have over their life. Each item is rated on a 7-point scale from 1 = strongly disagree to 7 = strongly agree; scores were averaged, with higher levels reflecting higher levels of mastery.

Personality

Openness to Experience, Agreeableness, Emotional Stability (scored in the direction of Neuroticism), Extraversion, and Conscientiousness were measured at wave 2 with the Brief Measure of Big-Five Personality (Gosling et al., 2003). Each construct was assessed by two items. Participants rated how well a list of personality

descriptors, with two items per construct, described them on a 7-point scale from 1 = strongly disagree to 7 = strongly agree. Scores for each construct were averaged, with higher scores reflecting higher levels of each construct. Internal consistency of the scales was acceptable (see correlations in Table 2) except for openness, which could be due to the trade-off between the scale brevity and content coverage.

Demographic variables

Demographic variables were assessed at wave 1 and included gender (male/female/other/prefer not to say), age (in years), existing mental disorders (whether participants reported to have a current diagnosis of/past diagnosis of/ have never been diagnosed with different mental disorders), and recent adversity (if they reported to have experienced a recent adverse event). These variables were reported to be significantly related to suicide ideation in the previous study (Batterham et al., 2022; Kawohl & Nordt, 2020).

COVID-19 impact and impairment

We assessed whether participants had experienced either direct or indirect impact of the COVID-19 pandemic

at all waves by asking participants whether they: (1) had been diagnosed with COVID-19, (2) had been a close contact with someone diagnosed with COVID-19, (3) had been tested for COVID-19 and waiting for the results, (4) had one or more family members diagnosed with COVID-19, (5) had lost job due to COVID-19, or (6) experienced financial distress due to COVID-19. A COVID-19 impact variable (yes/no) was created to indicate if participants reported to have experienced any of the above six aspects.

In addition, perceived impairment due to COVID-19 was assessed at all waves by the Work and Social Adjustment Scale (WSAS) on five work and social domains (ability to work, home management, social leisure activities, private leisure activities, and the ability to form and maintain close relationships). Participants responded to each item on an 8-point scale (1 = not at all impaired to 8 = very severely impaired), and the average score for the five items was used as an overall impairment score.

Data analytic strategy

All analyses were performed in R (version 4.2). We first applied Poisson regression with robust standard errors (MacKinnon & White, 1985) to model the overall incidence of suicidal ideation and estimate relative risk (RR) across time over the 7 waves. The base model included demographic variables (age, gender, history of mental disorders, and recent life adversity) measured at wave 1. The key predictor variables being tested included belongingness (wave 1), COVID-19 impact and impairment (wave 1), risk tolerance, five personality traits, and mastery. The models were analyzed using the "stats" package, and the robust standard errors were estimated using the "sandwich" package (Zeileis et al., 2020).

We then carried out longitudinal autoregressive ordinal regression to model the change in the degree of suicidal ideation over time. A first order auto-regressive function for suicidal ideation was estimated; suicidal ideation status in waves 2–7 was regressed on suicidal ideation status at the wave immediately prior to observation (e.g., SI_{t2} regressed on SI_{t1}). Demographic variables were in the base models. The fixed predictor variables (measured once) being tested included risk tolerance, personality traits, and mastery. The time-variant predictor variables included belongingness (waves 1, 3, and 5), COVID-19 impact and impairment (waves 1–6). Waves 2–3, waves 4–5, and waves 6–7 suicide ideation were regressed on wave 1, wave 3, and wave 5 belongingness, respectively. Waves 2–7 suicide ideation were regressed on waves 1–7 COVID-19 impact and impairment, respectively. The models were analyzed using the "ordinal" package (Christensen, 2022).

For both sets of models, we examined the total (or bivariate; by testing a single predictor being added to the base model) and unique effects (or multivariate; adding all predictors to the base model) of predictor variables on suicidal ideation. The moderating effects of COVID-19 impact and impairment, mastery, and personality on the link between belongingness and suicidal ideation were tested with the likelihood ratio test on a model including the full main effects and the 2-way interaction between the moderators and belongingness.

RESULTS

Sample descriptives

Table 1 summarizes the characteristics of the sample over the 7 waves. The proportions of participants who reported suicidal ideation were similar across waves, and on average, 29% of the cases were new onset compared to the previous wave. Analyzing the overall attrition in waves 2–7 using the predictor variables measured at wave 1 suggested that younger or female participants were more likely to miss one or more waves' survey.

Overall incidence of suicidal ideation

Table 3 shows the overall incidence of suicidal ideation over the seven waves of data collection. When tested on their own, greater belongingness, mastery, extraversion, conscientiousness, and agreeableness were all associated with lower RR of reporting suicidal ideation across the seven waves. By contrast, higher risk tolerance and neuroticism were associated with greater RR of reporting suicidal ideation. However, in multivariate models, conscientiousness and agreeableness no longer had a significant association with suicidal ideation, suggesting they did not have a significant unique contribution to suicidal ideation. In addition, the link between extraversion and suicidal ideation became positive. Testing the interaction effects revealed that mastery interacted with belongingness, such that negative associations between belongingness and suicidal ideation (b = −0.30) were greater in those with greater than lower mastery. The coefficient of belongingness was −0.46 for participants who were 1 score above the average in mastery, while being only −0.14 for participants who were 1 score below the average in mastery. Additional analyses on cases that did not report suicidal ideation (N = 698; see Table S2) suggested similar patterns of results, except that extraversion was no longer positively associated with suicidal ideation in the full model.

TABLE 3 Robust Poisson regression predicting overall incidence of suicidal ideation.

	Total effect (univariate)		× Belongingness (univariate)		Unique main effect (full model)		Final model	
	Coef.	RR	Coef.	RR	Coef.	RR	Coef.	RR
Belongingness	−0.35***	0.70 [0.66, 0.75]			−0.15**	0.86 [0.78, 0.95]	−0.30***	0.74 [0.67, 0.81]
COVID-19 impact	0.50***	1.64 [1.36, 1.98]	0.09	1.10 [0.97, 1.24]	0.26**	1.30 [1.08, 1.54]	0.27**	1.31 [1.11, 1.54]
COVID-19 impairment	0.14***	1.15 [1.09, 1.21]	0.04**	1.04 [1.01, 1.08]	0.04	1.04 [0.99, 1.09]		
Risk tolerance	0.26***	1.30 [1.20, 1.40]	0.08***	1.09 [1.04, 1.14]	0.16***	1.17 [1.10, 1.25]	0.15***	1.17 [1.09, 1.24]
Mastery	−0.49***	0.61 [0.57, 0.66]	−0.17***	0.84 [0.81, 0.88]	−0.33***	0.72 [0.64, 0.80]	−0.50***	0.61 [0.54, 0.69]
Extraversion	−0.08	0.93 [0.85, 1.01]	−0.04	0.96 [0.91, 1.01]	0.16**	1.17 [1.06, 1.29]	0.13*	1.13 [1.03, 1.25]
Openness	−0.11	0.90 [0.81, 1.00]	−0.07*	0.93 [0.88, 0.99]	0.01	1.01 [0.90, 1.14]		
Conscientiousness	−0.24***	0.79 [0.71, 0.88]	−0.06	0.94 [0.88, 1.00]	−0.11	0.90 [0.80, 1.01]		
Agreeableness	−0.23***	0.79 [0.72, 0.88]	−0.11***	0.89 [0.84, 0.94]	−0.03	0.98 [0.88, 1.08]		
Neuroticism	0.35***	1.42 [1.29, 1.57]	0.11***	1.12 [1.06, 1.17]	0.20**	1.22 [1.08, 1.38]	0.22***	1.25 [1.11, 1.41]
Belongingness × Mastery							−0.16***	0.85 [0.82, 0.89]

Note: All models included demographic and COVID-19 impact variables (see Table S1); all continuous variables are centered. "× belongingness" refers to the interaction term between a variable and belongingness. Interactions between belongingness and openness, risk tolerance, agreeableness, and neuroticism were no longer significant once belongingness × mastery was in the model.

Abbreviation: RR, relative risk.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Autoregressive regression predicting change in suicidal ideation

Models characterizing the change in suicidal ideation over time are presented in Table 4. Results were similar to those of the Poisson regression models with the following two exceptions. First, neuroticism did not have a significantly unique contribution to the severity of suicidal ideation. Second, agreeableness significantly interacted with belongingness, such that the negative link between belongingness and the magnitude of suicide ideation ($b = -0.45$) was stronger in those with greater than lower agreeableness. Belongingness's coefficient was -0.57 for participants scored 1 score above the average on mastery or agreeableness and was -0.33 for those scored 1 score below the average. Finally, COVID-19 impact but not impairment had a unique effect on the overall incidence of suicidal ideation (see Table S1). Both COVID-19 impact and impairment were found to significantly increase the severity of suicidal ideation over time. No significant interaction effect was found between COVID-19 impact/impairment and belongingness on either incidence or severity of suicidal ideation.

Sensitivity analysis

We carried out sensitivity analyses by analyzing only the cases that completed all waves ($N = 614$) for both Poisson regression (for overall incidence) and ordinal regression (for change in severity). All the main results relating to the testing variables in terms of significance did not change (e.g., results in Table S2 and Table 4), with one exception. The interaction between belongingness and mastery in the autoregressive ordinal model predicting the change in the severity of suicidal ideation was significant when being tested alone (that is, with each interaction term entered into a separate model with lower order terms) but was no longer significant after the model also included the interaction between belongingness and agreeableness. The interaction between belongingness and agreeableness remained significant in the full model. In addition, we ran autoregressive logistic regression for binary responses (no suicidal ideation vs. suicidal ideation) for the final model of the autoregressive ordinal regression to test if results were sensitive to outcome pairs. Significance of the terms remained unchanged except that the interaction between belongingness and agreeableness was no longer statistically significant. We also carried out the autoregressive ordinal regression on participants who had suicidal ideation at baseline ($N = 142$). Results were similar to the sensitivity analysis on the complete cases, except that COVID-19 impact and impairment's direct effects were no longer statistically significant.

DISCUSSION

The current study examined the link between belongingness and suicidal ideation, accounting for potential moderators, including risk tolerance, mastery, personality traits, and COVID-19 impact. In line with our predictions, based on the IPTS, participants who experienced a higher level of belongingness were less likely to report suicidal ideation and had a lower degree of suicidal ideation over time. Such effect was not dependent on COVID-19's impact on other aspects of participants' life (e.g., lost job, financial distress, or work and life adjustment). This result suggests that promoting effective social connectedness during times of isolation, such as during the COVID-19 pandemic, might be crucial for suicide prevention during these times. Furthermore, very few studies on risk tolerance and suicidal ideation use longitudinal designs and most studies use nonrepresentative samples such as college students. By contrast, our study prospectively tested relationships between risk tolerance and suicidal ideation, using a representative Australian adult sample.

One score increase in health risk tolerance was positively associated with a 17% increase in the incidence of suicidal ideation and 37% greater odds of having a greater level of suicidal ideation. This finding is in line with previous studies showing that people who have attempted suicide have greater risk tolerance (Colbert et al., 2021; Franklin et al., 2019; Huang et al., 2020; Pasculli & Harris, 2018). As suggested by the IPTS, a lack of fear of physical pain and death may be a key component in suicide. Although the IPTS emphasizes the link between pain tolerance and suicidal behavior, the current findings suggest that tolerance of negative health consequences may also contribute to suicide ideation. As physical harm and death are the main loss outcomes of suicide, it is possible that the reduced aversion to physical harm and death results in a lower perceived severity of the loss if one chooses to suicide. This can increase preference for suicide as an option during the ideation stage if the perceived gain of choosing to suicide is unchanged or even increases. Furthermore, the lack of interaction effect between risk tolerance and belongingness suggests that the two components independently contribute to suicidal ideation.

Next, consistent with previous research (Fitzpatrick et al., 2020; Thorne & Ebener, 2018; Vilhjalmsson et al., 1998; Wiebenga et al., 2021), mastery was significantly associated with a lower incidence and severity of suicidal ideation. In addition, mastery significantly

TABLE 4 Autoregressive ordinal regression predicting changes in severity of suicidal ideation over 7 waves.

	Total effect (univariate)		× Belongingness (univariate)		Unique effect (full model)		Final model	
	Coef.	OR	Coef.	OR	Coef.	OR	Coef.	OR
Belongingness	−0.54***	0.58 [0.53, 0.63]			−0.31***	0.73 [0.66, 0.81]	−0.45***	0.64 [0.56, 0.73]
COVID-19 impact	0.56***	1.74 [1.43, 2.13]	0.03	1.03 [0.86, 1.22]	0.34**	1.38 [1.11, 1.71]	0.29**	1.34 [1.08, 1.66]
COVID-19 impairment	0.20***	1.22 [1.16, 1.28]	0.07**	1.07 [1.02, 1.11]	0.08**	1.08 [1.02, 1.15]	0.08**	1.08 [1.03, 1.15]
Risk Tolerance	0.36***	1.43 [1.33, 1.55]	0.09*	1.09 [1.02, 1.18]	0.34***	1.40 [1.29, 1.53]	0.32***	1.37 [1.26, 1.49]
Mastery	−0.74***	0.48 [0.43, 0.52]	−0.20***	0.82 [0.76, 0.88]	−0.57***	0.57 [0.50, 0.64]	−0.70***	0.50 [0.43, 0.57]
Extraversion	−0.14**	0.87 [0.79, 0.95]	−0.04	0.96 [0.90, 1.03]	0.09	1.11 [0.98, 1.25]		
Openness	−0.15**	0.86 [0.77, 0.96]	−0.08	0.92 [0.85, 1.01]	−0.06	0.95 [0.83, 1.09]		
Conscientiousness	−0.28***	0.76 [0.68, 0.85]	−0.12*	0.89 [0.80, 0.97]	−0.05	0.96 [0.84, 1.09]		
Agreeableness	−0.32***	0.73 [0.65, 0.81]	−0.19***	0.83 [0.76, 0.91]	−0.12	0.89 [0.78, 1.00]	−0.25**	0.78 [0.66, 0.92]
Neuroticism					0.09	1.09 [0.97, 1.24]		
Belongingness × Mastery							−0.12**	0.89 [0.82, 0.95]
Belongingness × Agree							−0.12*	0.89 [0.80, 0.98]

Note: All models included demographic and COVID-19 impact variables (see Table S3); all models have included the demographic and COVID-19 impact variables; all continuous variables are centered. "× belongingness" refers to the interaction term between a variable and belongingness. Risk Tolerance × belongingness became nonsignificant in the final model.

Abbreviation: OR, odds ratio.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

moderated the negative link between belongingness on the incidence and severity of suicidal ideation. This result might suggest that mastery modulates the link between thwarted belongingness and suicidal ideation through a perceived higher ability to change and potentially control the situation. Individuals who believe that they are able to change the situation (e.g., being temporarily disconnected from others) may have been less influenced by the increase in loneliness and isolation during the COVID-19 pandemic, particularly during stringent public health responses to the pandemic, such as stay-at-home orders.

For personality traits, agreeableness, openness, and conscientiousness did not have significant unique effects on suicidal ideation over time once the model controlled for other variables. Counterintuitively, extraversion became positively related to the incidence of suicidal ideation in the full model. It might be due to that after protective components such as social connectedness and assertiveness have been accounted for by variables like belongingness and mastery, the remaining elements of extraversion, such as stimulation seeking, may promote ideation of self-injurious actions, including suicide (Ireland & York, 2012). Again, the findings were widely consistent with the limited research on the effects of personality traits on IPTS constructs, suggesting tenuous and inconsistent associations (Baertschi et al., 2018; Christensen et al., 2014).

Neuroticism was positively associated with the incidence of suicidal ideation (one score increase was associated with a 25% increase in the incidence of suicidal ideation) but had no significant impact on the change of suicidal ideation over time. This indicates that neuroticism and suicidal ideation could be common outcomes of the same psychological dysfunction instead of being causally related. On the contrary, while no direct association between agreeableness and suicidal ideation was detected, agreeableness significantly moderated the link between belongingness and the severity of suicidal ideation. This may indicate that agreeableness facilitates prosocial behavior that promotes a sense of belonging (Luengo Kanacri et al., 2014), particularly during times of social disruption. For instance, people high in agreeableness may have provided help and support to friends and neighbors during the pandemic, which may have promoted feelings of community and belonging. While the effects of personality were somewhat limited in this study, it is possible that more pathological personality traits (Christensen et al., 2014) may yield stronger associations, particularly through their relationships to psychotic and personality disorders.

Throughout the analyses including the sensitivity analyses, we also observed that mastery seemed to be more related to the link between belongingness and the incidence of suicidal ideation. By contrast, agreeableness seemed to be more related to the link between belongingness and the severity of suicidal ideation. The finding implies different mechanisms may be involved in the occurrence of suicidal ideation versus how it is maintained. More longitudinal future research is needed to verify those mechanisms.

Implications

The findings of the current study have several important theoretical, public health, and clinical implications. We observed that mastery outside the existing IPTS had a strong link with suicidal ideation beyond and exceeding the effect of belongingness. Understanding and incorporating the role of mastery in suicidal ideation is essential for future theoretical development. At a population level, there is potential for the dissemination of digital literacy programs that promote alternative ways to socially engage and maintain connectedness with others when physical contact is limited or restricted. There may also be a need for policy to consider those most at risk of adverse outcomes from isolation and to allow them to have direct contact with significant others from outside the household when stay-at-home orders are enforced. Clinical implications include the need to promote self-efficacy, mastery, and regulation of high levels of risk tolerance as therapeutic targets for people experiencing low mood and suicidal ideation. Our findings, however, suggest limited support for targeting more intensive therapy on the basis of personality or related psychological characteristics.

Limitations and conclusions

Some limitations should be noted. First, all measures in the current study were self-reported, and we did not assess actual behaviors such as suicide attempts. Using the single item from the PHQ-9 to assess suicidal ideation is a limitation in that it may not capture the full construct of suicidal ideation and may also capture self-harm ideation. Furthermore, the openness scale might also be limited by its low item-correlation potentially due to brevity as well as the unexpected pandemic, uncertainty, and nationwide lock down (e.g., more noise to participants' responses to the items on "artistic interests" and "active imagination"). Future studies can also incorporate perceived burdensomeness to clarify the potential interaction effect between belongingness and perceived burdensomeness.

Second, although we implemented a longitudinal design, all data were collected within a 3-month window. As with all correlational studies, no causal links can be demonstrated. The associations between various psychological

variables and suicidal ideation may occur over a longer time frame or as a proximal short-term trigger for suicidal thinking, requiring further research that can account for short-term fluctuations in suicidal ideation (e.g., ecological momentary assessments; Rabasco & Sheehan, 2022) or using longer-term follow-up. Moreover, mastery and risk tolerance were measured only once, and the results are based on the assumption that the two were stable over time. Previous studies have suggested moderate-to-high rank-order stability via test–retest correlations for both health risk attitudes (6-month interval, [Frey et al., 2017], 1-month interval, [Weber et al., 2002]) and perceived control (2-year interval, [Lundberg et al., 2009]). However, more evidence of the stability of the two variables during extraordinary circumstances (such as pandemics) may be needed. Finally, we focused on the Australian context, and more research is needed to test the generalizability of the results in other countries and cultural contexts (e.g., countries with higher population density).

In conclusion, the current study provided further support to the Interpersonal-psychological theory of suicide based on data from a longitudinal cohort study. Disruptions to belongingness, in conjunction with tolerance of health risk, contributed to the development and increased severity of suicidal ideation beyond social demographics and psychosocial changes, such as disruptions to finances and work. Mastery and agreeableness significantly strengthened the protective effect of belongingness.

CONFLICT OF INTEREST STATEMENT
The authors declare that they have no conflict of interest.

DATA AVAILABLITY STATEMENT
Data associated with this study are available upon request.

ETHICS STATEMENT
The ethical aspects of the study have been approved by the Australian National University (protocol 2020/152). Informed consent was obtained by all participants.

ORCID
Yiyun Shou https://orcid.org/0000-0002-7386-0031
Amelia Gulliver https://orcid.org/0000-0001-6351-9844
Louise M. Farrer https://orcid.org/0000-0001-5694-4631
Amy Dawel https://orcid.org/0000-0001-6668-3121
Richard Burns https://orcid.org/0000-0002-7750-4341
Alison L. Calear https://orcid.org/0000-0002-7028-725X
Nicolas Cherbuin https://orcid.org/0000-0001-6481-0748
Philip J. Batterham https://orcid.org/0000-0002-4547-6876

REFERENCES
Baertschi, M., Costanza, A., Canuto, A., & Weber, K. (2018). The function of personality in suicidal ideation from the perspective of the interpersonal-psychological theory of suicide. *International Journal of Environmental Research and Public Health*, 15, 636636. https://doi.org/10.3390/ijerph15040636

Batterham, P. J., Calear, A. L., Shou, Y., Farrer, L. M., Gulliver, A., McCallum, S. M., & Dawel, A. (2022). Effects of the COVID-19 pandemic on suicidal ideation in a representative Australian population sample–longitudinal cohort study. *Journal of Affective Disorders*, 300, 385–391. https://doi.org/10.1016/j.jad.2022.01.022

Blüml, V., Kapusta, N. D., Doering, S., Brähler, E., Wagner, B., & Kersting, A. (2013). Personality factors and suicide risk in a representative sample of the German general population. *PLoS One*, 8, e76646e76646. https://doi.org/10.1371/journal.pone.0076646

Brezo, J., Paris, J., & Turecki, G. (2006). Personality traits as correlates of suicidal ideation, suicide attempts, and suicide completions: A systematic review. *Acta Psychiatrica Scandinavica*, 113, 180–206. https://doi.org/10.1111/j.1600-0447.2005.00702.x

Calati, R., Romano, D., Magliocca, S., Madeddu, F., Zeppegno, P., & Gramaglia, C. (2022). The interpersonal-psychological theory of suicide and the role of psychological pain during the COVID-19 pandemic: A network analysis. *Journal of Affective Disorders*, 302, 435–439. https://doi.org/10.1016/j.jad.2022.01.078

Christensen, H., Batterham, P. J., Mackinnon, A. J., Donker, T., & Soubelet, A. (2014). Predictors of the risk factors for suicide identified by the interpersonal-psychological theory of suicidal behaviour. *Psychiatry Research*, 219, 290–297. https://doi.org/10.1016/j.psychres.2014.05.029

Christensen, R. H. B. (2022). Ordinal: Regression Models for Ordinal Data.

Chu, C., Buchman-Schmitt, J. M., Stanley, I. H., Hom, M. A., Tucker, R. P., Hagan, C. R., Rogers, M. L., Podlogar, M. C., Chiurliza, B., Ringer, F. B., Michaels, M. S., Patros, C. H. G., & Joiner, T. E. (2017). The interpersonal theory of suicide: A systematic review and meta-analysis of a decade of cross-national research. *Psychological Bulletin*, 143, 1313–1345. https://doi.org/10.1037/bul0000123

Colbert, S. M. C., Hatoum, A. S., Shabalin, A., Li, Q. S., Coon, H., Nelson, E. C., Agrawal, A., Docherty, A. R., & Johnson, E. C. (2021). Exploring the genetic overlap of suicide-related behaviors and substance use disorders. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, 186, 445–455. https://doi.org/10.1002/ajmg.b.32880

Czyz, E. K., Berona, J., & King, C. A. (2015). A prospective examination of the interpersonal-psychological theory of suicidal behavior among psychiatric adolescent inpatients. *Suicide and Life-threatening Behavior*, *45*, 243–259. https://doi.org/10.1111/sltb.12125

Davidson, C. L., Wingate, L. R., Slish, M. L., & Rasmus, K. A. (2010). The great black Hope: Hope and its relation to suicide risk among African Americans. *Suicide and Life-threatening Behavior*, *40*, 170–180. https://doi.org/10.1521/suli.2010.40.2.170

Dawel, A., Shou, Y., Smithson, M., Cherbuin, N., Banfield, M., Calear, A. L., Farrer, L. M., Gray, D., Gulliver, A., Housen, T., McCallum, S. M., Morse, A. R., Murray, K., Newman, E., Rodney Harris, R. M., & Batterham, P. J. (2020). The effect of COVID-19 on mental health and wellbeing in a representative sample of Australian adults. *Frontiers in Psychiatry*, *11*, 579985579985.

Farooq, S., Tunmore, J., Wajid Ali, M., & Ayub, M. (2021). Suicide, self-harm and suicidal ideation during COVID-19: A systematic review. *Psychiatry Research*, *306*, 114228114228. https://doi.org/10.1016/j.psychres.2021.114228

Fitzpatrick, K. M., Harris, C., & Drawve, G. (2020). How bad is it? Suicidality in the middle of the COVID-19 pandemic. *Suicide and Life-threatening Behavior*, *50*, 1241–1249. https://doi.org/10.1111/sltb.12655

Franklin, J. C., Huang, X., & Bastidas, D. (2019). Virtual reality suicide: Development of a translational approach for studying suicide causes. *Behaviour Research and Therapy*, *120*, 103360103360. https://doi.org/10.1016/j.brat.2018.12.013

Frey, R., Pedroni, A., Mata, R., Rieskamp, J., & Hertwig, R. (2017). Risk preference shares the psychometric structure of major psychological traits. *Science Advances*, *3*, 1–14. https://doi.org/10.1126/sciadv.1701381

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, *37*, 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Gratz, K. L., Tull, M. T., Richmond, J. R., Edmonds, K. A., Scamaldo, K. M., & Rose, J. P. (2020). Thwarted belongingness and perceived burdensomeness explain the associations of COVID-19 social and economic consequences to suicide risk. *Suicide and Life-threatening Behavior*, *50*, 1140–1148. https://doi.org/10.1111/sltb.12654

Hatcher, S., & Stubbersfield, O. (2013). Sense of belonging and suicide: A systematic review. *Canadian Journal of Psychiatry*, *58*, 432–436. https://doi.org/10.1177/070674371305800709

Huang, X., Funsch, K. M., Park, E. C., & Franklin, J. C. (2020). Anticipated consequences as the primary causes of suicidal behavior: Evidence from a laboratory study. *Behaviour Research and Therapy*, *134*, 103726103726. https://doi.org/10.1016/j.brat.2020.103726

Ireland, J. L., & York, C. (2012). Exploring application of the interpersonal-psychological theory of suicidal behaviour to self-injurious behaviour among women prisoners: Proposing a new model of understanding. *International Journal of Law and Psychiatry*, *35*, 70–76. https://doi.org/10.1016/j.ijlp.2011.11.006

Joiner, T. E., Brown, J. S., & Wingate, L. R. (2005). The psychology and neurobiology of suicidal behavior. *Annual Review of Psychology*, *56*, 287–314. https://doi.org/10.1146/annurev.psych.56.091103.070320

Joiner, T. E., Van Orden, K. A., Witte, T. K., et al. (2009). Main predictions of the interpersonal-psychological theory of suicidal behavior: Empirical tests in two samples of young adults. *Journal of Abnormal Psychology*, *118*, 634–646. https://doi.org/10.1037/a0016500

Kawohl, W., & Nordt, C. (2020). COVID-19, unemployment, and suicide. *The Lancet Psychiatry*, *7*, 389–390. https://doi.org/10.1016/S2215-0366(20)30141-3

Liu, S., Haucke, M. N., Heinzel, S., & Heinz, A. (2021). Long-term impact of economic downturn and loneliness on psychological distress: Triple crises of COVID-19 pandemic. *Journal of Clinical Medicine*, *10*, 45964596. https://doi.org/10.3390/jcm10194596

Luengo Kanacri, B. P., Pastorelli, C., Eisenberg, N., Zuffianò, A., Castellani, V., & Caprara, G. V. (2014). Trajectories of prosocial behavior from adolescence to early adulthood: Associations with personality change☆. *Journal of Adolescence*, *37*, 701–713. https://doi.org/10.1016/j.adolescence.2014.03.013

Lundberg, J., Karlsson, N., & Kristenson, M. (2009). Does two-year stability for scale scores of psychosocial factors differ by socioeconomic position? *Psychological Reports*, *105*, 1009–1022. https://doi.org/10.2466/PR0.105.F.1009-1022

Ma, J., Batterham, P. J., Calear, A. L., & Han, J. (2016). A systematic review of the predictions of the interpersonal–psychological theory of suicidal behavior. *Clinical Psychology Review*, *46*, 34–45. https://doi.org/10.1016/j.cpr.2016.04.008

MacKinnon, J. G., & White, H. (1985). Some heteroskedasticity-consistent covariance matrix estimators with improved finite sample properties. *Journal of Econometrics*, *29*, 305–325. https://doi.org/10.1016/0304-4076(85)90158-7

McCallum, S. M., Calear, A. L., Cherbuin, N., et al. (2021). Associations of loneliness, belongingness and health behaviors with psychological distress and wellbeing during COVID-19. *Journal of Affective Disorders Reports*, *6*, 100214100214. https://doi.org/10.1016/j.jadr.2021.100214

Mitchell, S. M., Brown, S. L., Roush, J. F., Bolaños, A. D., Littlefield, A. K., Marshall, A. J., Jahn, D. R., Morgan, R. D., & Cukrowicz, K. C. (2017). The clinical application of suicide risk assessment: A theory-driven approach. *Clinical Psychology & Psychotherapy*, *24*, 1406–1420. https://doi.org/10.1002/cpp.2086

Monteith, L. L., Menefee, D. S., Pettit, J. W., Leopoulos, W. L., & Vincent, J. P. (2013). Examining the interpersonal–psychological theory of suicide in an inpatient veteran sample. *Suicide and Life-threatening Behavior*, *43*, 418–428. https://doi.org/10.1111/sltb.12027

Pasculli, A. J., & Harris, K. M. (2018). Suicidal women may risk their lives but not their social relationships. *Clinical Psychologist*, *22*, 46–54. https://doi.org/10.1111/cp.12103

Pearlin, L. I., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior*, *19*, 2–21. https://doi.org/10.2307/2136319

Pirkis, J., John, A., Shin, S., DelPozo-Banos, M., Arya, V., Analuisa-Aguilar, P., Appleby, L., Arensman, E., Bantjes, J., Baran, A., Bertolote, J. M., Borges, G., Brečić, P., Caine, E., Castelpietra, G., Chang, S. S., Colchester, D., Crompton, D., Curkovic, M., … Spittal, M. J. (2021). Suicide trends in the early months of the COVID-19 pandemic: An interrupted time-series analysis of preliminary data from 21 countries. *The Lancet Psychiatry*, *8*, 579–588. https://doi.org/10.1016/S2215-0366(21)00091-2

Quan, J., Yu, X., Cai, Y., & Tu, D. (2021). Comparison of psychometric characteristics for five versions of the interpersonal needs

questionnaire in teenagers sample. *Frontiers in Psychology*, *12*, 676361676361.

Rabasco, A., & Sheehan, K. (2022). The use of intensive longitudinal methods in research on suicidal thoughts and behaviors: A systematic review. *Archives of Suicide Research*, *26*, 1007–1021. https://doi.org/10.1080/13811118.2021.1903635

Raifman, J., Ettman, C. K., Dean, L. T., Abdalla, S. M., Skinner, A., Barry, C. L., & Galea, S. (2022). Economic precarity, loneliness, and suicidal ideation during the COVID-19 pandemic. *PLoS One*, *17*, e0275973e0275973. https://doi.org/10.1371/journal.pone.0275973

Ribeiro, J. D., & Joiner, T. E. (2009). The interpersonal-psychological theory of suicidal behavior: Current status and future directions. *Journal of Clinical Psychology*, *65*, 1291–1299. https://doi.org/10.1002/jclp.20621

Santomauro, D. F., Mantilla Herrera, A. M., Shadid, J., Zheng, P., Ashbaugh, C., Pigott, D. M., Abbafati, C., Adolph, C., Amlag, J. O., Aravkin, A. Y., Bang-Jensen, B. L., Bertolacci, G. J., Bloom, S. S., Castellano, R., Castro, E., Chakrabarti, S., Chattopadhyay, J., Cogen, R. M., Collins, J. K., ... Ferrari, A. J. (2021). Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *The Lancet*, *398*, 1700–1712. https://doi.org/10.1016/S0140-6736(21)02143-7

Shou, Y., & Olney, J. (2021). Measuring risk tolerance across domains: Scale development and validation. *Journal of Personality Assessment*, *104*, 1–12.

Spitzer, R. L., Kroenke, K., & Williams, J. B. (1999). Validation and utility of a self-report version of PRIME-MD: The PHQ primary care study. Primary care evaluation of mental disorders. Patient Health Questionnaire. *JAMA*, *282*, 1737–1744. https://doi.org/10.1001/jama.282.18.1737

Szücs, A., Szanto, K., Aubry, J.-M., & Dombrovski, A. Y. (2018). Personality and suicidal behavior in old age: A systematic literature review. *Frontiers in Psychiatry*, *9*, 128128.

Szücs, A., Szanto, K., Wright, A. G. C., & Dombrovski, A. Y. (2020). Personality of late- and early-onset elderly suicide attempters. *International Journal of Geriatric Psychiatry*, *35*, 384–395. https://doi.org/10.1002/gps.5254

Thorne, K., & Ebener, D. (2018). Locus of control as a mediator between posttraumatic stress and suicide risk: Rural implications. *Rural Society*, *27*, 208–223. https://doi.org/10.1080/10371656.2018.1504759

Van Orden, K. A., Cukrowicz, K. C., Witte, T. K., & Joiner, T. E., Jr. (2012). Thwarted belongingness and perceived burdensomeness: Construct validity and psychometric properties of the interpersonal needs questionnaire. *Psychological Assessment*, *24*, 197–215. https://doi.org/10.1037/a0025358

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., et al. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*, 575–600. https://doi.org/10.1037/a0018697

Vilhjalmsson, R., Kristjansdottir, G., & Sveinbjarnardottir, E. (1998). Factors associated with suicide ideation in adults. *Social Psychiatry and Psychiatric Epidemiology*, *33*, 97–103. https://doi.org/10.1007/s001270050028

Weber, E. U., Blais, A.-R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, *15*, 263–290. https://doi.org/10.1002/bdm.414

Wiebenga, J. X. M., Dickhoff, J., Mérelle, S. Y. M., Eikelenboom, M., Heering, H. D., Gilissen, R., van Oppen, P., & Penninx, B. W. J. H. (2021). Prevalence, course, and determinants of suicide ideation and attempts in patients with a depressive and/or anxiety disorder: A review of NESDA findings. *Journal of Affective Disorders*, *283*, 267–277. https://doi.org/10.1016/j.jad.2021.01.053

Zeileis, A., Köll, S., & Graham, N. (2020). Various versatile variances: An object-oriented implementation of clustered covariances in R. *Journal of Statistical Software*, *95*, 1–36. https://doi.org/10.18637/jss.v095.i01

SUPPORTING INFORMATION

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

How to cite this article: Shou, Y., Gulliver, A., Farrer, L. M., Dawel, A., Burns, R., Calear, A. L., Cherbuin, N., & Batterham, P. J. (2024). Psychological mechanisms of the development of suicidal ideation: Longitudinal cohort study. *Suicide and Life-Threatening Behavior*, *00*, 1–13. https://doi.org/10.1111/sltb.13060