Suicide prevention through better understanding and identification of interpersonal risk factors and building strengths

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A thesis submitted for the degree of Doctor of Philosophy of

The Australian National University

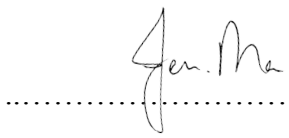
June 2018

Declaration

This work has not been previously submitted for a degree or diploma to any higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made.

The systematic review reported in Chapter 2 was conducted with assistance from Associate Professor Philip J. Batterham, Associate Professor Alison L. Calear, and Dr. Jin Han, who cross-coded the included papers. Associate Professor Philip J. Batterham provided access to the dataset and assisted with the Latent Class Analysis in Chapter 3. Associate Professor Philip J. Batterham and the Black Dog Institute Clinic provided access to the dataset in Chapter 4. Dr. Matthew Sunderland assisted with the Confirmatory and Bi-factor Exploratory Factor Analysis and Item Response Theory analysis in Chapter 5.

This research is supported by an Australian Government Research Training Program (RTP) Scholarship.



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Acknowledgements

I would like to express my sincere gratitude to my supervisors, Associate Professor Philip J. Batterham, Associate Professor Alison L. Calear, Dr. Kate Fairweather-Schmidt, and Dr. Matthew Sunderland. Their guidance and support throughout this PhD has made the journey such a positive experience, and I feel very blessed to have received their mentorship.

I would like to thank and acknowledge the Black Dog Institute clinic staff involved in the data collection for the 'Longitudinal test of the Interpersonal Psychological Theory of Suicide in an Australian clinical sample' (Chapter 4), and the Australian National University Counselling Centre staff for delivering the 'Get Up & Go' peer-support walking program and collaborating on the pilot controlled trial study (Chapter 6).

I would also like to thank everyone at the Centre for Mental Health Research (especially my fellow PhD cohort) who have been a wonderful source of community and support. I will have many fond memories of our time together at the centre.

Lastly, I would like to thank my family for their love and support. Their hard work and belief in the power of education has enabled me to pursue my goals and dreams. A special thanks goes out to my partner, who helped me to navigate this period with balance and joy.

Abstract

Introduction: Suicide bears a significant public health impact worldwide, and there is a need for better identification of suicide risk and protective factors and more accurate prediction of its development. The aim of the present thesis was to promote suicide prevention through: (1) better understanding and identification of interpersonal risk factors for suicide, as outlined by a recent predictive model of suicide: the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), and (2) building interpersonal strengths. **Methods:** A systematic review was conducted to identify support for the IPTS predictions regarding suicide ideation and suicide attempt. Based on the results of this review, several studies were conducted to fill critical gaps in the literature base. This included: (a) a latent class study of 1,321 adults to test the generalisability of the IPTS predictions in a community sample, (b) a longitudinal study in an Australian clinical sample (n = 331) to test the IPTS predictions over time in a high-risk population, (c) a study to develop and validate a new self-report measure for thwarted belongingness (TBS) against the Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, Witte, & Joiner, 2012) and (d) a pilot study to investigate the feasibility of a university-based peer-support walking program in contributing to decreased interpersonal suicide risk in Australian university students. **Results:** The systematic review found mixed evidence across the theory's main predictions. The effect of perceived burdensomeness on suicide ideation was the most tested and supported relationship. The theory's other predictions, particularly in terms of critical interaction effects, were less strongly supported. Across studies testing the IPTS predictions (Chapters 3-5), the role and specificity of the two-way interaction between TB and PB on suicide ideation was supported in two community-based samples, but not supported cross-sectionally or longitudinally in a clinical sample. No support was found for the IPTS three-way interaction prediction. However, associations

between the interpersonal risk factors and suicidality were consistently supported across the studies. Findings from the pilot controlled trial (Chapter 6) indicated that a university-based peer-support walking program contributed to increased levels of positive friendship social support (Cohen's $d = 0.82$) and decreased levels of psychological distress (Cohen's $d = -0.32$) in university students. **Conclusions:** Mixed findings regarding the two- and three-way IPTS interactions highlight the critical need for additional IPTS studies designed with the aim of overcoming existing methodological limitations before the full extent of the theory's theoretical and clinical utility can be determined. Support for the interpersonal risk factors as main effects suggests that they may serve as valuable targets for suicide prevention and intervention more broadly. Future research utilising the best available and validated measures of the interpersonal risk factors is needed for better prediction of interpersonal suicide risk, and for use in the design and evaluation of connectedness-based suicide prevention/intervention programs to promote interpersonal strengths in the community.

PUBLICATIONS AND CONFERENCE PRESENTATIONS ARISING FROM THIS THESIS

Peer reviewed publications

1. **Ma, J.**, Batterham, P. J., Calear, A. L., & Han, J. (2018). Suicide risk across latent class subgroups: A test of the generalizability of the Interpersonal Psychological Theory of Suicide. *Suicide and Life-Threatening Behavior*, Jan 6. doi: 10.1111/sltb.12426.
2. **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. doi: 10.1016/j.cpr.2016.04.008

Submitted manuscripts

1. **Ma, J.**, Batterham, P. J., Calear, A. L. & Christensen, H. (2018). A longitudinal test of the Interpersonal Psychological Theory of Suicide in an Australian clinical sample.
2. **Ma, J.**, Batterham, P. J., Calear, A. L., & Sunderland, M. (2018). The Development and Validation of the Thwarted Belongingness Scale (TBS) for Interpersonal Suicide Risk.
3. **Ma, J.**, Batterham, P. J. & Calear, A. L. (2018). The effects of a peer-support walking program on interpersonal suicide risk and wellbeing in university students: A pilot controlled trial.

Conference presentations

1. **Ma, J. S.,** Batterham, P. J., Calear, A. L. (2017). The effects of a peer-support walking program on student wellbeing and interpersonal suicide risk: A controlled trial. Society for Mental Health Research. Hyatt Hotel, Canberra, Australia, December 6-8.

2. **Ma, J. S.,** Batterham, P. J., Calear, A. L., & Han, J. (2017). Suicide risk across latent class subgroups: A test of the Interpersonal Psychological Theory of Suicide. The National Suicide Prevention Conference. Sofitel Brisbane Central, Queensland, Australia, July 26-29.
3. **Ma, J. S.,** Batterham, P. J., Calear, A. L., & Han, J. (2016). Suicide risk across latent class subgroups: A test of the Interpersonal Psychological Theory of Suicide. 2016 Research School of Population Health Student Conference. John Curtin School of Medical Research, Canberra, Australia, October 19.
4. **Ma, J. S.,** Batterham, P. J., Calear, A. L., & Han, J. (2016). A systematic review of the predictions of the Interpersonal-Psychological Theory of suicidal behaviour. 31st International Congress of Psychology. Pacifico Yokohama, Yokohama, Japan, July 24-29.

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CHAPTER 1: Promoting Suicide Prevention

1.1 Suicide and its prevention

Suicide is a phenomenon that bears a significant public health impact worldwide. Each year it is estimated that approximately 800,000 people die by suicide, accounting for 1.4% of all deaths worldwide, ranking suicide as the 17th leading cause of death in globally (World Health Organization, 2014, 2018). Disconcertingly, the prevalence of non-fatal suicide attempts and suicidal thoughts are thought to be considerably higher, which also has considerable burden on the population, including people with lived experience of suicidal thoughts and behaviours and those who care for them. For every death attributed to suicide, it is estimated there are approximately 20 suicide attempts made by individuals in the general population, and as high as 200 attempts per suicide death among adolescents (Nock, Borges, Bromet, Cha, et al., 2008). Additionally, cross-national lifetime prevalence estimates have shown rates for suicidal thoughts (9.2%) to be three times higher than those found for suicidal plans (3.1%) or suicide attempts (2.6%) (Nock, Borges, Bromet, Alonso, et al., 2008). Sadly, these estimates have not been found to decline appreciably over the last few decades despite increased use of health-care services and developments in treatment research (Centers for Disease Control and Prevention, 2016; World Health Organization, 2014).

One reason for this may be attributed to the fact that, though preventable, suicidal thoughts and behaviours are complex phenomena influenced by several interacting factors, including personal, social, psychological, cultural, biological, and environmental (Goldston et al., 2008; King et al., 2001; Mann et al., 2005; O'Connor, 2011). As such, there is no singular underlying explanation as to why a person may attempt suicide, resulting in a highly contextual and varied picture of its development and potential pathways for effective intervention (World Health Organization, 2010).

The complex nature of suicide may also partially explain why much of the suicide prevention research conducted over the past 50 years has been limited in its ability to identify novel suicide risk and protective factors and provide enhanced prediction of the development of suicidal thoughts and behaviours (Franklin et al., 2017). The comparative lack of studies on the protective factors of suicide, in particular, is an important area to address, as these may help provide a valuable pathway for the development of prevention and early intervention initiatives that lead to the decrease of suicidal thoughts and the promotion of mental health more broadly (Batterham, Calear, & van Spijker, 2015). Consequently, there is currently a need for suicide research to identify new risk and protective factors for suicide, and to investigate the relationships between these factors in contributing to suicidal thoughts and behaviours. In this regard, theoretical models of suicide have been suggested as a way in which to advance understandings of the contexts in which suicide may broadly develop (Klonsky & May, 2015; Van Orden et al., 2010).

In the following section, an overview of a recent predictive model of suicide, the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), will be presented and is utilised throughout this thesis as a theoretical framework. In line with accepted nomenclature (Silverman, Berman, Sanddal, O'carroll, & Joiner, 2007), the present thesis uses the following definitions for suicide-related behaviours: suicide ideation refers to self-reported thoughts of ending one's life; suicide attempt refers to a nonfatal, self-inflicted act in which there is the potential for injury and the individual has some intent to die; and suicide refers to a fatal, self-inflicted destructive act with some intent to die. The term 'suicidality' is used throughout this thesis to encompass both suicide ideation and suicide-related behaviours.

1.2 The Interpersonal Psychological Theory of Suicide

The Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) was developed with the aim of providing a theoretical model of suicide behaviour. The IPTS consolidates a broad range of suicide risk factors, and provides testable predictions of who will develop desire for suicide (i.e., ideation), and from these, who will go on to attempt. As such, the theory holds much promise in regards to bettering our understanding of how certain suicide risk factors interact, and where prevention and intervention efforts may be best focused (Christensen, Batterham, Mackinnon, Donker, & Soubelet, 2014; Stellrecht et al., 2006).

According to the IPTS, suicidal desire is caused by the simultaneous presence of two proximal, causal risk factors: (1) thwarted belongingness, (2) perceived burdensomeness, and hopelessness (i.e., "this will never change") about these states (Joiner, 2005; Van Orden et al., 2010). Thwarted belongingness refers to the experience that one is alienated from friends, family, or other valued social circles. It is said to comprise of two facets, loneliness (i.e., "I feel disconnected from others") and the absence of reciprocal care (i.e., "I have no one to turn to and I don't support others"). It is viewed as a dynamic cognitive-affective state that is influenced by inter and intra-personal factors such as experiencing family conflict, living alone, possessing few social supports, and being prone to interpret others' behaviour as rejection (Van Orden et al., 2010). Perceived burdensomeness, on the other hand, refers to the view that one's existence is a burden on friends, family members, and/or society, and comprises of two facets, self-hate (i.e., "I hate myself") and feelings of liability (i.e., "my death is worth more than my life to others"). Like thwarted belongingness, perceived burdensomeness is conceptualised as a dynamic cognitive affect state, where risk factors such as homelessness, unemployment, physical illness, and feelings of low-self-esteem and being unwanted are said to contribute to its development (Van Orden et al., 2010).

Though it is hypothesised that experiencing either perceived burdensomeness or thwarted belongingness alone will elicit passive suicidal ideation, it is their interaction coupled with the view that they are stable and unchanging (i.e., hopelessness) that will cause active suicidal desire.

The development from active suicidal desire to suicidal behaviour is said to only result through the presence of an additional third construct: (3) acquired capability[1]. Acquired capability refers to one's ability to overcome the inherent drive for self-preservation and engage in lethal self-injury (Joiner, 2005). This process of acquiring the capability for suicide is hypothesised as being possible due to a lowered fear of death resulting from repeated exposure and habituation to physically painful and/or fear-inducing experiences, and an elevated tolerance of physical pain. It is viewed as a continuous construct that accumulates over time, with risk factors such as family history of suicide, previous suicide attempt, exposure to combat, and childhood maltreatment contributing to its development (Ribeiro & Joiner, 2009; Van Orden et al., 2010). Thus, individuals who have high levels of all three constructs, thwarted belongingness, perceived burdensomeness, and acquired capability, are said to be at most risk for lethal suicidal behaviour, as they possess both the desire for and capability to attempt suicide. See Figure 1-1.

[1] This term was used in original accounts of the theory. However, as subsequent research has indicated that it may have a substantial genetic component (Smith et al., 2012), it is now commonly referred to as capability for suicide (CS). In line with recommendations, the following chapters employ use of the term capability for suicide (CS) in place of acquired capability (AC) when discussing and testing the theory.

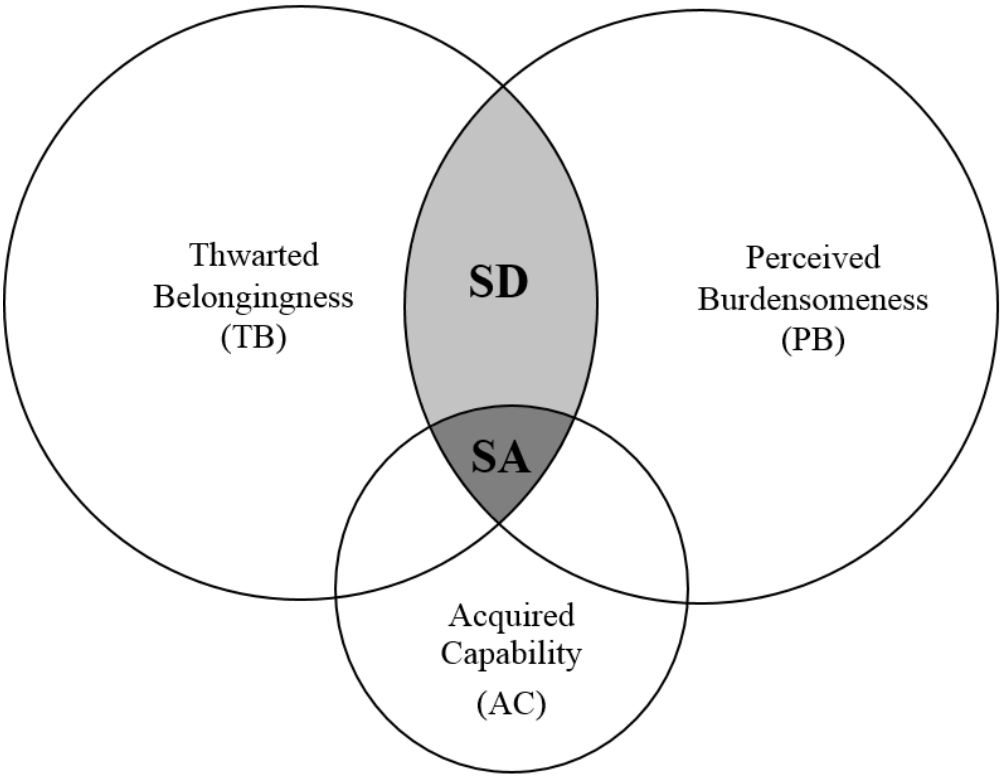

Figure 1- 3. The Interpersonal Psychological Theory of Suicide
Note. SD = Suicide Desire, SA = Suicide Attempt

Research conducted on the IPTS has been varied with studies providing partial to full support of the IPTS constructs across various populations, including military (Bryan, Morrow, Anestis, & Joiner, 2010), detainee (Ireland & York, 2012), community-based (Christensen, Batterham, Soubelet, & Mackinnon, 2013), clinical (Joiner et al., 2009), undergraduate (Van Orden, Witte, Gordon, Bender, & Joiner, 2008), and LGBT samples (Kim & Yang, 2015). Additionally, two systematic reviews, one reporting on the role of perceived burdensomeness on suicide-related behaviour within clinical samples (Hill & Pettit, 2014), and another examining support for the IPTS from studies published between 2002-2011 in German (Wachtel & Teismann,

2013) have provided support for the cross-sectional associations of perceived burdensomeness with suicide ideation and attempt in clinical populations, and all three interpersonal risk factors with different facets of suicidality.

The cross-sectional support identified for the IPTS constructs and their associations with suicidality across multiple populations highlights the potential of the IPTS as a framework to inform clinical and public health interventions to prevent suicide. As potentially amenable cognitive-affective states, the interpersonal risk factors of thwarted belongingness and perceived burdensomeness may serve as valuable targets in prevention and early intervention initiatives (Stellrecht et al., 2006; Van Orden et al., 2010). While suggestions have been made as to how the IPTS may be incorporated into existing Cognitive Behavioural Therapy and Interpersonal Psychotherapy frameworks in clinical settings (Stellrecht et al., 2006; Van Orden, Talbot, & King, 2012), intervention-based research on the interpersonal risk factors has been limited. To date, only two trials have been conducted with the specific aim of reducing interpersonal suicide risk: a pilot randomised controlled trial of a web-based psychosocial intervention targeting cognitions of perceived burdensomeness towards others in adolescents (Hill & Pettit, 2016), and a randomised trial of a peer companionship intervention in older adults (Van Orden et al., 2013). The former indicated that perceived burdensomeness could be modified via a psychosocial intervention, whilst findings of the latter have not yet been reported.

In order to promote the intervention and treatment of suicide, more studies investigating the extent to which thwarted belongingness and perceived burdensomeness are amenable to change and their respective influence on decreasing suicide risk are needed. To extend the range of available interventions that target thwarted belongingness and perceived burdensomeness beyond clinical settings, interventions aimed at incorporating ways to build interpersonal strengths, such as

feelings of connectedness, belonging, and mattering may provide valuable pathways for decreasing interpersonal suicide risk in the broader population (Van Orden et al., 2013; Whitlock, Wyman, & Barreira, 2012; Whitlock, Wyman, & Moore, 2014).

1.3 The present study

1.3.1 Research aims. To summarise, though preventable, suicide remains a major public health concern and there persists a need for the better identification of suicide risk and protective factors, and for more accurate prediction of its development. As such, the present thesis aims to promote suicide prevention through: (1) better understanding and identification of interpersonal risk factors for suicide, as outlined by a recent predictive model of suicide: the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), and (2) exploring ways to build interpersonal strengths in the context of connectedness interventions for suicide prevention in university settings.

1.3.2 Outline and contributions of the thesis. The current chapter provides a rationale for the thesis, highlighting the importance of promoting suicide prevention through better identification of risk and protective factors for suicide. An overview of a recent predictive model for suicide, the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), is presented and utilised throughout this thesis as a theoretical framework to investigate relationships between interpersonal risk factors and suicidal thoughts and behaviours.

Since the development of the Interpersonal Psychological Theory (IPTS; Joiner, 2005), a growing body of literature has emerged testing different aspects of the theory across a range of populations. In order to identify the level of support for the theory's predictions across multiple populations, Chapter 2 presents a systematic review of current evidence testing the effects of thwarted belongingness, perceived burdensomeness, and acquired capability on suicide ideation and attempt. The findings

of this systematic review and the critical gaps and future research recommendations identified were used to inform the studies presented in the following thesis chapters (Figure 1-2).

The findings of the systematic review in Chapter 2 raised the question of whether the IPTS was generalisable to the general population or holds more explanatory power for certain subsets of individuals compared to others. To investigate this question, Chapter 3 presents the results of a latent class analysis study that was conducted on a population-based sample of 1,321 adults to test the generalisability of the IPTS across different subgroups of individuals based on their patterns of risk.

Additional critical gaps identified in the systematic review (Chapter 2) included the need for longitudinal studies examining the two-way and three-way interactions of the IPTS constructs, and the need to expand the availability of valid measurement approaches for the interpersonal risk factors. Addressing these gaps are the focus of Chapters 4 and 5. Chapter 4 presents the results of a study that tested the IPTS hypotheses around suicide ideation and suicide attempt cross-sectionally and longitudinally at six-month follow-up using logistic regression analyses on data obtained from an Australian clinical sample (N = 331). Chapter 5 details the development and validation of a new self-report measure for the interpersonal risk factor thwarted belongingness. In this study a 42-item pool underwent refinement via three consecutive stages: (1) expert feedback, (2) an item selection study using a sample of community-dwelling Australian adults (Study 1, N = 284), and (3) a validation study and test of the IPTS predictions in a larger sample of community-dwelling Australian adults (Study 2, N = 747).

With the project's dual focus of better identification and exploring ways to promote suicide prevention through building interpersonal strengths, Chapter 6 opens with a brief review of connectedness interventions for suicide prevention and their

applicability in university settings, and provides an introduction to an existing university-based peer support walking program ('Get Up & Go'). In line with the systematic review (Chapter 2) recommendations for future research exploring the extent to which the interpersonal risk factors are amenable to change, the method and results of a pilot controlled trial to investigate the feasibility of the 'Get Up & Go' program in contributing to decreased interpersonal suicide risk (i.e., reduced thwarted belongingness and perceived burdensomeness), decreased symptoms of depression, anxiety and psychological distress, and increased levels of social support, school membership, wellbeing and resilience in university students are also presented.

Lastly, Chapter 7 presents an overview of the findings arising from this thesis, followed by a discussion of their implications in relation to the project's aim of better identifying interpersonal risk factors and building strengths, and closes with conclusions and future research directions. As the thesis chapters are based on publication, there may be some repetition regarding description of the IPTS.

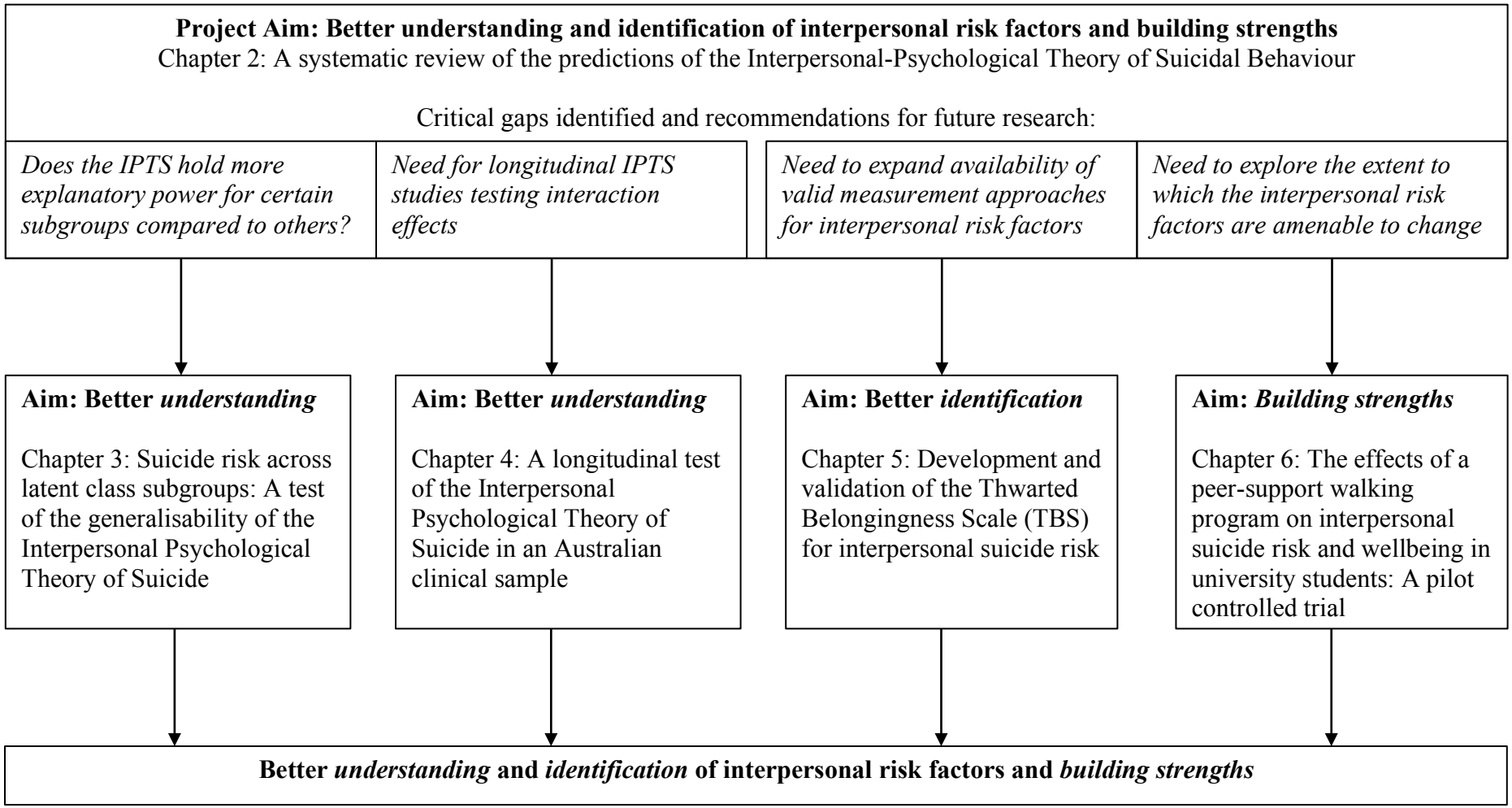

Figure 1- 4. Progression of the project within the thesis

CHAPTER 2: A systematic review of the predictions of the Interpersonal-Psychological Theory of Suicidal Behaviour

2.1 Introduction

As highlighted in Chapter 1, though preventable, suicidal thoughts and behaviours are complex phenomena influenced by several interacting factors resulting in a highly contextual and varied picture of its development (Goldston et al., 2008; King et al., 2001; Mann et al., 2005; O'Connor, 2011). Recently, the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) was developed to provide testable predictions of who will develop desire for suicide (i.e., ideation) and from this, who will go on to attempt. As such, the theory holds much promise in regards to bettering our understanding of where prevention and intervention efforts may be best focused (Christensen et al., 2014; Stellrecht et al., 2006). The present chapter provides a systematic review of the support for the predictions of the IPTS and, in doing so, aims to identify critical gaps in the evidence base and provide recommendations for future research to advance theoretical and clinical progress in this area.

Since the development of the IPTS in 2005, a growing body of research has emerged testing different aspects of the theory across a range of populations. In 2009, an article on the current status and future directions of the IPTS stated that the theory has stood up to 20 direct empirical tests, with results generally substantiating the theory's main predictions (Ribeiro & Joiner, 2009). Since then, two systematic reviews on the IPTS have been published, one reporting on the role of perceived burdensomeness on suicide-related behaviour within clinical samples (Hill & Pettit, 2014), and another examining support for the IPTS from studies published between 2002-2011 (Wachtel & Teismann, 2013).

In their systematic review of 27 empirical studies testing the association between

perceived burdensomeness and suicide ideation, suicide attempts, or suicide within clinical samples, Hill and Pettit (2014) found perceived burdensomeness to have statistically significant bivariate associations with both suicide ideation and past suicide attempts. Perceived burdensomeness was also found to be a predictor of suicidal ideation beyond the effects of other well established risk factors, and played a role as both moderator and mediator between suicide-related behaviours and other risk and protective factors. The authors noted that the majority of studies conducted focused on the relationship between perceived burdensomeness and suicide ideation, with results highlighting the role of perceived burdensomeness as a potential route for suicide intervention in clinical populations. A limitation of this review, however, is that it focused exclusively on the role of perceived burdensomeness within clinical samples, to the exclusion of the theory's more critical interaction predictions and applicability within other sample types.

The other systematic review, by Wachtel and Teismann (2013), was more comprehensive, in that it reviewed the results of 29 studies (published between 2002-2011) that examined support for all three interpersonal risk factors in relation to suicide-related behaviours. The authors found perceived burdensomeness, thwarted belongingness, and acquired capability to be associated with different facets of suicidality, concluding that there was a lack of studies investigating the interrelation of the theory's constructs. This review was published solely in German with its findings requiring translation in order to be accessible to non-German readers in the field. Additionally, the review was limited to articles published up to 2011, with a considerable proliferation of IPTS studies since that time.

Thus, the aim of the present review was to provide the first English systematic review of the full set of predictions of the IPTS across multiple populations. To assess the predictive power of the IPTS constructs independently of the contribution of other

major suicide risk factors, the review focused specifically on the results of studies that adjusted for the presence of other IPTS variables (i.e., thwarted belongingness, perceived burdensomeness, and acquired capability) and/or mental health-related measures (e.g., depression, anxiety, hopelessness) to provide a rigorous test of these predictions. In doing so, the current review aims to identify whether empirical research supports the theory, and to highlight critical gaps in the evidence base by reviewing what populations and what aspects of the theory have been most tested and supported.

2.2 Method

On the 8th of July 2015, the Medline and PsycInfo databases were electronically searched for English-language, human, peer reviewed articles published from January 2005 up to July 2015 using the search terms: "Interpersonal psychological OR interpersonal-psychological OR Joiner* OR thwarted belong* OR perceived burden* OR acquired capability AND suicid*." With limits imposed, 315 records were identified through database searching, and two additional articles from reference list searches. After duplicates were removed, 207 records were screened by the primary author for relevance to the systematic review. Sixty-three articles were excluded based on content (i.e., articles that were topically unrelated), and type of publication (i.e., review and scale development articles). The remaining 144 articles were considered for full-text review.

Full-text articles were coded by the author (JM) and one of three independent reviewers (PJB, ALC, JH). Potential discrepancies in double coding were resolved by reaching a joint consensus between the author and independent reviewer, or by assent of a third independent reviewer where consensus could not be reached. Articles were included in the systematic review if they met all of the following criteria: (i) included a direct predictor measure of IPTS components (i.e., either thwarted belongingness, perceived burdensomeness, or acquired capability), (ii) included a direct outcome

measure of suicidal thoughts or behaviours (i.e., either suicide ideation, attempt, or a composite measure), and (iii) reported on original, quantitative data. The exclusion criteria were as follows: (i) the study did not adjust for the presence of other IPTS variables/and or mental health-related measures, (ii) the article was not in English, (iii) no original data were reported, (iv) the study was a case-control design, (v) the study was qualitative, (vi) the study was not published after 2005, and (vii) the study was not published in a peer-reviewed journal. In the case where analysis was repeated on the same samples across articles, the most comprehensive and/or recent article was chosen for analysis, with the other being excluded.

In total, 58 articles, comprising of 66 studies, adhering to the inclusion and exclusion criteria were included in the present review (see Figure 2-1). Where sufficient data was available, effect size estimates were calculated based on formulas from "Practical Meta-analysis" by Lipsey and Wilson (2001). Odds Ratios were converted to Cohen's *d* (Cohen, 1988) for comparability between continuous and dichotomous outcomes using formulas outlined by Hasselblad and Hedges (1995). According to Cohen (1988), an effect size of 0.20 is considered small, 0.50 moderate, and 0.80 large. Where an effect size was not calculable, analyses of results relied on number of tests significant, using an alpha level of $p < 0.05$. Due to the heterogeneity of the studies (range of settings), the lack of effect size data, and the insufficiency of available data on interaction effects, a meta-analysis was unable to be conducted.

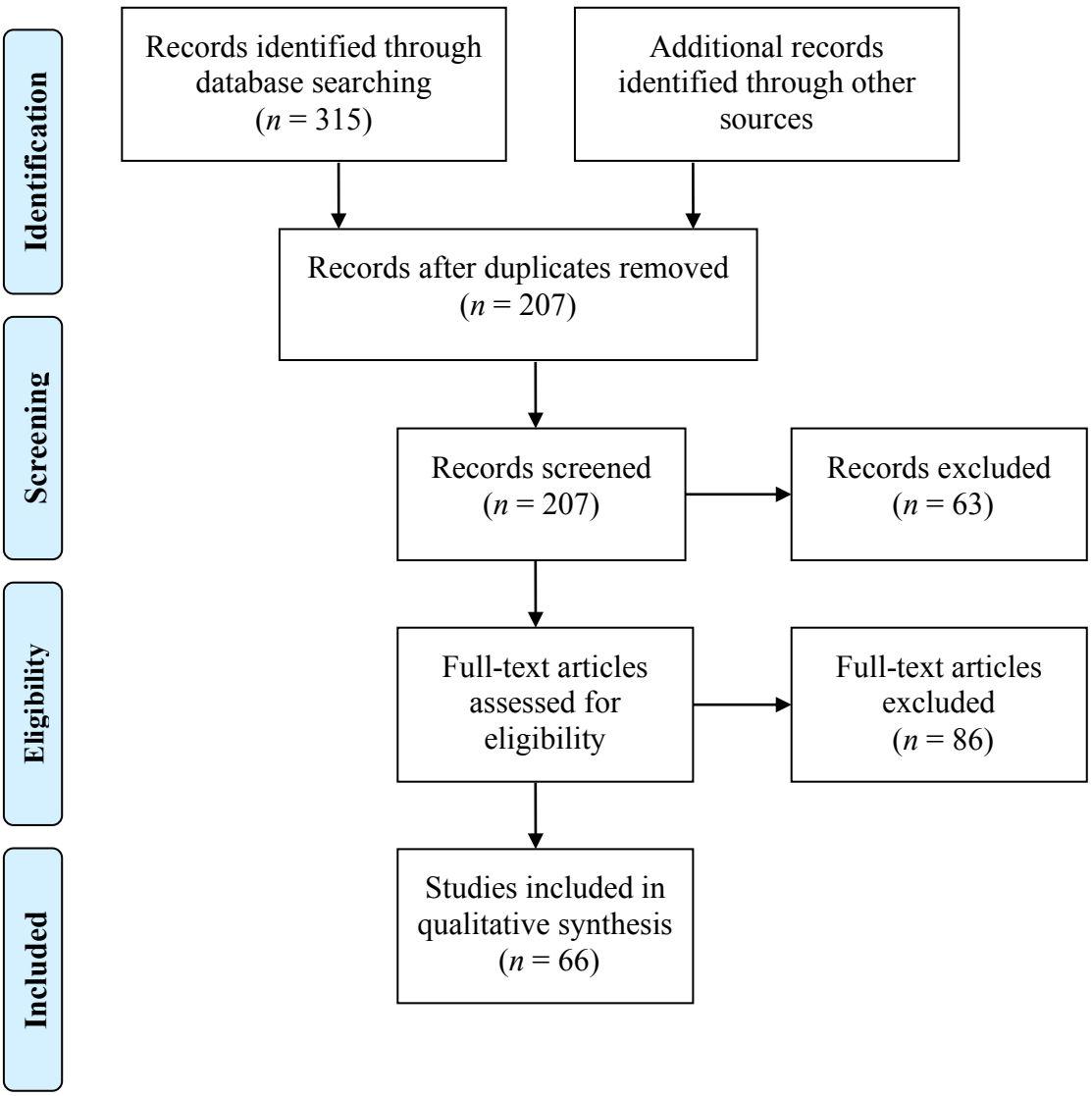

Figure 2- 1. PRISMA flow diagram for studies included and excluded from the systematic review

2.3 Results

A total of 66 studies were identified that tested the IPTS constructs in relation to suicide ideation or attempt (See Appendix B for study characteristics). In order to present the results categorically under either suicide ideation or suicide attempt, composite measures such as "suicide risk", "suicide potential", "suicide proneness", "suicidal symptoms," "suicide behaviour", "future likelihood of behaviour", and "suicidality" were classified under suicide ideation, as they all encompassed a measure of suicide ideation. Eleven studies were found to include a composite measure,

operationalised by the measurement scale used. The most commonly used composite measurement scale was the 4-item Suicidal Behaviours Questionnaire Revised (SBQ-R; Osman et al., 2001). The SBQ-R comprises of 4 items that measure suicidal ideation and attempt ("Have you ever thought about or attempted to kill yourself"); suicide ideation in the past year ("How often have you thought about killing yourself in the past year"); communication of intent ("Have you ever told someone that you were going to commit suicide, or that you might do it"); and likelihood of future attempts ("How likely is it that you attempt suicide someday"). Other composite measures used were similar in that they comprised of items or subscales that combined current suicidal ideation, suicide plans and preparation, and communication or threats of suicide.

Across the 66 studies, 206 tests adjusted for the presence of other IPTS variables (i.e., thwarted belongingness, perceived burdensomeness, and acquired capability) and/or mental health-related measures (e.g., depression, anxiety, hopelessness). The largest number of tests was on the main effect of perceived burdensomeness on suicide ideation (33.4%), followed by thwarted belongingness on suicide ideation (22.6%). Tests on the main effect of acquired capability on suicide attempt (4.3%), and the two-way (5.8%) and three-way interactions (3.3%) proposed by the IPTS were scant in comparison. Table 2.1 summarises the results of the adjusted tests across the various IPTS constructs.

Table 2.1. Statistical significance of the effects of IPTS constructs on suicide ideation and attempt, based on adjusted tests (N = 206)

	No. tests included	% Significant adjusted	% Not significant adjusted
TB on SI	55	22 (40%)	33 (60%)
TB on SA	11	4 (36.3%)	7 (63.6%)
PB on SI	69	57 (82.6%)	12 (17.3%)
PB on SA	13	3 (23%)	10 (76.9%)
AC on SI	21	12 (57.1%)	9 (42.8%)
AC on SA	9	5 (55.5%)	4 (44.4%)
TB × PB on SI	12	8 (66.6%)	4 (33.3%)
TB × PB on SA	9	0 (0%)	9 (100%)
TB × PB × AC on SA	7	3 (42.8%)	4 (57.1%)

Note. TB = Thwarted Belongingness, PB = Perceived Burdensomeness, AC = Acquired Capability, SI = Suicide Ideation, SA = Suicide Attempt, × = interaction.

2.3.1 Suicide ideation.

2.3.1.1 IPTS critical interaction effect: Thwarted belongingness and perceived burdensomeness on suicide ideation. Twelve tests of the interaction between thwarted belongingness and perceived burdensomeness on suicide ideation were found, 8 (66.6%) of which were significant, and 4 (33.3%) non-significant. Significant study sample sizes ranged from 115 to 6133, with a mean of 1033.4, and median of 239. Non-significant study sample sizes ranged from 60 to 293, with a mean of 147, and median of 88. Only two studies reported an effect size, with effect sizes ranging from 0.46 to 0.61, with a mean of 0.53, considered a moderate effect.

The interaction of thwarted belongingness and perceived burdensomeness was found to predict suicide ideation across hospital, primary care, school, and community populations. In one of the largest studies testing this interaction in a community sample, Christensen et al. (2014) found that after adjusting for gender, age, and the IPTS main effects, the combination of high levels of thwarted belongingness and perceived

burdensomeness significantly contributed to suicide ideation in a cross-sectional sample of 1,167 participants aged between 32-38 years old. This effect was also observed in studies that used proxy measures, such as social support (proxy for thwarted belongingness) and mattering (proxy for perceived burdensomeness). In their study on 815 young adults, Joiner et al. (2009) found that those low in both mattering and family social support reported the highest levels of suicidal ideation, controlling for the effects of six-month and lifetime histories of depression.

Some studies showed that the interaction between thwarted belongingness and perceived burdensomeness on suicide ideation was only significant at high levels of perceived burdensomeness (Van Orden et al., 2008(1)), high levels of thwarted belongingness (Kleiman, Riskind, Stange, Hamilton, & Alloy, 2014; O'Keefe et al., 2014), or by age group (Christensen et al., 2013). In their community-based study of 6,133 participants aged between 28 to 72 years of age, Christensen et al. (2013) found that the interaction between thwarted belongingness and perceived burdensomeness was significant in a model including the main effects of thwarted belongingness, perceived burdensomeness, hopelessness, and the two-way and three-way interactions between the constructs only when the analyses was stratified by age, as opposed to when analysed in the full sample. Here, the interaction between thwarted belongingness and perceived burdensomeness became non-significant in the full sample when the three-way interaction between thwarted belongingness, perceived burdensomeness, and hopelessness was included, suggesting that hopelessness plays an important role as a suicide risk factor. Studies reporting on this interaction effect were typically limited by cross-sectional designs and focus on samples with low base rates of suicidal ideation.

2.3.1.2 IPTS main effect: Thwarted belongingness and suicidal ideation. Fifty-five tests were conducted on the effect of thwarted belongingness on suicide ideation. Of these, 22 (40%) were significant, and 33 (60%) were non-significant. Sample sizes

among significant studies ranged from 38 to 6133, with a mean of 721.6, and median of 335. Non-significant study sample sizes ranged from 60 to 994, with a mean of 328.4, and median of 208. Only three studies reported an effect size, with effect sizes ranging from 0.49 to 0.74, with a median of 0.57, considered a moderate effect.

Thwarted belongingness was found to predict suicide ideation, suicide risk, and suicidality across the mental health clinic, primary care, school, community, and detainee populations. One study conducted on a sample of 129 undergraduates found that thwarted belongingness contributed to 6% of the variance in suicide ideation (Davidson, Wingate, Rasmussen, & Slish, 2009). The effect of thwarted belongingness on suicide ideation was also reflected in studies using proxy measures, such as distress in interpersonal relations (Wilson, Kowal, Henderson, McWilliams, & Peloquin, 2013), detachment/estrangement (Davis, Witte, & Weathers, 2014), family belongingness (Ploskonka & Servaty-Seib, 2015), social support (Christensen et al., 2013), social relations (Joiner et al., 2009(1)), and interpersonal conflict and belongingness (You, Van Orden, & Conner, 2011). Some of the studies used proxy measures because they undertook secondary analysis of an existing dataset, and thus had to examine the IPTS interpersonal risk factors as post-hoc constructs. Others did so to compare different facets of thwarted belongingness. For instance, Ploskonka and Servaty-Seib (2015) explored the relationship between three domains of belongingness (family, peer, and academic institution) and suicide ideation in a sample of 249 undergraduates. They found that the only domain that significantly contributed to suicide ideation was family belongingness, suggesting that it may be one of the most important sources of belongingness.

In regards to the non-significant tests, many studies that included measurements of both perceived burdensomeness and thwarted belongingness found that only perceived burdensomeness was a significant predictor of suicide ideation within

hospital, mental health clinic, and school settings. In one undergraduate sample, the effect of thwarted belongingness on suicide ideation became non-significant after adjusting for depressive symptoms (Hill & Pettit, 2013). Additionally, in an online sample, thwarted belongingness was only significant after accounting for mediation by hopelessness (Kim & Yang, 2015).

2.3.1.3 IPTS main effect: Perceived burdensomeness and suicidal ideation.

Sixty-nine tests were conducted on the effect of perceived burdensomeness on suicide ideation. Of these, 57 (82.6%) were significant, and 12 (17.3%) were not significant. Significant study sample sizes ranged from 47 to 6133, with a mean of 419.6, and median of 245. Non-significant study sample sizes ranged from 38 to 815, with a mean of 286.8, and median of 205. Only six studies reported an effect size, with effect sizes ranging from 0.61 to 12.60, with a median of 1.42, considered a large effect.

Perceived burdensomeness was found to predict suicide ideation and suicide risk across the hospital, mental health clinic, primary care, school, community, and online populations. Some of the studies indicated that perceived burdensomeness contributed substantial additional variance (36% and 41%) to suicide ideation, above and beyond the contribution of depressive symptoms and hopelessness (Davidson et al., 2009; Van Orden, Lynam, Hollar, & Joiner, 2006). However, these studies were limited by their cross-sectional design and use of primarily Caucasian samples. The effect of perceived burdensomeness on suicide ideation was also reflected in studies using proxy measures, such as whether people's lives would be positively impacted by one's death (Kanzler, Bryan, McGeary, & Morrow, 2012). For instance, in a sample of 103 patients experiencing chronic pain recruited from a mental health out-patient clinic Kanzler et al. (2012) found perceived burdensomeness to be the sole predictor of suicidal ideation, even after controlling for age, gender, depressive symptoms, and pain severity.

However, this study was limited by its use of a non-validated single-item assessment for perceived burdensomeness and low base rate of suicidal ideation.

Most of the studies that did not find a significant effect for perceived burdensomeness on suicide ideation also found no significant effects for other IPTS variables and covariates. For example, perceived burdensomeness alongside the three-way interaction of thwarted belongingness, perceived burdensomeness and hopelessness (Cukrowicz, Jahn, Graham, Poindexter, & Williams, 2013), and the three-way interaction of direct combat exposure, depression, PTSD, and hopelessness (Bryan, Ray-Sannerud, Morrow, & Etienne, 2013(b)) did not significantly predict suicide ideation in the mental health clinic and primary care settings. These studies were limited by their cross-sectional design and lack of power to detect moderate effect sizes.

2.3.1.4 Acquired capability and suicide ideation. There were 21 tests of the relationship between acquired capability and suicide ideation, with 12 found to be (57.1%) significant, and 9 (42.8%) non-significant. Significant study sample sizes ranged from 38 to 1208, with a mean of 324.4, and median of 168. Non-significant study sample sizes ranged from 55 to 1167, with a mean of 374.5, and median of 327.5. No effect size data was available. Acquired capability was found to predict suicide ideation, suicide risk, suicide potential, suicidal symptoms, and suicidality across the mental health clinic, school, and community populations (including military and detainee samples). It has been found to explain a significant portion of variance in suicidal ideation beyond the contribution of prior suicide attempt, stress, depression, and hopelessness in a military sample (Shelef, Levi-Belz, & Fruchter, 2014), and in one study using an undergraduate sample, contributed to 4% of the variance in suicide ideation (Davidson et al., 2009). In one of the few studies conducted on acquired capability conducted outside of the United States, Shelef et al. (2014) found that in a sample of 168 soldiers recruited from the Israel Defence Forces, suicide attempters were

found to have significantly higher levels of dissociation and acquired capability compared to psychologically treated and healthy control groups, where depression and acquired capability were found to explain a significant portion of variance in suicide ideation.

2.3.2 Suicide attempt.

2.3.2.1 IPTS full model: Three-way interaction of thwarted belongingness, perceived burdensomeness, and acquired capability on suicide attempt. Seven tests of the interaction between thwarted belongingness, perceived burdensomeness, and acquired capability on suicide attempt were found, 3 (42.8%) of which were significant, and 4 (57.1%) non-significant. Significant study sample sizes ranged from 313 to 6133, with a mean of 2312.6, and median of 492. Non-significant study sample sizes ranged from 181 to 376, with a mean of 278.5. Only one study reported an effect size, that of 1.01, considered a large effect.

In a cross-sectional study of 313 patients recruited from outpatient and inpatient facilities affiliated with a major U.S. Army medical centre (one of the first studies to assess the full model) the three-way interaction of thwarted belongingness, perceived burdensomeness, and lifetime number of suicide attempts (proxy for acquired capability) was found to predict recent suicide attempt and current suicide status controlling for the covariates of depression, hopelessness, and borderline personality disorder symptoms (Joiner et al., 2009(2)). It was noted that the strength of this effect was similar to other traditionally strong predictors such as family history of suicide. However, like many of the other studies, this study was limited by its cross sectional design and use of proxy measures to assess the IPTS constructs. For instance, lifetime number of suicide attempts was used as a proxy for acquired capability, neglecting other experiences of physically painful or fear-inducing experiences which also contribute to the development of acquired capability.

In another cross-sectional study conducted on 492 patients seeking treatment at a mental health clinic, Anestis and Joiner (2011) found that the three-way interaction predicted participant's lifetime number of suicide attempts, controlling for depression and participant sex. In one of the largest studies on the full model, the interaction between suicide ideation and acquired capability, but not the main effect of acquired capability, was found to predict suicide attempt in a community sample of 1,167 adults (Christensen et al., 2014).

A non-significant effect for the three-way interaction was observed in in-patient settings. For instance, Monteith, Menefee, Pettit, Leopoulos, and Vincent (2013) found that only the two-way interactions of perceived burdensomeness and acquired capability, and thwarted belongingness and acquired capability predicted suicide attempt cross-sectionally. Here, the only variable that was found to distinguish participants who reported no suicide attempts in the past from those who reported one suicide attempt was recent suicidal ideation.

2.3.2.2 IPTS main effect: Acquired capability and suicide attempt. Nine tests were conducted on the effect of acquired capability on suicide attempt. Of these, 5 (55.5%) were significant, and 4 (44.4%) were non-significant. Significant study sample sizes ranged from 44 to 376, with a mean of 177.7, and median of 145.5. Non-significant study sample sizes ranged from 52 to 6133, with a mean of 1659.2, and median of 226. Only three studies reported an effect size, with effect sizes ranging from 0.51 to 1.09, with a median of 0.76, considered a moderate to large effect.

Acquired capability was tested across the hospital, mental health clinic, community, and detainee populations. In one of the three longitudinal studies included in the review, baseline history of suicide attempt (a proxy for acquired capability) was found to predict suicide attempt at 12 months after hospitalisation in an in-patient, primarily Caucasian hospital sample (Czyz, Berona, & King, 2015). Another study

conducted in the UK by Ireland and York (2012) found that in a sample of 191 detainees, engagement in a range of self-damaging behaviours (proxy for acquired capability) significantly predicted self-injurious behaviour (proxy for suicide attempt) cross-sectionally.

Of the non-significant studies, acquired capability was found to not be significantly associated with past suicide attempt, nor differentiate individuals in the suicidal behaviour group from individuals in the non-suicidal behaviour groups. One cross-sectional study conducted in a community sample, found that the main effect of acquired capability was only a significant predictor among the middle-aged (44-48) age group (Christensen et al., 2013).

2.3.2.3 Thwarted belongingness and suicide attempt. Eleven tests were conducted on the effect of thwarted belongingness on suicide attempt. Of these, 4 (36.3%) were significant, and 7 (63.7%) non-significant. Significant study sample sizes ranged from 131 to 1167, with a mean of 704. Non-significant study sample sizes ranged from 181 to 6133, with a mean of 1185, and median of 376. Only three studies reported an effect size, with effect sizes ranging from 0.51 to 0.89, with a median of 0.54, considered a moderate effect.

Thwarted belongingness was found to predict suicide attempt in studies set in hospital, mental health clinic, school, and community populations. In one cross-sectional study of 131 patients in treatment for opiate dependence, Conner, Britton, Sworts, and Joiner (2007) found that in a model including the effects of drug use severity, aggression, depression, hopelessness, thwarted belongingness, and perceived burdensomeness, only scores on belonging were associated with lower probability of having a history of attempted suicide. The effect of thwarted belongingness on suicide attempt was also reflected in studies using proxy measures such as belongingness

(reverse proxy) (You et al., 2011) in a sample of 814 patients in a substance use treatment program.

2.3.2.4 Perceived burdensomeness and suicide attempt. There were 13 tests of the relationship between perceived burdensomeness and suicide attempt, 3 (23%) significant, and 10 (76.9%) non-significant. Significant study sample sizes ranged from 215 to 1167, with an average of 554.2, and median of 417.5. Non-significant study sample sizes ranged from 52 to 6133, with an average of 1110.1, and median of 313. Only two studies reported an effect size, with effect sizes ranging from 0.52 to 1.70, with a median of 1.11, considered a large effect. The significant studies were conducted in mental health clinic and community populations. For instance, in a cross-sectional study of 215 mental health out-patients, Hawkins et al. (2014) found that perceived burdensomeness was significantly associated with past suicide attempt, adjusting for depression, although effect sizes were small. In another cross-sectional study, perceived burdensomeness significantly predicted suicide plans/attempts, alongside thwarted belongingness and acquired capability, adjusting for gender, age, and the two-way interaction between thwarted belongingness and perceived burdensomeness in a sample of 1,167 community-based participants (Christensen et al., 2014).

2.3.3 Alternative relationships.

2.3.3.1 Mediation & moderation effects. When undertaking the systematic review, the author came across many studies that tested the effect of thwarted belongingness, perceived burdensomeness, and acquired capability as mediators across the hospital, primary care, mental health clinic, school, and community settings. The following factors were found to significantly mediate the relationship between constructs of the IPTS and suicidal ideation or behaviours:

- Thwarted belongingness: attachment security, agreeableness, parental displacement
- Perceived burdensomeness: anger, depression, post traumatic disorder symptoms, childhood emotional abuse, sexual orientation victimisation, sexual identity, body mass index, negative cognitive style, maladaptive perfectionism, basic need satisfaction
- Both thwarted belongingness and perceived burdensomeness: neuroticism, extraversion, forgiveness of self and others, family discrepancy, discrimination
- Acquired capability: over-exercise

2.3.3.2 Other two-way interactions. Other two-way interactions amongst the IPTS risk factors were found to be significant in the literature. These were conducted across the hospital, mental health clinic, school, and community settings and included the interactions between thwarted belongingness and acquired capability in predicting suicidality, current risk for suicide, and suicide attempt; perceived burdensomeness with individuals' reproductive potential, health, and romantic relationship satisfaction in predicting suicide ideation; thwarted belongingness and optimism, and perceived burdensomeness and optimism in predicting suicide ideation; and acquired capability with agitation, and over-arousal on suicidality and suicidal symptoms.

2.3.3.3 Other three and four-way interactions. Other significant three and four-way interactions amongst the IPTS risk factors were reported in the literature. These were conducted across the mental health clinic, school, and community settings and included: the three-way interaction of thwarted belongingness, perceived burdensomeness, and acquired capability on suicide ideation; the three-way interaction of age, combat exposure, and belongingness on suicide ideation; and the four-way interaction of thwarted belongingness, perceived burdensomeness, acquired capability and negative urgency on suicide attempt.

2.4 Discussion

2.4.1 Overview of the support for the Interpersonal Psychological Theory of Suicide's main predictions.

The current review aimed to systematically examine current evidence testing the effects of thwarted belongingness, perceived burdensomeness, and acquired capability on suicide ideation and attempt. Contrary to our expectations, the studies provided mixed support across the theory's main predictions. The main effect of perceived burdensomeness on suicide ideation was the most tested and supported relationship, with over three-quarters (82.6%) of the studies found to be significant across hospital, mental health clinic, primary care, school, community, and online populations. It was found to contribute a considerably larger amount of variance (36% to 41%) in suicide ideation compared to the contribution of thwarted belongingness, and in some cases overrode thwarted belongingness as the only significant effect. The main effect of thwarted belongingness on suicide ideation, on the other hand, though found to be significant across a range of settings, was tested less frequently than perceived burdensomeness, and was less supported, with over half (60%) the tests being non-significant due to the stronger effects of perceived burdensomeness and other covariates. In cases where it was found to be significant, thwarted belongingness seemed to contribute a smaller amount of variance in suicide ideation (6%) compared to perceived burdensomeness, and had a moderate median effect size, compared to the large median effect size reported for perceived burdensomeness. Contrary to the IPTS prediction that thwarted belongingness and perceived burdensomeness would be specific to suicide desire, approximately a third of the tests of thwarted belongingness on suicide attempt, and a quarter of perceived burdensomeness on attempt were significant, with a moderate median effect size for the former, and a large median effect size for the latter.

In comparison to the main effects of perceived burdensomeness and thwarted belongingness, the main effect of acquired capability on suicide attempt was tested considerably less, with results providing only partial support. Just over half of the studies found a significant effect for acquired capability on suicide attempt across hospital, mental health clinic, and community populations, with a moderate to large median effect size. Additionally, contrary to the theory's predictions of acquired capability being specific to suicide attempt, half of the tests on acquired capability and suicide ideation were significant. However, it is important to note that this percentage may have been influenced by the re-classification of composite outcomes under suicide ideation.

Studies testing the IPTS predictions regarding the interaction effects were scant in comparison to those testing the main effects of thwarted belongingness and perceived burdensomeness, and showed mixed results. Two thirds (66.6%) of the tests on the interaction between thwarted belongingness and perceived burdensomeness in predicting suicide ideation were found to be significant, with a moderate mean effect size. The specificity of their interaction contributing to suicide ideation only was supported by the literature. Moreover, only three (42.8%) out of the seven tests on the interaction between thwarted belongingness, perceived burdensomeness, and acquired capability on suicide attempt were significant, with over half of the tests on the full model found to be non-significant across the hospital, mental health clinic, and community populations. However, given that these non-significant effects were found in studies with samples sizes ranging from 181 to 376, these findings may be the product of too many low-powered studies to detect an effect for the full IPTS model, as a large effect size was found in one of the significant studies. Nevertheless, studies that did identify significant interaction effects tended to have similar sample sizes compared to those that did not find an effect.

Overall, these results suggest that, at this point in time, the IPTS may not be as clearly defined nor supported as initially thought. Some of the conflicting findings across thwarted belongingness, acquired capability, and the two-way, and three-way interactions provoke a number of questions, including: (a) whether the interpersonal risk factors have different relationships on suicide ideation and attempt than stipulated by the theory (i.e., alternative interactions), (b) whether the measures commonly used across the studies adequately capture the constructs, (c) whether the theory is only accurate in predicting suicidal outcomes for a subset of suicidal individuals, and (d) whether there are other crucial variables that may help to better predict suicide ideation and attempt, which are not accounted for in the theory. In relation to (a), it may be that perceived burdensomeness is a more robust interpersonal risk factor for suicide ideation, in comparison to thwarted belongingness, which seems to also have associations with suicide attempt. However, in relation to (b), it may be the case that the measures used to assess thwarted belongingness, particularly the thwarted belongingness subscale on the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, et al., 2012), do not fully capture the construct. This is an issue that has been raised by other researchers who have observed thwarted belongingness to have non-significant effects on suicide ideation when measured directly, as opposed to when measured using a proxy (Bryan, Clemans, & Hernandez, 2012). As research may privilege testing the relationship of perceived burdensomeness over thwarted belongingness, due to the conflicting findings of the latter, future research could look at validating broader proxy measures for thwarted belongingness, and examining what components may be missing from existing measures in order to balance out the evidence base.

In relation to (c), whether the theory predicts suicidal outcomes for a subset of individuals, recent work using latent class analysis indicates that there are subclasses of

individuals experiencing suicide ideation or attempt who display different symptom patterns and risk trajectories over time (Logan, Hall, & Karch, 2011). As suicidality is a heterogeneous outcome, it may be the case that the theory has more explanatory power for certain subsets of individuals. For example, in the case of acquired capability, studies that found a non-significant effect for the role of acquired capability on suicide attempt tended to have larger sample sizes (i.e., had greater statistical power) than those which found a significant effect. This suggests that other factors, such as sample characteristics and study setting may play a role in detecting a relationship. Future research testing the IPTS risk factors across different sub-sets of individuals would help to further specify the generalisability and explanatory strength of the IPTS predictions.

In relation to (d), whether there are other crucial variables of interest not accounted for in the theory, studies have begun to examine the integration of the IPTS with other models of depression and suicide-related behaviour, such as Hopelessness Theory (HT; Abramson, Metalsky, & Alloy, 1989) and the weakest link theory of suicidal ideation (Kleiman, Law, & Anestis, 2014; Kleiman, Riskind, et al., 2014). Research is also being conducted on counterpart theories, such as the Integrated Motivational-Volitional Model of Suicidal Behaviour (IMV; O'Connor, 2011), which builds upon the IPTS through the incorporation of thwarted belongingness, perceived burdensomeness, and acquired capability as moderators with other constructs, such as defeat and humiliation appraisals and entrapment; the work of which is essential to furthering theoretical endeavours within the field.

In relation to clinical implications, these remain unclear due to the disparity in the number of studies focusing on the different IPTS constructs, and in particular, the lack of studies testing the critical interaction effects. Though work has been undertaken to outline how the IPTS can be used as a framework for identifying pernicious risk factors and tailoring assessments and interventions to address these factors (Stellrecht et

al., 2006), further research elucidating the strength of the critical interaction predictions is needed to aid in the development of interventions that are able to specifically target the IPTS constructs to reduce suicidal ideation and suicide attempt. On a preliminary note, the results of the systematic review suggest that intervention-based efforts focused on identifying and decreasing levels of perceived burdensomeness in patients may be a more potent pathway for minimising risk of suicide-related behaviour compared to that of thwarted belongingness. There is also evidence suggesting that interventions based on reducing levels of the three interpersonal risk factors may act to reduce different aspects of suicide-related behaviour than initially stated by the IPTS, the pathways of which could be influenced by additional presenting risk or protective factors. Here, given the focus of the theory on identifying interpersonal risk factors, patients may feel more comfortable talking about feelings of belonging and burden with a clinician, as opposed to discussing suicidal behaviours. Focusing clinical discussions on risk factors, rather than suicidal behaviours, may help to increase engagement with clinical services and circumvent the potential stigma of discussing suicide (Calear, Batterham, & Christensen, 2014; Gulliver, Griffiths, & Christensen, 2010). This interpersonal focus may also promote clinician empathy by highlighting the clinician's role as an important source of social support in the suicide risk factor framework, and could provide flow-on effects in improving the therapeutic alliance and patient outcomes (Baldwin, Wampold, & Imel, 2007; Lambert & Barley, 2001).

2.5 Strengths and Limitations

2.5.1 Study strengths and limitations. A major strength of the studies included in the current review was that they examined the IPTS across a large range of settings, and were not limited to testing the theory's main predictions. Many explored other interactions between the IPTS interpersonal risk factors and related constructs, contributing to our understanding of how distal risk factors influence suicide-related

behaviour through the IPTS proximal risk factors. However, many studies were limited by their cross-sectional design (63 out of 66), largely relying on retrospective reporting of suicidal ideation or behaviours, use of undergraduate samples with a low level of suicide ideation and attempt that were primarily Caucasian and female, use of self-report measures, evaluation of suicide ideation only (where suicide attempt was often underpowered), small sample sizes, and in some cases, small effect sizes for significant findings. Additionally, though the present review provides coverage of four additional years of publications on the IPTS, the same limitations regarding the lack of studies investigating the interrelation of the theory's constructs remain from previous systematic reviews. More high powered studies testing these critical interactions are needed to more comprehensively evaluate support for the theory.

2.5.2 Systematic review strengths and limitations. To my knowledge, this is the first systematic review on the IPTS that examines the English-language literature on validation studies covering the full theory across multiple populations. By specifically analysing the results of studies that adjusted for the presence of other IPTS variables and/or mental health-related measures, the review was able to robustly examine the strength of the theory's predictions. Additionally, the inclusion of studies using proxy measures of the IPTS variables highlighted alternative measurement pathways that may aid in better operationalisation of the IPTS constructs.

Although comprehensive, a limitation of the present review was that it did not include articles that used non-standard terminology, nor articles published in languages other than English. The reclassification of suicide composite measures as suicide ideation, though helping to clarify the IPTS risk factor relationships with either suicide ideation or attempt, may also have inadvertently obscured more complex discussion of concurrent suicide-related behaviours. Here, it is important to note that the suicide composite measures that were reclassified as suicide ideation may not have been

directly comparable, and should thus be interpreted with caution. Additionally, due to the lack of available data reported by the reviewed studies, the review relied primarily on summarising the results of significance tests, as opposed to effect sizes, limiting estimation of the magnitude of the relationships across studies. Moreover, when effect sizes were reported, Odds Ratios were converted to Cohen's *d* for comparability between continuous and dichotomous outcomes, which relied on the assumptions about the underlying distributions. Lastly, due to the comprehensiveness of the review, resulting in heterogeneity of studies, and the lack of reporting of effect size data, meta-analyses were unable to be conducted.

2.6 Conclusions

This review indicated that the relationship between perceived burdensomeness and thwarted belongingness on suicide ideation, and their interaction with acquired capability on suicide attempt appears to be less straightforward than originally stated in the IPTS. There is a need for more high powered studies examining the two-way and three-way interactions of the theory's constructs, use of longitudinal designs, and further tests of alternative interaction and mediation effects identified by some studies, highlighting potential for re-thinking the relationships predicted by the IPTS. Future research focused on expanding the availability of valid measurement approaches for the interpersonal risk factors, and further elaborating upon their mixed relationships with suicide ideation and attempt across multiple populations is important to advance both theoretical and clinical progress in the field. In the chapters following, the methods and results of studies aimed at addressing some of the critical gaps highlighted in this review will be presented. This collection of studies may aid suicide prevention efforts by providing a targeted investigation into previously under-researched and novel areas of the IPTS across multiple populations.

CHAPTER 3: Suicide risk across latent class subgroups: A test of the generalisability of the Interpersonal Psychological Theory of Suicide

3.1 Introduction

As noted in Chapter 1, though preventable, suicide remains a major public health concern and there persists a need for the better identification of suicide risk factors and more accurate prediction of its development (Franklin et al., 2017). In Chapter 2, a systematic review conducted on the predictions of the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) indicated that whilst there has been support for the main effects of the interpersonal risk factors across various populations, support for the theory's interaction effects has been scarce in comparison, and it remains unclear as to whether the theory holds more explanatory power for certain subgroups compared to others (Ma, Batterham, Calear, & Han, 2016). As the IPTS assumes equivalent predictive power across individuals, the aim of the present chapter is to investigate this assumption.

One approach to exploring this assumption is to identify subgroups of individuals with suicidal ideation through the use of latent class analysis (LCA; Lazarsfeld & Henry, 1968), a statistical modelling technique that allows individuals from a population to be grouped into smaller subgroups based on similar characteristics or patterns of behaviours. Suicide studies using LCA have identified subclasses of individuals with suicide ideation or attempt who display different symptom patterns and risk trajectories over time (Logan et al., 2011; Rueter, Holm, McGeorge, & Conger, 2008). Such research highlights the feasibility of classifying individuals based on suicide risk. However, there has been little research using LCA to examine the IPTS interpersonal risk factors, which would enable exploration of potential patterns of co-occurrence between the interpersonal and other known suicide-risk factors to aid risk identification and the development of targeted prevention strategies. Of the few studies

conducted, results have supported the IPTS, with levels of the interpersonal risk factors found to be higher in suicidal versus non-suicidal groups (Dhingra, Boduszek, & Klonsky, 2016; Wong & Maffini, 2011). However, a limitation of these studies is that they were based on student samples, where typologies may not generalise to community or clinical populations, and middle-age and older adults are underrepresented. Additionally, none of these studies focused on assessing the full predictions of the IPTS across the subgroups. This is important for identifying the strength of the theory's critical interaction predictions and generalisability across subgroups.

Thus, the aim of the present study was to: (a) identify subgroups of individuals who endorsed suicide ideation in the past month from an online community sample based on a range of mental health and demographic variables, (b) compare levels of the IPTS constructs (thwarted belongingness, perceived burdensomeness, capability for suicide) in these subgroups, and (c) test the theory's predictions for severity of suicide ideation and presence of suicide attempt within each group. For (b), it was hypothesised that the highest levels of thwarted belongingness and perceived burdensomeness would be found in groups reporting high levels of mental health symptoms, a strong risk factor for suicide. For (c), in line with IPTS predictions, it was hypothesised that across all identified latent classes, the two-way interaction between thwarted belongingness and perceived burdensomeness would be significantly associated with presence of suicide ideation in the past month. Likewise, it was hypothesised that the three-way interaction between thwarted belongingness, perceived burdensomeness, and capability for suicide would be significantly associated with presence of suicide attempt in the past year.

3.2 Methods

3.2.1 Participants and procedure. Australian adults (N = 1,321; 58% female) aged 18 years and over were recruited from Facebook using targeted paid advertisements linked to an online survey for a study of mental health and suicide

ideation outcomes in a population-based sample (Batterham, Calear, & Christensen, 2013; Batterham et al., 2015). Sample characteristics are reported in Table 3.1. The study involved a 30 minute online survey that assessed psychological distress, depression, anxiety disorders, alcohol use, sleep problems, suicidal ideation, suicide literacy, suicide stigma, exposure to suicide, interpersonal risk factors for suicide, and a range of sociodemographic characteristics. Written information about the study aims was provided to participants prior to commencing the survey, with informed consent and a list of mental health resources provided online. No incentive was provided. There was no missing data and diagnostic analyses revealed no systematic outliers. The study received ethics approval from the Science and Medical Delegated Ethics Review Committee at the Australian National University (protocol number 2012/310).

3.2.2 Measures.

Sociodemographic variables. Gender (reference males), age (18-24, 25-29, 30-39, 40-49, 50-59, 60 and over), level of education (up to high school, associate/trade degree or diploma, bachelor's degree, postgraduate degree), employment status (full-time, part-time, unemployed/seeking work, retired or not in the workforce), and marital status (married or de facto, single/never married, separated or divorced, widowed) were measured.

Suicide outcome measures. Suicide ideation was measured using the SIDAS (van Spijker et al., 2014), which consists of five items that measure the frequency, controllability, and distress of suicidal thoughts, closeness of making an attempt, and impact on daily functioning experienced in the past month on a scale from 0 (*never*) to 10 (*always*). Higher scores indicate more severe suicidal thoughts (range 0-50). The SIDAS has strong internal consistency and convergent validity with other measures of suicide and psychological distress (van Spijker et al., 2014) and demonstrated good internal consistency in this sample ($\alpha = .85$).

Suicide attempt was measured with the sixth item from the C-SSRS (Posner et al., 2011) that assesses whether the individual has done anything, started to do anything, or prepared to do anything to end their life in the past year on a *yes*/*no* scale. The C-SSRS has good convergent and divergent validity with other multi-informant suicidal ideation and behaviour scales, and high sensitivity and specificity for suicidal behaviour classifications (Posner et al., 2011).

Mental health measures for latent class analysis. Psychological distress was assessed using the K6 (Kessler et al., 2002) consisting of six items that measure the frequency of negative emotional states experienced over the past four weeks on a scale from 0 (*none of the time*) to 4 (*all of the time*). Higher scores indicate greater levels of distress (range 0-24). The K6 has been validated in a number of countries (Fassaert et al., 2009; Patel et al., 2008), and has good concordance with independent clinical ratings of serious mental illness. In this sample, the K6 had good internal consistency ($\alpha = .89$).

Depression was assessed using the PHQ-9 (Spitzer, Kroenke, & Williams, 1999) consisting of nine items that measure how often an individual has been bothered by symptoms of depression over the past two weeks on a scale from 0 (*not at all*) to 3 (*nearly every day*). Higher scores indicate more severe depression symptoms (range 0-27). The PHQ-9 detects major depression with 88% sensitivity and specificity (Kroenke, Spitzer, & Williams, 2001) and demonstrated excellent internal consistency ($\alpha = .91$) in this sample. In this study, the ninth item related to suicidal ideation was omitted from the total score to avoid confounding with the outcome.

Anxiety was measured using the GAD-7 (Spitzer, Kroenke, Williams, & Löwe, 2006) consisting of seven items that measure how often an individual has been bothered by symptoms of anxiety over the past two weeks on a scale from 0 (*not at all sure*) to 3 (*nearly every day*). Higher scores indicate more severe anxiety symptoms (range 0-21).

The GAD-7 detects generalised anxiety disorder with 89% sensitivity and 82% specificity (Spitzer et al., 2006) and demonstrated excellent internal consistency (α = .92) in this sample.

Panic symptom count was measured using the PHQ-Panic (Spitzer et al., 1999) consisting of fifteen items that measure the presence and characteristics of anxiety attacks experienced over the past four weeks on a *yes*/*no* scale. The PHQ-Panic has been validated in high-risk primary care and outpatient populations (Löwe et al., 2003; Wittkampf, Baas, van Weert, Lucassen, & Schene, 2011). In this sample, the PHQ-Panic had excellent internal consistency (KR-20 = .95).

Social phobia was measured using the SOPHS (Batterham, Mackinnon, & Christensen, 2017) consisting of five items that measure the presence and extent of fear and embarrassment experienced over the past month on a scale from 1 (*not at all*) to 5 (*extremely*). Higher scores indicate greater severity (range 5-25). The SOPHS has been validated in a community-based sample of young Australians aged 18-30 (n = 12,292) (Batterham et al., 2017). In this sample, the SOPHS had excellent internal consistency (α = .91).

Insomnia was measured using the ISI (Bastien, Vallières, & Morin, 2001) consisting of seven items that target the subjective symptoms and consequences of insomnia and sleep concerns experienced over the last two weeks on a scale from 0 (*none*) to 4 (*very severe*). Higher scores indicate more acute symptoms of insomnia (range 0-28). The ISI has concurrent validity with clinician ratings and subjective and objective sleep measures (Bastien et al., 2001), and had good internal consistency (α = .86) in this sample.

Alcohol dependence was measured using the AUDIT-C (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998) consisting of three items that measure the frequency of alcohol consumption across a month, week, and typical day on a five-point scale.

Higher scores indicate that the respondent's drinking is affecting their safety (range 0-12). The AUDIT-C has a sensitivity of 86% and specificity of 72% in detecting individuals with heavy drinking or dependence (Bush et al., 1998). In the current sample, the AUDIT-C had acceptable internal consistency (α = .73).

ADHD was measured using the ASRS (Kessler et al., 2005) consisting of six items that measure how often an individual has had difficulties with organisation and overactivity over a six-month period on a scale from 0 (*never*) to 4 *(very often)*. Higher scores indicate greater severity of ADHD symptoms (range 0-24). The ASRS screener has adequate sensitivity (68.7%) and excellent specificity (99.5%) (Kessler et al., 2005), and demonstrated good internal consistency (α = .80) in the current sample.

Interpersonal risk factors. Thwarted belongingness (TB) and perceived burdensomeness (PB) were measured using the INQ-12 (Van Orden, Cukrowicz, et al., 2012; Van Orden et al., 2008) consisting of five items that assess TB and seven that assess PB on a scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher ratings indicate greater TB (range 5–35) and PB (range 7–49). The INQ-12 has been validated in community and undergraduate samples (Batterham et al., 2015; Freedenthal, Lamis, Osman, Kahlo, & Gutierrez, 2014). In this sample, the INQ-12 had excellent internal consistency (α = .91), the TB subscale had good internal consistency (α = .85), and the PB subscale had excellent internal consistency (α = .91).

Capability for suicide (CS) was measured using the ACSS (Van Orden et al., 2008) consisting of five items that measure fearlessness about engaging in potentially lethal self-harmful behaviours on a scale from 1 (*not at all like me*) to 5 (*very much like me*). Higher scores indicate greater capability for suicide (range 5-25). This short form of the ACSS has been validated in a community sample (Batterham et al., 2015). In this sample, the ACSS had questionable internal consistency (α = .63). Therefore, analyses were re-estimated using the first three items of the ACSS that better fit a uni-

dimensional construct (α = .72). Findings from the re-estimated models were largely consistent with the analyses presented.

3.2.3 Analysis. Latent Class Analysis (LCA; Lazarsfeld & Henry, 1968) was conducted with Mplus version 6.12 (Muthén & Muthén, 1998-2010) among participants who reported suicidal ideation in the past month (n = 544). LCA is a form of mixture modelling that aims to categorise people into classes using observed dependent variables, and identify items that best distinguish between the classes (Nylund, Asparouhov, & Muthén, 2007). LCA estimation procedures assign respondents to groups based on probability estimates (i.e., the combined probability that a proportion of the population would fall into a given suicide ideation class and that a particular response to the self-report measures would occur) from which statistical fit indices can be used to evaluate competing models.

In the study, LCA was used to identify class membership based on a number of mental health and demographic variables including psychological distress, depression, generalised anxiety, panic symptoms, social anxiety, insomnia, alcohol dependence, ADHD symptoms, gender, age, level of education, employment status and martial status. Firstly, a 1-class model was specified and run, repeating analyses until the addition of classes was found to have no significant improvement on model fit, based on the BLRT (McLachlan & Peel, 2000). After the best fitting model was identified, names were generated to broadly describe the characterisation of the overall response patterns.

Following the LCA, one-way ANOVAS and post-hoc follow-up testing (i.e., Tukey) were conducted to compare levels of the interpersonal risk factors (i.e., TB, PB, CS) across each class. Differences in mental health variables across the classes were assessed by Tukey HSD tests, and demographic differences by χ^2 tests. Refusals to answer questions on age (n = 8 or 0.6%), education (n = 11 or 0.8%), employment (n =

17 or 1.3%) and marital status (n = 26 or 2.0%) were treated as missing values. Linear regression models were then used to test the IPTS predictions for severity of suicidal ideation reported over the previous month, and logistic regression models to test the IPTS predictions for suicide attempt reported over the previous year across the classes. As the suicide ideation outcome displayed over dispersion in the full sample (LR χ^2 = 1874.17, df = 1, $p < 0.01$) and classes A (LR χ^2 = 520.50, df = 1, $p < 0.01$) and B (LR χ^2 = 468.73, df = 1, $p < 0.01$), negative binomial regression models were used. To account for the presence of excess zeros in the full sample, zero inflated negative binomial regression was employed. The suicide ideation model included the main effects of TB, PB, and their two-way interaction, as the model indicates that high levels of both constructs be present for suicidal desire to develop. Similarly, the suicide attempt model included the main effects of TB, PB, CS, and their two-and three-way interactions. The IPTS and suicide ideation variables were standardised to have a mean of 0 and *SD* of 1 in the linear and logistic regression models to aid interpretation. Descriptive analysis, multiple and logistic regressions were conducted using SPSS v21 (IBM Corp, 2012). Negative binomial regressions were conducted using STATA v14 (StataCorp, 2015).

3.3 Results

3.3.1 Class assignment based on mental health and demographic variables.

Analysis of the mental health and demographic items from participants who reported suicide ideation in the past month (n = 544) indicated that the 4-class model was the best fitting solution as compared to the 1, 2, 3, and 5-class models. Fit indices showed that the parametric Bootstrap Likelihood Ratio Test (BLRT) of 3 versus 4 classes was significant ($p < .001$), indicating better fit for the 4-class model, while the 5-class model did not have significantly better fit than the 4-class model. The -2 log likelihood was also significant χ^2 (df = 30, n = 544) = 258.8, $p < 0.001$. None of the classes contained

less than 5% of the sample (the smallest class contained 15%), and the entropy value of .89 was greater than the recommended .80.

Membership for the 4-class solution was as follows: Class A had 150 (11% of full sample) members and consisted primarily of individuals 18-29 years old, who were predominantly single, had completed high school, were currently a student, and had slightly elevated mental health scores (young group with slightly elevated symptoms); Class B had 188 (14%) members and consisted primarily of individuals aged 30 years and older, who were predominantly either single, separated/divorced or widowed, and had slightly elevated mental health scores (older group with slightly elevated symptoms); Class C had 124 (9%) members and consisted primarily of individuals 18-29 years old who were predominantly female, single, had completed high school, and scored highly across all mental health symptom measures (young group with highly elevated symptoms); and lastly, Class D had 82 (6%) members and consisted primarily of individuals 30 years and older who were predominantly either married/de facto or separated/divorced, had completed some of high school, were more likely to be retired or not in the workforce, and scored highly across all mental health symptoms (older group with highly elevated symptoms).

All classes differed from Class X (no suicide ideation, 58% full sample) on most mental health measures, except for comparisons between Class A on panic symptom count and insomnia, Class B on ADHD, and Class D with symptoms of alcohol dependence. Additionally, all classes significantly differed from Class X on age, education, marital status, and employment status, which may have been attributable to the age differences.

Table 3.1. Characteristics of the sample based on class

	(X) No ideation (*n* = 777)		(A) Young, slight symptoms (*n* = 150)		(B) Older, slight symptoms (*n* = 188)		(C) Young, high symptoms (*n* = 124)		(D) Older, high symptoms (*n* = 82)	
	Mean or frequency	*SD* or %	*Mean or frequency*	*SD or %*	*Mean or frequency*	*SD or %*	*Mean or frequency*	*SD or %*	*Mean or frequency*	*SD or %*
Suicide ideation (SIDAS)	-	-	9.94	9.16	7.63	7.22	23.95	11.44	17.95	11.29
Suicide attempt (C-SSRS)	23	3%	24	16%	20	10.6%	51	41.1%	23	28%
Psychological distress (K6)	**5.53**^{A,B,C,D}	4.37	**9.82**^{X,B,C,D}	3.95	**8.26**^{X,A,C,D}	3.88	**16.58**^{X,A,B}	3.27	**15.85**^{X,A,B}	3.85
Depression (PHQ-9)	**6.05**^{A,B,C,D}	5.38	**9.99**^{X,C,D}	4.74	**9.21**^{X,C,D}	4.85	**20.77**^{X,A,B,D}	4.35	**19.01**^{X,A,B,C}	4.85
Anxiety (GAD-7)	**4.60**^{A,B,C,D}	4.59	**6.62**^{X,C,D}	4.18	**5.64**^{X,C,D}	3.33	**16.08**^{X,A,B}	3.79	**15.04**^{X,A,B}	4.07
Panic symptom count	**0.71**^{B,C,D}	1.60	**0.78**^{C,D}	1.61	**1.09**^{X,C,D}	1.89	**3.08**^{X,A,B}	2.14	**3.27**^{X,B}	2.13
Social phobia (SOPHS)	**0.22**^{A,B,C,D}	0.41	**0.46**^{X,C,D}	0.50	**0.38**^{X,C,D}	0.49	**0.83**^{X,A,B}	0.38	**0.86**^{X,A,B}	0.34
Insomnia (ISI)	**7.92**^{B,C,D}	6.07	**8.55**^{B,C,D}	5.59	**10.59**^{X,A,C,D}	5.85	**16.86**^{X,A,B}	6.04	**17.09**^{X,A,B}	6.16
Alcohol dependence (AUDIT-C)	**3.30**^{A,B,C}	2.88	**4.28**^{X}	3.17	**3.85**^{X}	3.57	**4.20**^{X}	3.46	3.44	3.70

ADHD (ASRS)	**1.14**^{A,C,D}	1.44	**2.00**^{X,B,C,D}	1.53	**1.28**^{A,C,D}	1.45	**3.24**^{X,A,B}	1.69	**3.49**^{X,A,B}	1.61
Thwarted belongingness	**13.80**^{A,B,C,D}	7.18	**19.30**^{X,C,D}	6.95	**19.44**^{X,C,D}	6.70	**23.83**^{X,A,B}	6.57	**23.00**^{X,A,B}	6.44
Perceived burdensomeness	**12.77**^{A,B,C,D}	6.72	**21.47**^{X,B,C,D}	8.81	**18.34**^{X,A,C,D}	8.42	**32.47**^{X,A,B}	9.56	**29.71**^{X,A,B}	9.18
Capability for suicide	9.27	4.24	9.42	4.62	10.13	3.98	9.69	4.72	9.69	4.62
Gender	**A,C**		**X,C**		**C**		**X,A,B,D**		**C**	
Male	313	40%	74	51%	88	47%	32	26%	42	52%
Female	460	60%	72	49%	99	53%	91	74%	39	48%
Age group	**A,B,C,D**		**X,B,C,D**		**X,A,C,D**		**X,A,B,D**		**X,A,B,C**	
18-24	228	29%	119	79%	1	1%	89	72%	0	0%
25-29	39	5%	24	16%	0	0%	10	8%	3	4%
30-39	63	8%	4	3%	29	15%	16	13%	11	13%
40-49	115	15%	0	0%	42	22%	4	3%	30	37%
50-59	165	21%	0	0%	73	39%	3	2%	28	34%
60 and over	164	21%	0	0%	43	23%	1	1%	9	11%
Education	**A,B,C,D**		**X,B,C,D**		**X,A,C,D**		X,A,B,D		**X, A,B,C**	

Up to high school	325	42%	91	60%	49	26%	87	70%	43	52%
Assoc/trade degree/diploma	193	25%	15	10%	66	35%	8	6%	27	33%
Bachelors degree	153	20%	36	24%	37	20%	24	19%	0	0%
Postgraduate degree	99	13%	4	3%	36	19%	5	4%	12	15%
Employment status	**A,B,C,D**		**X,B,C,D**		**X,A,C,D**		**X,A,B,D**		**X,A,C,D**	
Full-time	207	27%	28	19%	63	34%	16	13%	18	22%
Part-time	147	19%	24	16%	36	19%	19	15%	14	17%
Unemployed, seeking work	46	6%	10	7%	16	9%	21	17%	4	5%
Retired/not in the workforce	193	24%	4	3%	66	35%	10	8%	44	54%
Marital status	**A,B,C,D**		**X,B,D**		**X,A,C**		**X,B,D**		**X,A,C**	
Married or de facto	346	45%	51	34%	103	55%	32	25%	27	33%
Single, never married	275	35%	128	85%	35	19%	97	78%	5	6%
Separated or divorced	118	15%	1	1%	60	32%	5	4%	32	39%
Widowed	38	5%	0	0%	10	5%	0	0%	5	6%

Note. Bold values indicate $p < 0.05$ for Tukey HSD tests or χ^2 tests between classes. Superscripts refer to classes and the significant pairwise differences.

3.3.2 Class differences in the interpersonal risk factors. Three one-way between-groups ANOVA were conducted to explore the impact of class on levels of thwarted belongingness (TB), perceived burdensomeness (PB), and capability for suicide (CS). TB, PB, and CS were the dependent variables, and latent class was the independent variable. For the TB ANOVA, there was a statistically significant difference in TB scores for the five classes: F (4, 1321) = 94.64, $p < .001$. The mean difference ranged from 0.13 to 10.03, with an eta-square effect size of 0.22. Post-hoc comparisons using the Tukey HSD test indicated that the five groups significantly differed from each other on levels of TB, except for the comparisons between Classes A and B (the young and older slightly elevated symptom groups), and Classes C and D (the young and older highly elevated symptom groups) (Figure 3-1). For the PB ANOVA, there was a statistically significant difference at the $p < .001$ level in PB scores for the five classes: F (4, 1321) = 252.66, $p < .001$. The mean difference ranged from 2.75 to 19.70, with an eta-square effect size of 0.43. Post-hoc comparisons using the Tukey HSD test indicated that all five groups significantly differed from each other on levels of PB, except for the comparisons between Classes C and D (the young and older highly elevated symptom groups) (Figure 3-2). For the CS ANOVA, no statistically significant difference between classes was found: F (4, 1321) = 1.65, $p = .15$ (Figure 3-3).

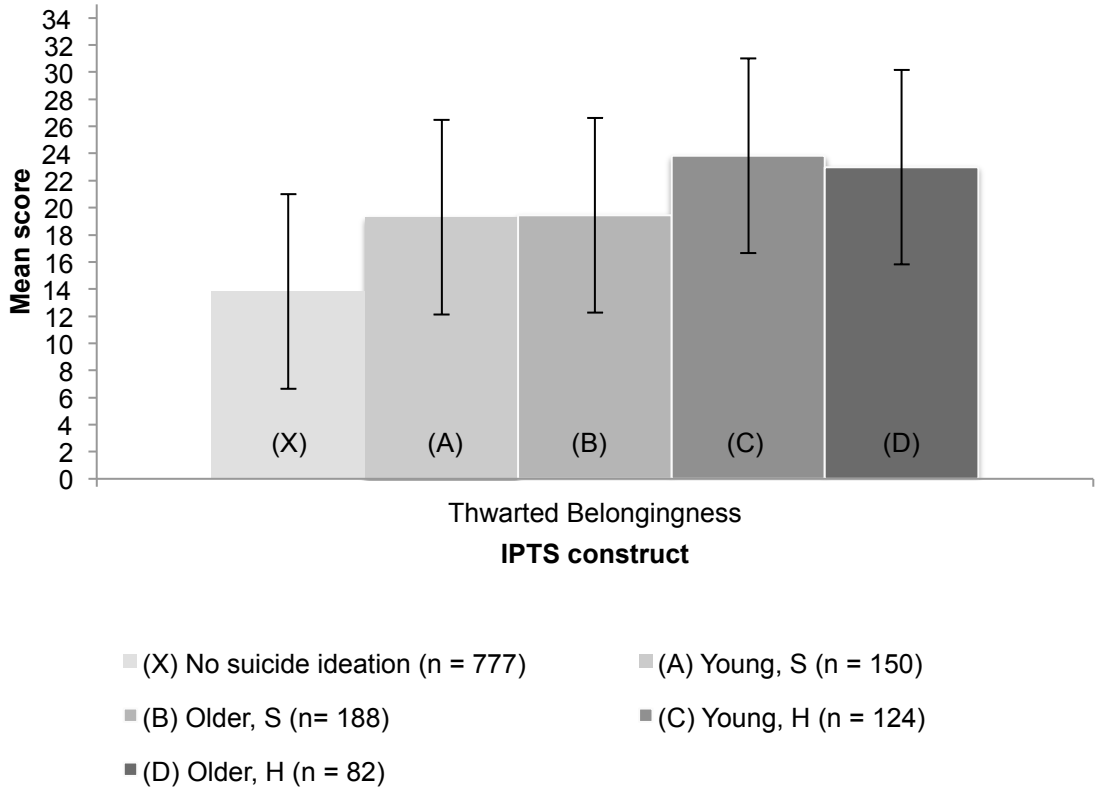

Figure 3-1. Comparison of levels of Thwarted Belongingness (TB) across classes

Note. S = Slightly elevated symptoms, H = highly elevated symptoms. Error bars represent Standard Deviation.

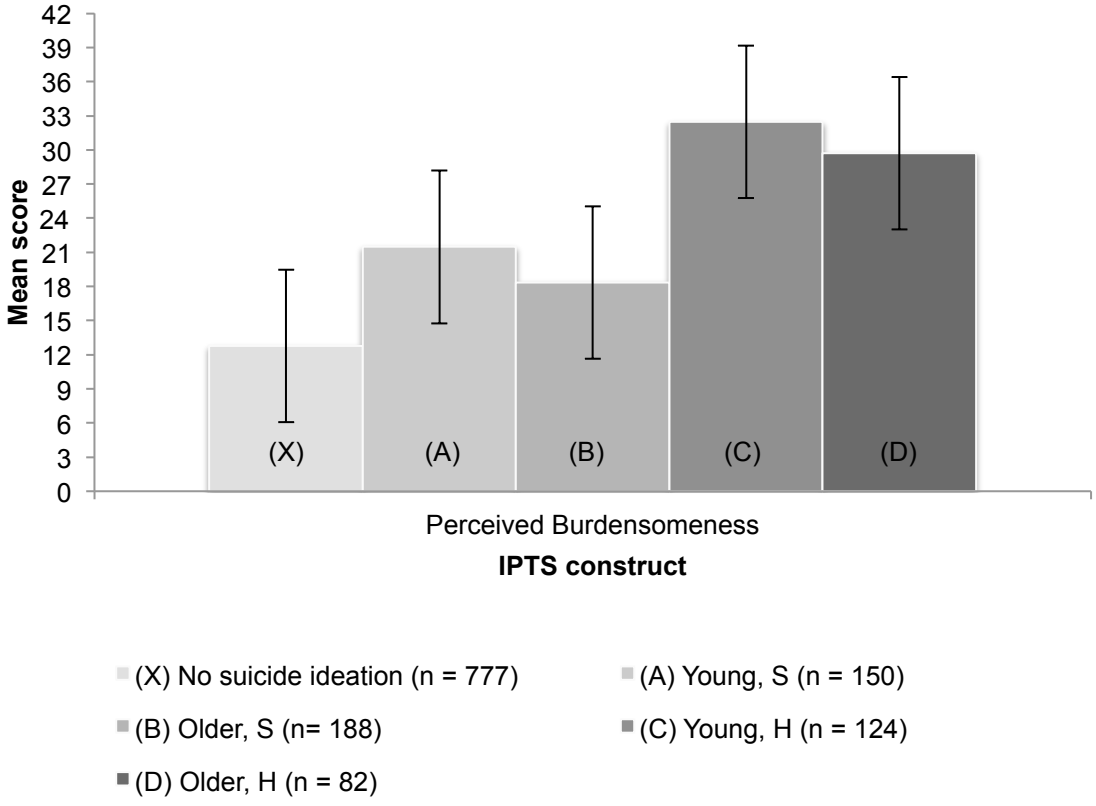

Figure 3-2. Comparison of levels of Perceived Burdensomeness (PB) across classes

Note. S = Slightly elevated symptoms, H = highly elevated symptoms. Error bars represent Standard Deviation.

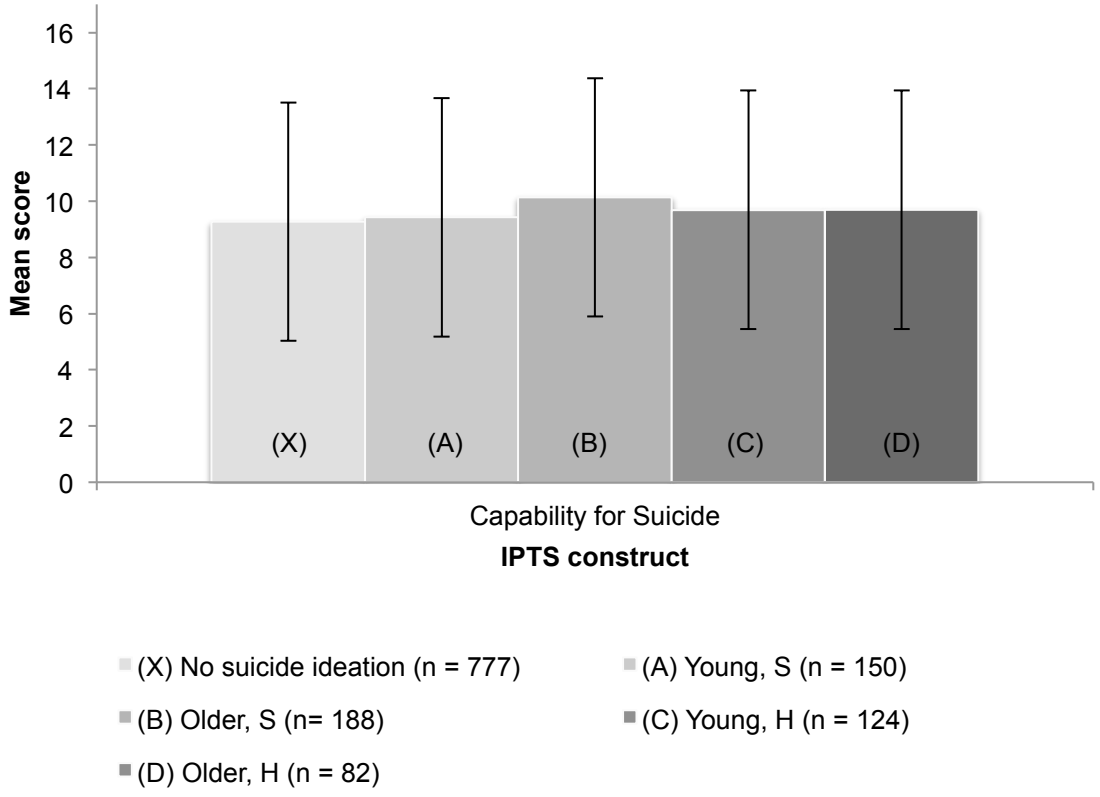

Figure 3-3. Comparison of levels of Capability for Suicide (CS) across classes

Note. S = Slightly elevated symptoms, H = highly elevated symptoms. Error bars represent Standard Deviation.

3.3.3 Testing the predictions of the IPTS model on suicide ideation and attempt outcomes by class. Zero inflated negative binomial regression models (full sample), negative binomial regression models (Classes A and B), and linear regression models (Classes C and D) were used to assess associations of the interpersonal risk factors (TB, PB, and their two-way interaction) with severity of suicide ideation reported in the past month. Across the groups, 25% in the full sample (M = 13.54, SD = 11.53), 13% in Class A (young, slight symptoms; M = 9.94, SD = 9.16), 5% in Class B (older, slight symptoms; M = 7.63, SD = 7.22), 59% in Class C (young, high symptoms; M = 23.95, SD = 11.44), and 40% in Class D (older, high symptoms; M = 17.95, SD = 11.29) reported a SIDAS severity score in the extreme range (≥21) (van Spijker et al., 2014). The negative binomial regression model with all three predictors was significant

in the full sample (LR χ^2 = 171.86, *df* = 3, $p < 0.01$), Class A (young, slight symptoms; LR χ^2 = 30.07, *df* = 3, $p < 0.01$) and B (older, slight symptoms; LR χ^2 = 25.80, *df* = 3, $p < 0.01$). The linear regression models containing all three predictors were also statistically significant, where it explained 30.6% of the variance in suicide ideation for Class C (young, high symptoms; F (3, 124) = 17.67, $p < .001$), and 16.4% for Class D (older, high symptoms; F (3, 82) = 5.09, $p = .003$). However, despite the significant models across all groups, as shown in Table 3.2, the two-way interaction of TB and PB made a significant contribution only in Class C (young, high symptoms; $\beta = 0.25$, $p = 0.01$) (Figure 3-4).

Table 3.2. Negative binomial and linear regression models testing the predictions of the Interpersonal-Psychological Theory for suicidal ideation in the full sample and across classes

	Full sample (n = 1321)			(A) Young, slight symptoms (n = 150)			(B) Older, slight symptoms (n = 188)			(C) Young, high symptoms (n = 124)			(D) Older, high symptoms (n = 82)		
	Est	Wald χ^2	p	Est	Wald χ^2	p	Est	Wald χ^2	p	Est	t	p	Est	t	p
Intercept	0.78	8.06	0.04	0.79	2.35	0.12	1.00	5.82	0.01	1.16	5.82	<0.01	0.69	3.10	<0.01
TB	0.03	5.68	0.06	0.03	1.30	0.25	0.02	1.52	0.21	-0.23	-1.15	0.25	0.25	1.07	0.28
PB	0.04	18.31	**<0.01**	0.05	4.47	**0.03**	0.02	1.48	0.22	0.27	1.96	0.05	0.18	0.93	0.35
TB × PB	-0.00	-0.70	0.45	-0.00	-0.38	0.53	-0.00	-0.01	0.90	0.29	2.62	**0.01**	0.11	0.66	0.50

Note. Estimates are unstandardised; p values are based on Wald χ^2 from negative binomial regression models or t tests from linear regression models; bold values indicate $p < 0.05$; Est = Estimate, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, ×= interaction.

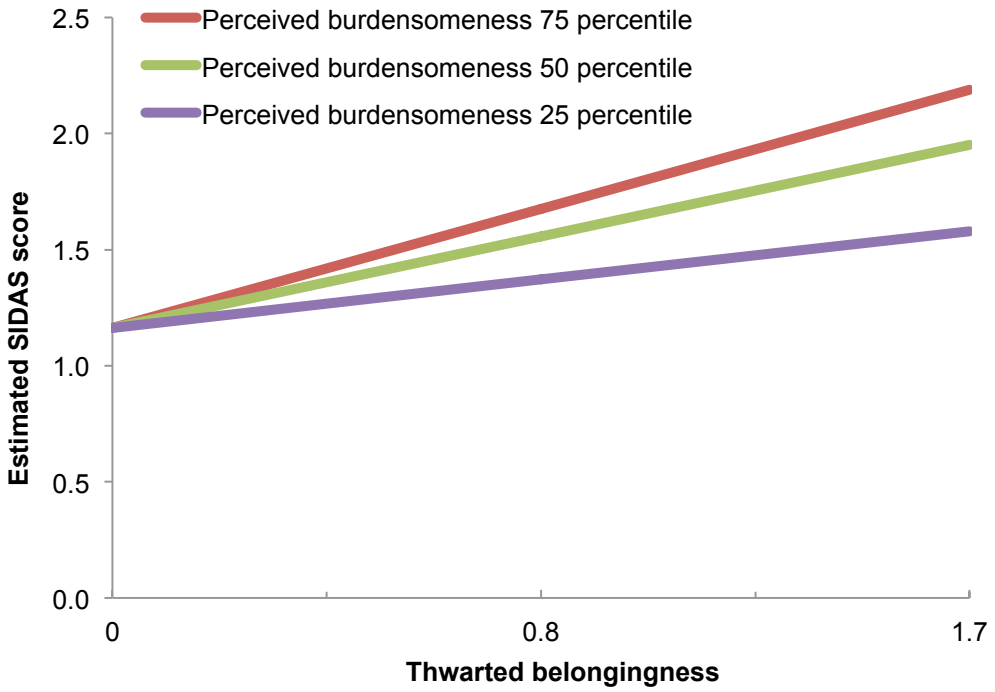

Figure 3-4. Interaction between Thwarted Belongingness (TB) and Perceived Burdensomeness (PB) on suicide ideation in Class C (young, high symptoms)

Note. TB, PB and SIDAS scores are standardised**.**

Logistic regression models were used to assess associations of the interpersonal risk factors (TB, PB, CS, and their two-way and three-way interactions) with the likelihood that respondents reported suicide behaviour in the past year. Across the groups, 10% participants in the full sample, 2% participants in Class X (no suicide ideation), 16% in Class A (young, slight symptoms), 10% in Class B (older group, slight symptoms), 41% in Class C (young, high symptoms), and 28% in Class D (older, high symptoms) reported suicide behaviour in the past year. The full model containing all eight predictors was statistically significant for the full sample, χ^2 (7, N = 1321) = 194.94, $p < .001$, Class X (no suicide ideation; χ^2 (7, N = 777) = 40.06, $p < 0.01$), and Class C (young, high symptoms, χ^2 (7, N = 124) = 19.84, $p < 0.01$). It was not significant for Class A (young, slight symptoms, χ^2 (7, N = 150) = 11.44, $p = 0.12$), Class B (older, slight symptoms, χ^2 (7, N = 188) = 6.46, $p = 0.48$), or Class D (older,

high symptoms, χ^2 (7, N = 82) = 13.35, p = 0.06), indicating that the model did not significantly distinguish between respondents who reported and did not report suicide attempt in the past year in these groups. The significant models as a whole explained between 5% (Cox and Snell R^2) to 27.8% (Nagelkerke R^2) of the variance in suicide attempt, and correctly classified 67.7% to 97.3% of cases. The model for the full sample, followed by the model for Class X (no suicide ideation) explained the most variance. As shown in Table 3.3 and Figure 3-5, the three-way interaction was only significant in the Class X model, where respondents who reported experiencing all three interpersonal risk factors simultaneously were significantly less likely to report having attempted suicide over the past year compared to those who did not, controlling for all other factors in the model. However, on using the three-item version of the ACSS that showed adequate internal consistency, this three-way interaction effect was no longer significant (p = 0.08).

Table 3.3. Logistic regression models for suicide attempt versus no attempt in full sample and across classes

Full sample (N = 1321)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.25	0.14	1.29 [0.96, 1.73]	0.08
PB	1.01	0.12	2.74 [2.14, 3.50]	<0.01***
CS	0.41	0.13	1.51 [1.16, 1.97]	<0.01***
TB × PB	0.00	0.10	1.00 [0.82, 1.22]	0.94
CS × TB	-0.03	0.14	0.97 [0.73, 1.27]	0.83
CS × PB	-0.07	0.11	0.93 [0.74, 1.17]	0.54
TB × PB × CS	-0.05	0.08	0.95 [0.79, 1.12]	0.55
(X) No suicide ideation (*n* = 777)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.37	0.30	1.45 [0.80, 2.62]	0.21
PB	1.04	0.29	2.84 [1.59, 5.07]	<0.01***
CS	0.74	0.27	2.10 [1.23, 3.59]	<0.01***
TB × PB	-0.04	0.28	0.95 [0.54, 1.65]	0.86
CS × TB	0.18	0.30	1.20 [0.66, 2.19]	0.54
CS × PB	-0.11	0.26	0.89 [0.53, 1.49]	0.66
TB × PB × CS	-0.55	0.25	0.57 [0.35, 0.94]	0.02**
(A) Young, slight symptoms (*n* = 150)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	-0.11	0.38	0.88 [0.41, 1.89]	0.75
PB	-0.08	0.38	0.91 [0.43, 1.94]	0.82
CS	0.46	0.30	1.58 [0.88, 2.86]	0.12
TB × PB	0.65	0.33	1.91 [0.99, 3.70]	0.05
CS × TB	-0.22	0.34	0.80 [0.40, 1.58]	0.52
CS × PB	-0.21	0.32	0.80 [0.42, 1.51]	0.49
TB × PB × CS	0.19	0.30	1.21 [0.67, 2.19]	0.51
(B) Older, slight symptoms (*n*= 188)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.17	0.36	1.18 [0.58, 2.42]	0.64
PB	0.47	0.40	1.60 [0.72, 3.54]	0.24
CS	0.47	0.36	1.60 [0.79, 3.25]	0.18

TB × PB	-0.00	0.50	0.99 [0.37, 2.64]	0.98
CS × TB	-0.51	0.41	0.59 [0.26, 1.33]	0.21
CS × PB	0.07	0.55	1.07 [0.36, 3.18]	0.89
TB × PB × CS	0.06	0.43	1.06 [0.44, 2.51]	0.89
(C) Young, high symptoms (*n* = 124)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	-0.56	0.54	0.56 [0.19, 1.66]	0.30
PB	0.77	0.35	2.16 [1.07, 4.35]	0.03*
CS	-0.33	0.50	0.71 [0.26, 1.92]	0.50
TB × PB	0.21	0.28	1.23 [0.70, 2.17]	0.45
CS × TB	0.68	0.51	1.98 [0.71, 5.47]	0.18
CS × PB	0.31	0.37	1.37 [0.66, 2.85]	0.39
TB × PB × CS	-0.31	0.26	0.72 [0.42, 1.23]	0.23
(D) Older, high symptoms (*n* = 82)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.45	0.65	1.58 [0.44, 5.67]	0.48
PB	0.34	0.59	1.41 [0.43, 4.55]	0.56
CS	0.02	0.89	1.02 [0.17, 5.90]	0.98
TB × PB	0.30	0.49	1.36 [0.51, 3.62]	0.53
CS × TB	0.58	0.75	1.79 [0.40, 7.88]	0.43
CS × PB	0.39	0.72	1.48 [0.35, 6.18]	0.58
TB × PB × CS	-0.64	0.59	0.52 [0.16, 1.67]	0.27

Note. TB = Thwarted Belongingness, PB = Perceived Burdensomeness, CS = Capability for Suicide, ×= interaction. * $p < 0.05$ ** $p < 0.025$ *** $p < 0.01$

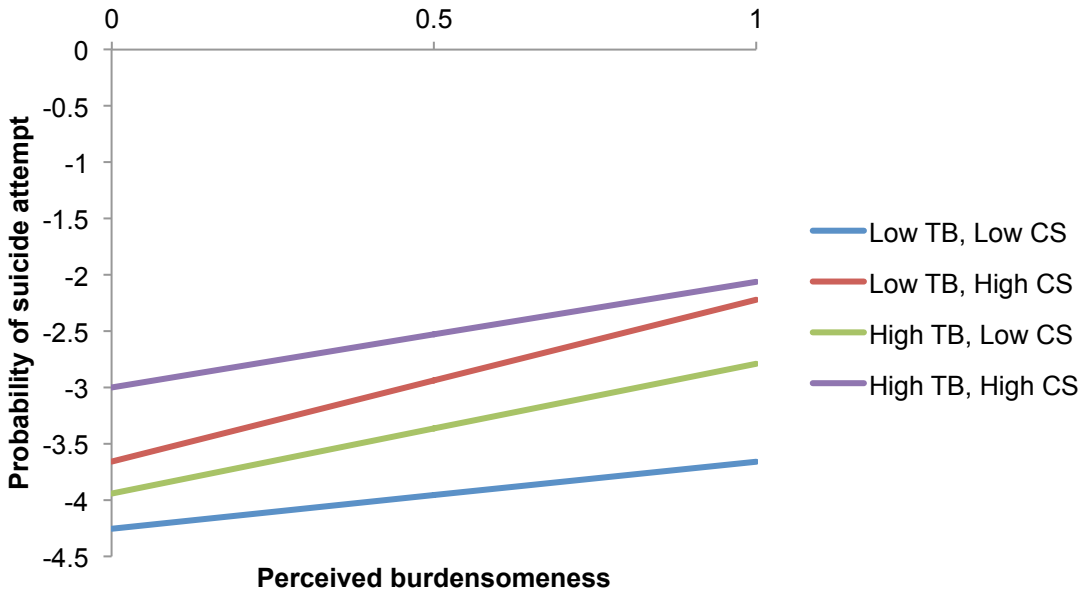

Figure 3-5. Interaction between Thwarted Belongingness (TB), Perceived Burdensomeness (PB) and Capability for Suicide (CS) on suicide attempt in Class X (no suicide ideation)

Note. Low = 25th percentile, high = 75th percentile. TB, PB and CS scores are standardised.

3.4 Discussion

The value in theories of suicidal behaviour is their ability to identify shared factors that predict whether any particular individual is likely to die by suicide (Gunn & Lester, 2014). However, limited research has tested whether the IPTS holds more explanatory power for specific subgroups or whether it is broadly applicable. The current study aimed to: (a) identify subgroups of individuals who endorsed suicide ideation in the past month from an online community sample based on a range of mental health and demographic variables, (b) compare levels of the IPTS constructs across these subgroups, and (c) test the IPTS predictions for suicidal ideation and suicide attempt for each group. In relation to (a), four distinct classes of individuals differentiated by age and severity of mental health symptoms endorsing suicide ideation in the past month were identified. The majority of the ideation sample were classed into

a group that consisted of older individuals (30-60+) with slightly elevated mental health symptom scores, followed by groups consisting of younger individuals (18-29) with slightly elevated mental health symptom scores, young individuals (18-29) with highly elevated mental health symptom scores, and older individuals (30-60+) with highly elevated mental health symptom scores. All classes significantly differed from the no suicide ideation class on most mental health measures in addition to age, education, and marital and employment status.

As having a mental disorder, being an adolescent or older adult, having lower educational attainment, being unmarried and being unemployed are identified as cross-national risk factors for suicide (Nock, Borges, Bromet, Cha, et al., 2008), the findings of the current study provide further support for the role of mental health symptoms (even if only slightly elevated), age, education, marital and employment status as risk factors associated with suicide ideation. Interestingly, the significant differences across the groups in relation to these sociodemographic variables were predominantly attributable to age, where younger groups tended to be single and currently studying, whilst older groups tended to be either married/defacto or separated/divorced, and retired or not in the workforce. Although it is important to note that it is not necessarily the case that all samples with suicide ideation will fall into the above described groups, these profiles highlight the contextual nature of suicide risk and how it may manifest differently depending on life stage (e.g., loss of relationship through divorce or death experienced mainly in older groups), which has implications on the design and acceptance of targeted suicide prevention strategies and interventions.

For aim (b), it was hypothesised that the highest levels of the interpersonal risk factors would be found in the groups reporting high levels of mental health symptoms. In line with this, results showed that high levels of thwarted belongingness (TB) and perceived burdensomeness (PB) were found only in the four classes who reported

suicide ideation in the past month, and not in the group without ideation. These findings support those of Dhingra et al. (2016), as well as the IPTS prediction that high levels of both TB and PB are risk factors for suicide ideation (Joiner, 2005). The results of the current study also indicated that the highest levels of TB and PB were found in the groups who experienced high levels of mental health symptoms. Here, groups significantly differed on levels of TB and PB based on severity of their mental health symptoms, and not age, supporting the relationship between mental health problems and suicide risk (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Nock, Hwang, Sampson, & Kessler, 2010). Interestingly, a significant difference was not found in the levels of capability (CS) across any of the classes (including the no suicide ideation class). These findings suggest that CS may be quite stable over time and is perhaps less influenced by factors such as age, mental health symptom severity, and the absence or presence of suicide ideation. It also supports the theory's proposition of CS being less amenable to change in comparison to TB and PB, where the latter may serve as more suitable targets for prevention and intervention. However, in interpreting these findings, it is important to note that recent investigations have raised concerns about the construct validity of the original 5-item measure used in this study (Ribeiro, Witte, Van Orden, Selby, et al., 2014), limiting conclusions about the nature of capability for suicide as critical aspects of the construct, such as fearlessness about death, may not be adequately represented.

The third aim (c), testing the predictions of the IPTS in each of the classes, was largely unsupported. The two-way interaction between TB and PB was significantly associated with suicide ideation experienced in the past month only in the young group with highly elevated mental health symptom scores. Here, TB did not seem to contribute to levels of suicide ideation significantly until individuals scored highly on PB (50^{th} and 75^{th} percentiles), suggesting that PB may play a greater role in contributing to suicide ideation (Figure 3-4). In addition to this, the model for the young group with

highly elevated symptoms explained the most variance in suicide ideation compared to the other classes (approximately double), suggesting that the theory may be more strongly associated with suicide ideation in this demographic. This finding coincides with where a predominant amount of research on the IPTS has been focused (Ma et al., 2016).

In relation to the IPTS predictions regarding suicide attempt, the three-way interaction was significantly associated with attempt in the past year only for the group without suicidal ideation. This model also explained the most variance, which was a surprising finding especially when compared to the full sample model, where only PB and CS were significant variables. One explanation for this may be related to the differences in time periods used for the suicide outcome measures, as the suicidal ideation outcome focused on past month, whilst the suicide attempt outcome assessed attempts in the past year. Here, 23 (3%) of the 777 individuals who reported no suicide ideation in the past month reported a suicide attempt in the past year. This finding indicates that although individuals without suicidal ideation may have recovered in terms of their suicidal thoughts and behaviours, risk for suicide attempt may persist in the form of elevated interpersonal risk factors. Further investigation of the small subset of individuals with elevated interpersonal risk factors but no current suicidal ideation may identify protective factors that mitigate feelings of isolation and burden. A further explanation for this finding may be that the interpersonal risk factors may be more intrinsic and stable in nature than previously thought. Such stability in these factors may have implications for the way we approach suicide prevention and strategies for intervention, as they may not be readily amenable to intervention. If this is the case, then other interpersonal targets, such as those underlying TB and PB, may need to be identified that are more responsive to therapeutic intervention. Future research would benefit from examining the extent to which these interpersonal risk factors are amenable

to change, as well as longitudinally examining their role and strength in contributing to vulnerability to suicide across the lifespan.

3.4.1 Strengths and limitations. Strengths of this study include the large community based sample, use of well-established and validated mental health measures, and novel application of LCA in relation to the IPTS. To my knowledge, this is the first study to test the IPTS predictions across subgroups derived by latent class analysis in a population-based sample. However, the study also had several limitations. First, because the study was cross-sectional, it is not possible to draw conclusions about the direction of the relationships. Second, though the sample was community based, it may not have been representative of the population as individuals with higher rates of psychopathology were recruited into the study. Third, measures used for the mental health constructs were brief self-report epidemiological scales as opposed to structured clinical assessments, which may perform marginally better in assessing risk due to the incorporation of more global measures of clinician-or patient-rated risk (Quinlivan, 2017). Additionally, the differing timeframes used to assess current specific disorders may have impacted temporal relationships with suicide outcomes. Fourth, the ACSS displayed low levels of internal consistency and may not be fully representative of the construct, limiting conclusions made about capability for suicide. Fifth, power to detect three-way interaction effects in the subgroups may have been limited due to smaller sample size. However, a three-way interaction effect was also not detected in the full sample, suggesting that samples in the thousands may be needed to observe the negligible magnitude of the three-way effects. Lastly, a downside of using LCA was that each of the subgroups had a restricted range of characteristics, reducing within-class variability in the outcome measures and the generalisability of the findings.

3.4.2 Conclusions. The present study highlighted the utility of LCA in testing the predictions of the IPTS in an online community survey of Australian adults,

contributing a number of useful insights into the nature of the interpersonal risk factors in the community. Support was provided for the relationship between severity of mental health symptoms and higher levels of thwarted belongingness and perceived burdensomeness in people with suicidal ideation. However, lack of support for the IPTS predictions regarding suicide ideation and attempt outcomes across the subgroups and full sample in this study raise some questions around the broad applicability of the theory. These findings add to the picture of mixed support for the IPTS predictions identified in the Chapter 2 systematic review, and indicate a need to investigate the role these critical interaction effects play on the development of suicidality in heterogeneous samples with varying levels of risk. In particular, consistent support needs to be identified for the IPTS interaction effects beyond that which has primarily been found in student samples.

In the following chapter, the associations between mental health symptom severity, the interpersonal risk factors, and suicidality will be further explored using longitudinal study methodology to assess the role of the interpersonal risk factors over time in a clinical sample.

CHAPTER 4: A longitudinal test of the Interpersonal Psychological Theory of Suicide in an Australian clinical sample

4.1 Introduction

In Chapter 1, it was highlighted that despite increased use of health-care services and developments in treatment research, suicide continues to be a leading cause of death and disease burden globally (World Health Organization, 2014). In the previous chapter (Chapter 3), the relationship between mental health symptom severity and increased levels of thwarted belongingness and perceived burdensomeness amongst individuals with suicide ideation was supported in a community-based sample. The present chapter aims to further explore these associations by examining the role and strength of the interpersonal risk factors in contributing to suicide risk over time in a clinical sample.

Individuals in clinical settings are at elevated risk of suicide due to their high prevalence and severity of suicidal thoughts and behaviours relative to the population (Bertolote & Fleischmann, 2002; Larkin, Smith, & Beautrais, 2008). These individuals may also encounter problems unique to clinical settings including issues related to good practice in suicide risk assessment, adequate discharge planning, and continuity of care across services and jurisdictions, which may compound risk and negatively impact treatment outcomes (National Mental Health Working Group, 2005; Ting et al., 2012).

Recently, the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) has been suggested as a framework for suicide risk assessment and for intervention with distinct clinical applications (Stellrecht et al., 2006; Van Orden, Talbot, et al., 2012). According to the theory, the presence of either thwarted belongingness (TB) or perceived burdensomeness (PB) are proximal, causal risk factors for the development of passive suicide desire (e.g., “I wish I was dead”), and their simultaneous presence (e.g., two-way interaction) combined with a sense of hopelessness is said to contribute to the development of active suicide desire (e.g., “I

want to kill myself") (Van Orden et al., 2010). For progression to suicide attempt, however, the individual must possess both active desire for suicide and the capability (CS) to enact a lethal attempt (Joiner, 2005). These interpersonal risk factors and their differential relationships to suicide ideation and suicide attempt have the potential to serve as important theoretically driven points of suicide prevention and intervention.

Research conducted on the IPTS in clinical populations has provided support for the relationship between PB and suicidality cross-sectionally, as well as associations between the other interpersonal risk factors and suicidality, though to a lesser extent (Hill & Pettit, 2014; Ma et al., 2016). To date only two studies have found cross-sectional support for the two and three-way interaction effects of the IPTS in clinical populations (Anestis & Joiner, 2011; Joiner et al., 2009), and there is a paucity of longitudinal research testing the full predictions of the IPTS in clinical samples which would enable exploration of the role and clinical applicability of these interpersonal risk factors over time (Ma et al., 2016).

Based on the systematic review reported in Chapter 2, only three prospective studies of the IPTS have been conducted in clinical populations (Miller, Esposito-Smythers, & Leichtweis, 2016; Teismann, Forkmann, Rath, Glaesmer, & Jürgen Margraf, 2016; Teismann, Glaesmer, von Brachel, Siegmann, & Forkmann, 2017). These studies have provided cross-sectional support for the role of PB (but not TB or their two-way interaction) in contributing to suicide ideation when controlling for factors such as age, sex, baseline depression symptom severity and suicidality. However, the follow-up time frames for these studies were short (three weeks to three months post-treatment) and none of these studies incorporated analysis of CS or tests of the IPTS three-way interaction prediction.

The aim of the present study was to: (a) test whether the interaction between TB and PB at baseline was significantly associated with suicide ideation cross-sectionally

and longitudinally at six-months follow-up, and (b) test whether the three-way interaction between TB, PB, and CS at baseline was significantly associated with suicide attempt cross-sectionally and longitudinally at six-months follow-up in an Australian clinical sample.

4.2 Method

4.2.1 Participants and procedure. Australian adults (N = 331; 55% female) aged 18 years and older were recruited from the Black Dog Institute Clinic (Sydney, Australia) between June 2014 and May 2017 to participate in a study to test mental health screening scales and better evaluate patient outcomes. Sample characteristics are reported in Table 4.1. The Black Dog Institute Clinic is a referral based psychology clinic that offers a range of services including: the assessment and development of treatment plans for people with a mental illness, individually-tailored psychological treatments for primary mental illnesses, group programs focusing on skills development for patients diagnosed with a mental illness, and the assessment and treatment of children and adolescents through specialist child and adolescent services. Participants were invited to complete a short set of paper-based mental health screening scales before or after their appointment with an optional six-month follow-up. The baseline survey took approximately 15 minutes to complete and assessed suicide ideation and attempt, interpersonal risk factors for suicide, hopelessness, suicide stigma, and suicide literacy. The follow-up survey assessed depression, anxiety disorders, alcohol use, suicide attempt, and suicidal ideation and on average took 15 minutes to complete. One hundred and thirty-one participants completed both baseline and six-month follow-up surveys. Written information about the study aims was provided to participants prior to commencing the survey, with informed consent and a list of mental health resources provided in person. No incentive was provided. The study received ethics approval from

the Human Research Ethics Committee at the Australian National University (protocol number 2013/144).

4.2.2 Measures.

Sociodemographic variables. Gender, age (open-ended), relationship status, employment status, and country of birth were measured.

Suicide outcome measures. Suicide ideation was measured using the Suicidal Ideation Attributes Scale (SIDAS; van Spijker et al., 2014), which consists of five items that measure the frequency, controllability, and distress of suicidal thoughts, closeness of making an attempt, and impact on daily functioning experienced in the past month on a scale from 0 (*never*) to 10 (*always*). Higher scores indicate more severe suicidal thoughts (scale range 0-50). Due to the considerable skew of SIDAS scores and large proportion of zero scores, total SIDAS scores were dichotomised for logistic regression analyses, so that 0 indicated no ideation and ≥1 indicated the presence of ideation. The SIDAS has strong internal consistency and convergent validity with other measures of suicide and psychological distress (van Spijker et al., 2014). It demonstrated good internal consistency at baseline ($\alpha = .86$) and six-month follow-up ($\alpha = .87$).

Suicide attempt was measured with the sixth item from the Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011) that assesses whether the individual has done anything, started to do anything, or prepared to do anything to end their life in the past year on a *yes*/*no* scale. The C-SSRS has good convergent and divergent validity with other multi-informant suicidal ideation and behaviour scales, and high sensitivity and specificity for suicidal behaviour classifications (Posner et al., 2011).

Interpersonal risk factors. Thwarted belongingness (TB) and perceived burdensomeness (PB) were measured using the Interpersonal Needs Questionnaire (INQ-12; Van Orden, Cukrowicz, et al., 2012; Van Orden et al., 2008) consisting of five items that assess TB and seven that assess PB on a scale from 1 (*not at all true for me*)

to 7 (*very true for me*). Higher ratings indicate greater TB (scale range 5–35) and PB (scale range 7–49). In this sample, the INQ-12 (α = .89) and TB subscale (α = .81) had good internal consistency, and the PB subscale had excellent internal consistency (α = .90).

Capability for suicide (CS) was measured using the Acquired Capability for Suicide Scale (ACSS; Van Orden et al., 2008) consisting of five items that measure fearlessness about engaging in potentially lethal self-harmful behaviours on a scale from 1 (*not at all like me*) to 5 (*very much like me*). Higher scores indicate greater capability for suicide (scale range 5-25). In this sample, the ACSS had questionable internal consistency (α = .67). Therefore, analyses were re-estimated using the first three items of the ACSS that better fit a uni-dimensional construct (α = .74) to explore any measurement based differences.

4.2.3 Analysis. Comparisons between individuals with and without suicidal thoughts/behaviours and individuals who completed baseline versus both baseline and follow-up were analysed using chi-square statistics for dichotomous variables, and independent-samples *t*-tests for continuous variables. A paired samples *t*-test and McNemar test were conducted to assess change in SIDAS scores from baseline to follow-up and a McNemar's test to assess change in presence of suicide attempt. Logistic regression models were used to test the IPTS predictions for suicide ideation (previous month) and suicide attempt (previous year) reported at baseline and six-month follow-up. Based on the IPTS hypotheses, the ideation model included the main effects of TB, PB, and their two-way interaction. The suicide attempt model included the main effects of TB, PB, CS, and their two and three-way interactions. IPTS variables were standardised to have a mean of 0 and *SD* of 1 to aid interpretation. There was some missing data for the sociodemographic variables assessed at baseline (18-19 cases per variable) due to incomplete survey responses, and a high rate of missing data for the

suicide outcome measures assessed at follow-up atrributed to participant dropout (217-218 cases). Listwise deletion was used for missing data in the longitudinal analyses, and pairwise deletion was used for missing data in all other analyses. Several outliers were identified using Mahalanobis and Cook's Distance. Models were re-analysed with these outliers removed, but did not differ, so results from the full data set are reported below. Descriptive analysis and logistic regressions were conducted using SPSS v21 (IBM Corp, 2012).

4.3 Results

4.3.1 Sample characteristics. Participants reporting suicidal thoughts/behaviours (n = 254) were significantly more likely to report Australia as their country of origin, having suicide ideation and/or history of a suicide attempt, and higher levels of TB (mean difference = -4.85, 95% CI: -6.69 to -3.00) and PB (mean difference = -8.91, 95% CI: -11.60 to -6.21) compared to participants reporting no suicidal thoughts/behaviours (n = 76) (Table 4.1). Participants who completed the baseline measure only (n = 192) were more likely to be single, separated, or divorced, χ^2 (1, n = 317) = 4.12, p = 0.04, *phi* = 0.12, compared to participants who completed both the baseline and follow-up measures (n = 124). No other differences were observed between groups.

Table 4.1. Sample characteristics by reported suicidal thoughts/behaviours at baseline

	No suicidal thoughts/behaviours (*n* = 76)		**Suicidal thoughts/behaviours (*n* = 254)**			
	Frequency	**%**	***Frequency***	**%**	***χ²***	***p***
Gender = female	38	53.5	147	60.0	0.70	0.40
Country of birth					3.02	**0.04**
Australia	49	70.0	192	78.0		
Other	21	30.0	46	18.7		
Unknown	N/A	N/A	8	3.3		
Relationship status					3.38	0.06
Defacto/Married	34	47.9	86	35.0		
Single/Separated/Divorced	37	52.1	160	65.0		
Employment status					2.15	0.54
Employed	39	54.9	130	52.8		
Unemployed	22	31.0	72	29.3		
Student	10	14.1	37	15.0		
Unknown	N/A	N/A	7	2.8		

Suicide ideation (SIDAS)					303.22	**<0.01**
Yes	N/A	N/A	254	100.0		
No	76	100.0	N/A	N/A		
History of suicide attempt (C-SSRS)					41.69	**<0.01**
Yes	N/A	N/A	101	39.8		
No	76	100.0	153	60.2		
	Mean	***SD***	**Mean**	***SD***	***t***	***p***
Age	38.7	13.7	38.6	13.2	0.02	0.98
Thwarted belongingness (TB)	16.36	7.55	21.21	6.93	-5.17	**<0.01**
Perceived burdensomeness (PB)	17.12	9.65	26.03	10.52	-6.50	**<0.01**
Capability for suicide (CS)	13.83	4.86	14.29	4.54	-0.74	0.45

Note. Bold values indicate $p < 0.05$ for *t*-tests or χ^2 tests between classes; *SD* = Standard Deviation.

4.3.2 Stability of suicide ideation and suicide attempt over the six-month period. The paired samples *t*-test showed a statistically significant decrease in SIDAS scores from Time 1 (M = 12.24, SD = 11.90) to Time 2 (M = 8.08, SD = 11.39), t (125) = 4.32, $p < .001$ (two-tailed). The mean decrease in SIDAS scores was 4.15 (95% confidence interval: 2.25-6.06). Cohen's d indicated a medium within groups effect size (.35). The frequency of responses across the individual items indicated there was a 16.1%-21.8% increase in participants reporting a score of 0 (*never*) across the five items (frequency of thoughts, distress of suicidal thoughts, closeness to making an attempt, and impact on daily functioning experienced in the past month), and overall a 1-3% decrease in participants reporting extreme scores at follow-up, potentially reflecting treatment effects. Similarly, based on dichotomous data, a McNemar test found a significant decrease (18.9%) in the prevalence of suicide ideation from baseline to follow-up, $p < 0.01$ (2 sided).

For suicide attempt reported over the past year, a McNemar test showed that the prevalence of attempt reported at baseline was significantly different to that at follow-up, $p = 0.008$ (2 sided). The frequency of responses indicated a 16.1% decrease in participants reporting an attempt.

4.3.3 Testing the predictions of the IPTS. Logistic regression models were used to assess associations between the interpersonal risk factors with the odds that respondents reported suicide ideation in the past month (at baseline and at six-month follow-up), and the likelihood that respondents reported suicide behaviour in the past year (at baseline and at six-month follow-up).

Suicide ideation was reported by 75.8% of participants at baseline, and 56.9% at six-month follow-up. The full ideation model containing all three predictors (TB, PB and their two-way interaction) was statistically significant at baseline, χ^2 (3, N = 320) = 44.53, $p < .001$ and six-months follow up, χ^2 (3, N = 127) = 20.27, $p < .001$. At

baseline, the model explained between 13% (Cox and Snell R^2) and 19.4% (Nagelkerke R^2) of the variance in suicide ideation, and correctly classified 77.5% of cases. At follow-up, the model explained between 14.8% (Cox and Snell R^2) and 19.8% (Nagelkerke R^2) of variance and correctly classified 67.7% of cases. Only PB was a significant predictor of suicide ideation at baseline and six-month follow-up. A one standard deviation increase in PB was associated with 2.1 times the odds of reporting suicide ideation at baseline and six-months follow-up (Table 4.2).

Suicidal behaviour was reported by 28.9% of participants at baseline, and 5.4% at six-month follow-up. The full attempt model containing all seven predictors (TB, PB, CS, and their two and three-way interactions) was statistically significant at baseline, χ^2 (7, N = 320) = 71.66, $p < .001$, and six-months follow up, χ^2 (7, N =128) = 14.91, $p < 0.05$. At baseline, the model explained between 20.1% (Cox and Snell R^2) and 28.4% (Nagelkerke R^2) of the variance in suicide attempt, and correctly classified 75.3% of cases. At follow-up, the model explained between 11% (Cox and Snell R^2) and 19.4% (Nagelkerke R^2) of the variance in suicide attempt, and correctly classified 85.2% of cases. Only PB and CS were significant predictors of suicide attempt at baseline, and PB at six-month follow-up. For a one standard deviation increase in PB and CS at baseline, participants had 2.9 increased odds and 1.5 increased odds, respectively, of reporting a suicide attempt in the past year. For one standard deviation increase in PB at six-months follow-up, participants had 2.7 increased odds of reporting an attempt (Table 4.3). The findings from re-estimated models using the first three items of the ACSS resulted in CS no longer being a significant predictor at baseline and the two-way interaction between PB and CS becoming a significant predictor at follow-up ($\beta = 0.94$, $p = 0.02$, OR: 2.56).

Table 4.2. Main and two-way interaction effects of predictor variables on suicide ideation at baseline and six-month follow-up

	Baseline (N = 320)				Follow-up (*n* = 127)			
	Estimate	*SE*	*p*	Odds ratio	Estimate	*SE*	*p*	Odds ratio
Intercept	1.42	0.16	<0.01	4.15	0.30	0.20	0.13	1.35
TB	0.28	0.18	0.12	1.33	0.29	0.22	0.18	1.34
PB	0.74	0.18	**<0.01**	2.10	0.78	0.23	**<0.01**	2.18
TB × PB	-0.13	0.17	0.43	0.87	0.12	0.23	0.60	1.12

Note. Estimates are unstandardised; *SE* = Standard Error, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, ×= interaction.

Table 4.3. Main, two-way and three-way interaction effects of predictor variables on suicide attempt at baseline and six-month follow-up

	Baseline (N = 320)				Follow-up (*n* = 128)			
	Estimate	*SE*	*p*	Odds ratio	Estimate	*SE*	*p*	Odds ratio
Intercept	-0.98	0.15	<0.01	0.37	-2.06	0.33	<0.01	0.12
TB	0.02	0.17	0.89	1.02	0.12	0.38	0.74	1.13
PB	1.09	0.17	**<0.01**	2.98	1.00	0.32	**<0.01**	2.73
CS	0.44	0.16	**<0.01**	1.55	0.04	0.33	0.88	1.04
TB × PB	-0.16	0.16	0.30	0.84	-0.002	0.36	0.99	0.99
CS × TB	-0.02	0.16	0.88	0.97	-0.31	0.35	0.37	0.73
CS × PB	-0.12	0.17	0.49	0.88	0.33	0.36	0.36	1.39
TB × PB × CS	-0.21	0.16	0.18	0.80	-0.27	0.36	0.44	0.75

Note. Estimates are unstandardised; *SE* = Standard Error, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, CS = Capability for suicide, ×= interaction.

4.4 Discussion

Demonstrating that interpersonal risk factors prospectively predict suicide-related behaviours, as opposed to just being correlates or consequences of suicide-related behaviours is an important task for their successful leverage in clinical settings and suicide prevention programs (Hill & Pettit, 2014). However, few studies have tested the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) longitudinally and little is known about the nature of the interpersonal risk factors and their relationship with suicide ideation and attempt over time. The present study aimed to provide a cross-sectional and longitudinal test of the IPTS predictions regarding suicide ideation and attempt in an Australian clinical sample.

In line with prior prospective studies (Miller et al., 2016; Teismann et al., 2016; Teismann et al., 2017), the IPTS prediction regarding the two-way interaction between TB and PB contributing to active suicide ideation was not supported cross-sectionally or longitudinally in this study. Additionally, support for the three-way interaction between TB, PB, and CS contributing to suicide attempt was not found. However, in contrast to these previous findings, all of the interpersonal risk factors were supported cross-sectionally and longitudinal support was found for perceived burdensomeness (PB). Here, PB was found to predict both suicide ideation and suicide attempt cross-sectionally and longitudinally at six-months follow-up, while thwarted belongingness (TB) was associated with suicide ideation and capability for suicide (CS) was associated with suicide attempt cross-sectionally.

The finding that PB (but not TB or CS) remained a significant and unique predictor, despite a significant reduction in levels of suicide ideation and attempt at follow-up, suggests that PB may play an important and consistent role in contributing to passive suicide ideation and risk of attempt over time. Interestingly, in this study, the odds ratios associated with PB in the suicide attempt model were higher than those in

the ideation model at both baseline and follow-up, a finding which does not support the specificity of the IPTS, as PB is hypothesised to be associated with passive and active suicide ideation only. This raises some questions around whether PB contributes more broadly to suicide risk than previously thought, which would have clinical implications in terms of widening the scope for when PB could be effectively targeted to reduce suicide risk. For instance, web-based interventions targeting cognitions of PB may help to decrease feelings of burden and passive ideation in individuals who display elevated, but not imminent risk of suicide-related behaviours (Hill & Pettit, 2016). Psychosocial treatment in the form of Dialectical or Cognitive Behavioural Therapy may be more efficacious at reducing levels of existing suicide ideation and/or suicide attempt by challenging distorted PB beliefs in high risk groups (Stellrecht et al., 2006). Future longitudinal studies exploring the relationship between PB and different aspects of suicidality may help shed more light on the contexts where it may serve a more specific (associated with passive and/or active ideation only) compared to broader role (both ideation and attempt).

The lack of longitudinal support for TB and CS may also be an indication that PB may be a more sensitive indicator of suicidality, which may help to explain why the role of PB has been consistently supported in studies of the IPTS compared to TB and CS (Ma et al., 2016). Additionally, PB may be more relevant in clinical samples as it has been found to be more strongly associated across a wide variety of mental health diagnoses such as depressive and bipolar disorders, borderline personality disorder, schizophrenia and other psychotic disorders, poly-substance dependence, somatoform disorders, schizotypal personality disorders and Pervasive Developmental Disorders in comparison to the other interpersonal risk factors which are associated over a narrower range of diagnoses (Silva, Ribeiro, & Joiner, 2015). Here, PB could serve as a particularly potent factor in suicide risk assessments for use in clinical settings, as well

as more broadly in populations exhibiting low rates of suicidality. However, future studies are needed to delineate whether these explanatory disparities are attributable to construct-related differences (i.e., PB is more explanatory in comparison) or measurement related issues.

4.4.1. Strengths and limitations. A major strength of this study was the longitudinal design, which incorporated a longer follow-up period than previously employed. To my knowledge, this study is the first to provide a longitudinal test of the full IPTS predictions in a clinical sample. The use of a clinical sample enabled exploration of the IPTS in a high-prevalence sample, with findings directly relevant to future interventions in clinical settings. However, the study also had several limitations. First, no follow-up data on the interpersonal risk factors was collected, precluding analysis of changes in these over time. Second, the ACSS displayed low levels of internal consistency and may not be fully representative of the construct, limiting conclusions made about capability for suicide. Future studies should incorporate the recently revised Acquired Capability for Suicide-Fearlessness About Death Scale (ACSS-FAD; Ribeiro, Witte, Van Orden, Edward A. Selby, et al., 2014). Third, power to detect the interaction effects at six months follow-up may have been limited due to low absolute prevalence of suicidal behaviours and attrition. Nevertheless, the study was well powered to detect cross-sectional three-way interaction effects, and none were detected.

4.4.2 Conclusions. Support was provided for the role of perceived burdensomeness in contributing to passive suicide ideation and suicide attempt cross-sectionally and longitudinally at six-month follow-up. However, support for the broader IPTS model was limited, consistent with other longitudinal studies. Perceived burdensomeness may serve as a relevant therapeutic target for the prevention and early intervention of suicidality, particularly in clinical settings.

In line with the previous chapters (2 and 3), perceived burdensomeness continues to be highlighted as a potentially pernicious interpersonal risk factor that may contribute to greater risk of suicide compared to the effects of the other interpersonal risk factors. There are a number of possible reasons as to why TB explains less variance in suicidal ideation, which require further investigation. For example, perhaps only extreme levels of TB influence suicidal thoughts, whereas PB may maintain strong associations with suicide ideation across its range (i.e., from low to high levels). It may also be the case that the relatively stronger effects of PB tend to obscure contributions from TB. These reasons indicate significant differences in the constructs themselves. However, they may also be influenced by inadequacies in the self-report scale used to measure TB. To explore this issue of whether explanatory disparities between the interpersonal risk factors may be attributable to measurement related issues, the following chapter presents a study aimed at developing and validating a new scale for thwarted belongingness against the existing Interpersonal Needs Questionnaire thwarted belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012) in a community-based sample.

CHAPTER 5: Development and validation of the Thwarted Belongingness Scale (TBS) for interpersonal suicide risk

5.1 Introduction

In Chapter 2, a systematic review of the predictions of the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) identified a need to expand the availability of valid measurement approaches for the interpersonal risk factors. Mixed support for the associations between thwarted belongingness (TB) and suicide-related behaviours identified in the systematic review (Chapter 2) and previous chapters (3 and 4) raise some questions around whether the existing measures used to assess TB adequately capture the construct. In order to help fill this gap and address the project's aim of promoting suicide prevention through better identification of interpersonal risk factors, this chapter presents a study aimed at developing and validating a new self-report measure for thwarted belongingness (TB). The study involved developing an item pool for TB based on a systematic literature search of existing belonging, loneliness, and social support scales. A systematic process was then used to select and refine the TB item pool, and included obtaining feedback from experts and identifying optimal items using a data-driven approach. The finalised TB scale was then used to test the IPTS hypotheses in a large sample of community-dwelling Australian adults who were recruited from the general community, rather than within clinical or other specific settings.

5.1.1 Loneliness, social isolation, and thwarted belongingness. Loneliness and social isolation have been identified as increasingly significant issues worldwide, and there have been recent calls for their public health prioritisation (Holt-Lunstad, 2018; Holt-Lunstad, Robles, & Sbarra, 2017). Conservative estimates suggest that approximately three out of ten people experience loneliness in Australia (Baker, 2012), and four in ten adults over the age of 45 experience chronic loneliness (six years or

more) in the United States (Wilson & Moulton, 2010). Both loneliness and social isolation have been found to be associated with a number of physical and psychological health issues including depression, cognitive decline and dementia (Cacioppo & Cacioppo, 2014), and increased risk of early mortality comparable to many leading health determinants (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015).

Suicide research is an area that has done well in recognising the impact of loneliness and social isolation on suicide risk. According to the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), the need to form and maintain strong, stable interpersonal relationships is considered a fundamental psychological need. According to the IPTS, when this need is unmet, a state of thwarted belongingness develops. Thwarted belongingness is said to comprise two facets: (1) loneliness, an affectively laden cognition that one has too few social connections, and (2) the absence of reciprocal caring relationships (i.e., where individuals feel cared about and demonstrate care of another). It is viewed as a dynamic cognitive-affective state that is influenced by inter-and intra-personal factors such as experiencing family conflict, living alone, possessing few social supports, and being prone to interpret others' behaviour as rejection (see Figure 5-1; Van Orden et al., 2010).

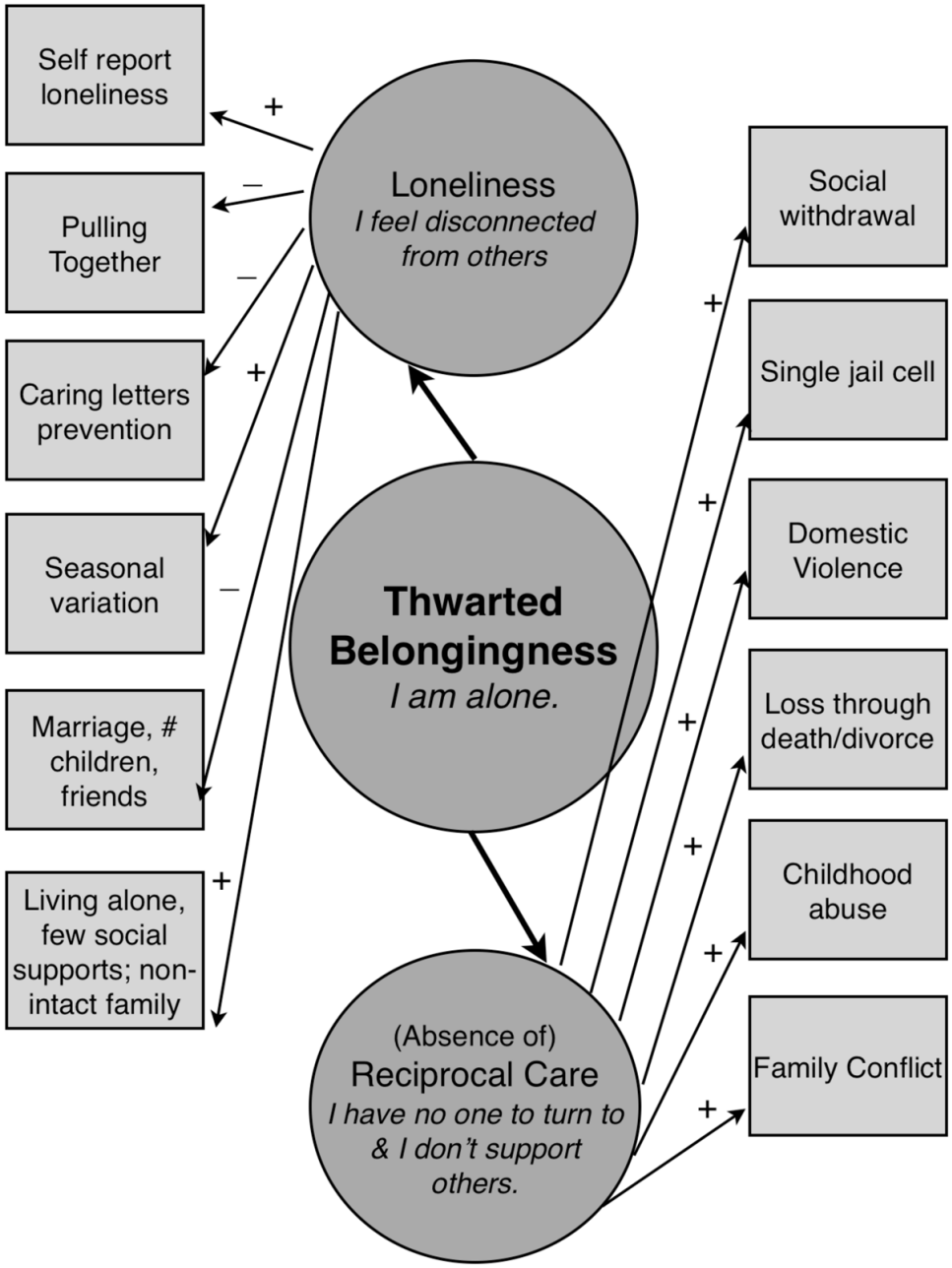

Figure 5-1. Dimensions and indicators of thwarted belongingness. A + sign indicates a positive association; a – sign indicates a negative association. Reprinted from "The interpersonal Theory of Suicide," by K. A. Van Orden et al., 2010, *Psychological Review*, *117*(2), 581 with permission.

5.1.2 The need for additional measures. Available measures for screening thwarted belongingness are currently limited to one self-report assessment: the Interpersonal Needs Questionnaire thwarted belongingness subscale (INQ TB; Van

Orden, Cukrowicz, et al., 2012). The 25-item INQ was developed in 2009 as part of a doctoral thesis to investigate the aetiology of suicidal desire/behaviour and provide part of a risk assessment framework grounded in the IPTS (Van Orden, 2009). It aims to measure beliefs about the extent to which individuals believe their need to belong is met or unmet (i.e., thwarted belongingness) and the extent to which they perceive themselves to be a burden on the people in their lives (i.e. perceived burdensomeness). There are currently five versions of the INQ (10, 12, 15, 18, and 25-item). All five versions have been used in studies of the IPTS since 2009, despite psychometric validation of the 25-item scale only being conducted three years after its development (Van Orden, Cukrowicz, et al., 2012).

Research using the INQ has shown thwarted belongingness to be linked, in conjunction with other risk factors, to elevated suicidal thoughts and behaviours (Chu et al., 2017; Van Orden et al., 2010). However, findings for the relationship between thwarted belongingness and suicidal thoughts/behaviours have generally been weaker or less supported in comparison to those found for perceived burdensomeness (Chu et al., 2017; Ma et al., 2016). Recent research has also indicated that the different versions of the INQ (10, 12, 15, 18, and 25-item) are not equivalent and that differences across the versions may influence associations found between perceived burdensomeness, thwarted belongingness and suicide ideation in studies of the IPTS (Hill et al., 2015). The possibility of the INQ TB subscale not adequately capturing the thwarted belongingness construct has also been raised to account for this discrepancy (Cero, Zuromski, Witte, Ribeiro, & Joiner, 2015; Ma et al., 2016). In order to expand the availability of valid measurement approaches for interpersonal risk and promote better identification of thwarted belongingness, the present study aimed to:

1) Develop a new self-report scale for thwarted belongingness (TB)
2) Test the psychometric properties of this newly developed scale, including

establishing convergent validity with the INQ TB subscale (Van Orden, Cukrowicz, et al., 2012) in a community-based sample, and,

3) Provide a comparative test of the IPTS (Joiner, 2005; Van Orden et al., 2010) hypotheses around suicide ideation and attempt using the newly developed TB self-report scale and the original INQ TB subscale.

5.2 Method

A pool of 42 candidate items was selected for potential inclusion in the Thwarted Belongingness Scale (TBS) (Appendix J). Items were derived and adapted from existing belonging, loneliness, and social support scales identified in a systematic literature search. These existing scales included the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, et al., 2012), UCLA loneliness scale (Russell, Peplau, & Cutrona, 1980; Russell, Peplau, & Ferguson, 1978), De Jong Gierveld Loneliness Scale (de Jong-Gierveld & Kamphuls, 1985), Family subscale of the SELSA (DiTommaso & Spinner, 1993), General Mattering Scale (Marcus, 1991), and Self-efficacy subscales of the Spirituality Index of Wellbeing (Daaleman & Frey, 2004). The selection of items into the pool was based on, and expanding upon, the definition of thwarted belongingness provided by the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden, Cukrowicz, et al., 2012), which highlights the role of loneliness, disconnection, meaning/mattering, contribution, additive risk factors (e.g., abuse), and social entrapment in contributing to thwarted belongingness (TB) (Figure 5-1). This 42-item pool underwent item refinement via three consecutive stages: (1) expert feedback to revise and remove items, (2) item selection study of the revised item pool in a sample of community-dwelling Australian adults, with further refinement (Study 1), and (3) validation of the final scale and test of the IPTS hypotheses in a large sample of community-dwelling Australian adults (Study 2).

5.2.1 Expert panel. Email invitations were sent out to 30 Australian and international researchers and clinicians, identified by their contribution to suicide-research and/or clinical experience with suicidal behaviour, to participate in a study to develop a self-report measurement for thwarted belongingness (TB). Seven experts consented to participate and were sent an online survey to evaluate a pool of 42 items. Participants were asked to rate each item for its relevance on a scale from 1 (*irrelevant*) to 5 (*highly relevant*). They were also asked to provide comments about each item and its wording, to rate whether the items taken as a whole adequately covered the construct of TB, and provide suggestions as to whether any other items or concepts could be included in the item pool. The study received ethics approval from the ANU Science & Medical Delegated Ethics Review Committee (protocol #2016/247).

After receiving expert feedback, items were systematically selected or eliminated from the 42-item pool based on whether a majority of experts (4 or more) rated the item as being 'quite' (4) or 'highly (5) relevant, and whether a majority of experts (4 or more) rated the item as being 'irrelevant' (1). Several items were also reworded in line with expert feedback to promote item clarity. This resulted in a 22-item TBS pool.

5.2.2 Study 1.

5.2.2.1 Participants and procedure. Australian adults (N = 284; 85% female) aged 18 years and over were recruited from the online social media website Facebook. A series of paid advertisements were placed on the website between September 2016 and January 2017, targeting Australians aged 18 years or older fluent in English. The advertisements read: "Social Support & Mental Health: Complete a 10 min survey for a PhD project on relationships, suicide, and mental health," and linked to the study's Facebook page and the survey. The Facebook page enabled participants to interact (share links, comment, like the page) and provided links to the survey and occasional

messages to encourage study participation. The survey was administered online via Qualtrics. Participants were provided with a comprehensive information screen prior to commencing the survey, with informed consent and a list of mental health resources provided online. The study received ethics approval from the ANU Human Research Ethics Committee (protocol #2016/387).

5.2.2.2 Measures.

Sociodemographic variables. Gender (male, female, other), age (18-24, 25-29, 30-39, 40-49, 50-59, 60 and over), level of education (up to high school, associate/trade degree or diploma, bachelor's degree, postgraduate degree), employment status (full-time, part-time, unemployed/seeking work, retired or not in the workforce), and marital status (married or de facto, single/never married, separated or divorced, widowed) were measured.

Interpersonal risk factors. Thwarted belongingness (TB) and perceived burdensomeness (PB) were measured using the INQ-15 (Van Orden, Cukrowicz, et al., 2012). The INQ-15 consists of nine items that assess TB and six that assess PB on a scale from 1 (*not at all true for me*) to 7 (*very true for me*), with higher ratings indicating greater TB (range 9-63) and PB (range 6–42). In comparison to other versions of the INQ, the INQ-15 has been found to more consistently demonstrate factorial validity in undergraduate and adolescent psychiatric inpatient samples (Hill et al., 2015). In this sample, the INQ-15 ($\alpha = .93$), TB subscale ($\alpha = .92$), and PB subscale ($\alpha = .91$) all had excellent internal consistency.

TB was also measured using a 22-item pilot version of the Thwarted Belongingness Scale (TBS) that assesses TB on a scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher ratings indicate greater TB (range 22-154). In this sample, the pilot version of the TBS had excellent internal consistency ($\alpha = .97$).

5.2.2.3 Analysis. The item pool selected after expert feedback consisted of 22 items. The psychometric properties of these items were initially established in a sample of community-dwelling Australian adults using Exploratory Factor Analysis (EFA, principal axis) alongside the INQ-15 9-item TB subscale to explore factor structure and identify items loading most strongly on the TB factor. Principal axis factoring (PAF) was used as it has been shown to generally outperform maximum likelihood factor analysis (MLFA) for relatively simple factor patterns or when weak factors are present (de Winter & Dodou, 2012). Parallel Analyses with 1000 datasets specified on a permutation of the original raw data set using O'Connor (2000) SPSS syntax for parallel analysis was conducted to determine the number of factors selected. Inter-item correlations between the top TB items (≥ 0.78 loading) were inspected for item redundancy. Items that displayed a significant correlation of ≥ 0.70 with another item that measured the same sub-theme of TB were systematically compared and removed from the final scale by the author. The eight items that remained after these analyses formed the Thwarted Belongingness Scale (TBS). Descriptive analysis and EFA were conducted using SPSS v21 (IBM Corp, 2012).

5.2.3 Study 2.

5.2.3.1 Participants and procedure.

Sample 2. Australian adults (N = 747; 81% female) aged 18 years and over and fluent in English were recruited using the same Facebook recruitment methods detailed in Study 1. The only difference was the advertised length of the survey (30 minutes), date of placement (December 2016 to January 2017), and addition of measures for suicide ideation and attempt, history of mental health, depression and anxiety, psychological distress, self-hatred, capability for suicide, defeat and entrapment, social support, meaning in life, motivations for volunteering, wellbeing, and resilience. The

study received ethics approval from the ANU Human Research Ethics Committee (protocol #2016/387).

5.2.3.2 Measures.

***Sociodemographic variables*.** Same as Study 1.

Interpersonal risk factors. As in study 1, thwarted belongingness (TB) and perceived burdensomeness (PB) were measured using the INQ-15 (Van Orden, Cukrowicz, et al., 2012). In this sample, the INQ-15 (α = .93), TB subscale (α = .91), and PB subscale (α = .94) had excellent internal consistency.

TB was also measured using the TBS, as established in Study 1 (Appendix S). In this sample, the TBS had excellent internal consistency (α = .94).

Capability for suicide (CS) was measured using the Acquired Capability for Suicide Fearlessness About Death scale (ACSS-FAD; Ribeiro, Witte, Van Orden, Selby, et al., 2014) consisting of seven items that measure fearlessness about engaging in potentially lethal self-harmful behaviours on a scale from 0 (*not at all like me*) to 4 (*very much like me*). Higher scores indicate greater capability for suicide (range 0-28). In this sample, the ACSS-FAD had acceptable internal consistency (α = .79).

Suicide outcome measures. Suicide ideation was measured using the SIDAS (van Spijker et al., 2014), which consists of five items that measure the frequency, controllability, and distress of suicidal thoughts, closeness of making an attempt, and impact on daily functioning experienced in the past month on a scale from 0 (*never*) to 10 (*always*). Higher scores indicate more severe suicidal thoughts (range 0-50). The SIDAS has strong internal consistency and convergent validity with other measures of suicide and psychological distress (van Spijker et al., 2014). It demonstrated excellent internal consistency (α = .91).

Suicide attempt was measured using the sixth item from the C-SSRS (Posner et al., 2011) that assesses whether the individual has done anything, started to do anything,

or prepared to do anything to end their life in the past three months on a *yes*/*no* scale. The C-SSRS has good convergent and divergent validity with other multi-informant suicidal ideation and behaviour scales, and high sensitivity and specificity for suicidal behaviour classifications (Posner et al., 2011).

5.2.3.3 Analysis. Comparisons between individuals with and without suicidal thoughts/behaviours were analysed using chi-square statistics for dichotomous variables, and independent-samples *t*-tests for continuous variables. 'Prefer not to answer' responses were treated as missing.

Uni-dimensional Confirmatory Factor Analyses (CFA) was conducted to obtain fit statistics for the previously identified EFA one-factor TB model. To ascertain how the TBS compared to the INQ TB subscale, three competing TB models were tested: the INQ TB subscale (9 items), the 8-item TBS scale, and both TB scales combined (17 items). Weighted Least Squares with Mean and Variance adjustment (WLSMV) estimation was used, with items treated as categorical given their Likert scale format. Bi-factor exploratory analyses (EFA) on the competing TB models were conducted to complement the CFA and explore whether the dataset was sufficiently uni-dimensional for Item Response Theory (IRT) analysis as recommended by Reise, Morizot, and Hays (2007). Two-factor against three-factor, and three-factor against four-factor models were compared for the INQ TB subscale (9 items), the 8-item TBS scale, and both TB scales combined (17 items). WLSMV estimation and Bi-Geomin Orthogonal rotation were used, with items treated as categorical given their Likert scale format. Uni-dimensionality of the TBS and combined scales were computed using Explained Common Variance (ECV) to determine the proportion of common variance across items explained by the TB general dimension.

Model based reliability for the TBS was calculated using the Omega Hierarchical for the total score (ωH), which reflects the proportion of total score

variance that can be attributed to the general factor (i.e., TB) after accounting for all additional first order factors (i.e., group factors) that may share variance.

The Comparative Fit Index (CFI: >.90 acceptable, >.95 excellent; Bentler, 1990), Tucker Lewis Index (TLI: >.90 acceptable, >.95 excellent; Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA: <.08 acceptable, <.05 excellent; Browne & Cudeck, 1993), and Standardised Root Mean Square Residual (SRMR: <.08 acceptable, <.05 good; Hu & Bentler, 1999; Kline, 1998) goodness-of-fit indices were used in the CFA and EFA to assess degree of fit between the models and sample.

IRT analysis was conducted to compare measurement precision across the 8-item TBS and INQ TB subscale. IRT is a model-based method for describing the relationship between individual items on a scale to the construct being measured, the individual's levels on the latent trait (i.e., TB) and their response to the scale items. IRT is known for addressing practical measurement problems characteristic of classical test theory methods, providing richer and more accurate descriptions of item-and scale-level performance (Hambleton & Jones, 1993). The graded response model was used to calibrate item parameter estimates for the TBS and INQ TB subscale given their ordered polytomous response format. Item fit was evaluated using polytomous extensions of the $S\text{-}\chi^2$ (Pearson's chi-square; Orlando & Thissen, 2003). Individual information function curves of all the items for each scale were summed separately to create test information function curves for the two TB scales. To test the reading grade of the TBS compared to the INQ TB, The Flesch Kincaid Reading Ease test was used (Flesch, 1948; score = 0-100, higher scores indicate text is easier to read). The CFA, bi-factor EFA, and IRT analyses used all available participant data on the thwarted belongingness items (pairwise deletion).

Lastly, due to the over-dispersion and the presence of excess zeros for the suicide ideation outcome (INQ TB: LR $\chi^2 = 934.75$, $df = 1$, $p < 0.01$; TBS: LR $\chi^2 =$

927.10, $df = 1$, $p < 0.01$), zero inflated negative binomial regression models were used to test the IPTS hypotheses regarding suicide ideation (past month). Logistic regression models were used to test the IPTS hypotheses regarding suicide attempt (past three months). Based on IPTS hypotheses, the ideation model included the main effects of TB (differentially assessed by INQ TB subscale or TBS), PB, and their two-way interaction. The suicide attempt model included the main effects of TB (differentially assessed by INQ TB subscale or TBS), PB, CS, and their two and three-way interactions. IPTS variables were standardised to have a mean of 0 and *SD* of 1 to aid interpretation. The zero inflated negative binomial and logistic regression models were conducted on participants with complete responses across the suicide and interpersonal risk factor outcomes ($n = 561$; listwise deletion). Descriptive analysis and logistic regressions were conducted using SPSS v21 (IBM Corp, 2012). Zero inflated negative binomial regression models were conducted using STATA v14 (StataCorp, 2015). CFA and IRT analyses were conducted using MPlus v8 (Muthén & Muthén, 1998-2017) and R v2.15.2 (R Core Team, 2012).

5.3 Results

5.3.1 Study 1.

5.3.1.1 Participants. The paid Facebook advertisements reached 3,029 people and resulted 20 link clicks. Out of the 284 participants, over half reported being between the ages of 18 and 29 years old (55%), and over a third reported being between the ages of 30 to 60+ years (37%). Approximately half of the participants reported working either full or part time (48%), and over half reported having completed up to an associate/trade degree or diploma (63%) or not being in a relationship (61%) (Table 5.1).

5.3.1.2 Exploratory factor analysis and inter-item correlations. The 22 candidate items for the Thwarted Belongingness Scale (TBS) and 9 items of the

Interpersonal Needs Questionnaire thwarted belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012) were subjected to an Exploratory Factor Analysis (EFA), principal axis. Prior to performing the EFA, suitability of the data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .96, exceeding the recommended value of .6 (Kaiser, 1970, 1974), and Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix. EFA revealed the presence of three factors with eigenvalues exceeding 1: 18.95, 1.41, and 1.30, explaining 61.13%, 4.55%, and 4.22% of the variance respectively. An inspection of the scree plot revealed a clear break after the first factor. Parallel analyses generated three eigenvalues: 18.69, 1.16, and 1.03. Based on Cattell's (1966) scree test, the presence of a primary factor with eigenvalue approximately 14 times larger than the second and third factors, and the study's aim of identifying a theoretically driven one-factor model for thwarted belongingness, one factor was retained for further investigation.

Sixteen TB items displayed a loading of ≥ 0.78 in the one-factor model. Out of these, a total of eight items were eliminated due to item redundancy, resulting in an 8-item self-report scale for thwarted belongingness, the TBS (Appendix S).

5.3.2 Study 2.

5.3.2.1 Participants. The paid Facebook advertisements reached 58,362 people and resulted 1,417 link clicks. Out of the 747 participants, approximately a quarter reported being between the ages of 18 and 29 years old (26%), and over a third between the ages of 30 to 49 years (34%) or 50 years and over (40%). Approximately half of the participants reported working either full or part time (50%) and having completed up to an associate/trade degree or diploma (46%). Over half of the participants reported not being in a relationship (58%).

Participants reporting suicidal thoughts/behaviours (n = 349) differed significantly to participants reporting no suicidal thoughts/behaviours (n = 219) in terms of younger age, gender (higher percentage of males), less employment, less education, more likely to be unmarried, and greater history of recent suicide attempt. Participants reporting suicidal thoughts/behaviours also had significantly higher levels of thwarted belongingness measured by the INQ TB (mean difference = -11.88, 95% CI: -13.88 to -9.89) and TBS (-14.11, 95% CI: -16.25 to -11.98), perceived burdensomeness (PB; mean difference = -10.91, 95% CI: -12.19 to -9.63), capability for suicide (CS; mean difference = -1.88, 95% CI: -2.99 to -0.77), and suicide ideation (past month; mean difference = -16.18, 95% CI: -17.47 to -14.90) (Table 5.1).

Table 5.1. Sample descriptives

	Sample 1 (N = 284)	**Sample 2 (N = 747)**	**Sample 2 No suicidal thoughts /behaviours (*n* = 219)**	**Sample 2 Suicidal thoughts/ behaviours (*n* = 349)**		
Variable	***F* (%) or *M* (*SD*)**	***F* (%) or *M* (*SD*)**	***F* (%) or *M* (*SD*)**	***F* (%) or *M* (*SD*)**	***χ²* / *t***	***p***
Age					11.565	**0.04**
18-24	133 (46%)	114 (15%)	22 (10%)	62 (17%)		
25-29	24 (8%)	80 (10%)	26 (11%)	38 (10%)		
30-39	35 (12%)	108 (14%)	34 (15%)	43 (12%)		
40-49	30 (10%)	146 (19%)	40 (18%)	77 (22%)		
50-59	40 (14%)	180 (24%)	53 (24%)	83 (23%)		
60 and over	22 (7%)	119 (15%)	44 (20%)	46 (13%)		
Gender					3.947	**0.04**
Male	33 (11%)	118 (15%)	28 (12%)	68 (19%)		
Female	243 (85%)	612 (81%)	187 (85%)	273 (78%)		
Other	8 (2%)	15 (2%)	2 (0.9%)	8 (2%)		
Prefer not to answer	N/A	2 (0.3%)	2 (0.9%)			

Employment					28.007	**<0.01**
Full-time	71 (25%)	204 (27%)	77 (35%)	86 (24%)		
Part-time	67 (23%)	171 (22%)	48 (21%)	76 (21%)		
Unemployed, seeking work	17 (6%)	55 (7%)	9 (4%)	37 (10%)		
Student	90 (31%)	124 (16%)	36 (16%)	58 (16%)		
Retired	15 (5%)	77 (10%)	29 (13%)	25 (7%)		
Not in the workforce	20 (7%)	106 (14%)	17 (7%)	64 (18%)		
Prefer not to answer	4 (1%)	10 (1%)	3 (1%)	3 (0.9%)		
Education					12.826	**<0.01**
No formal education	N/A	3 (0.4%)	0 (0%)	1 (0.3%)		
Primary school	1 (.4)	3 (0.4%)	1 (.5%)	1 (0.3%)		
Some of high school	23 (8%)	52 (7%)	9 (4%)	27 (7%)		
Completed high school	92 (32%)	103 (13%)	23 (10%)	51 (14%)		
Associate/trade degree or diploma	65 (22%)	186 (24%)	50 (22%)	93 (26%)		
Bachelors degree	57 (20%)	209 (28%)	57(26%)	92 (26%)		
Postgraduate degree	44 (15%)	188 (25%)	79 (36%)	81 (23%)		
Prefer not to answer	2 (.7%)	3 (0.4%)	0 (0%)	3 (0.9%)		

Relationship status					23.916	**<0.01**
Married	50 (17%)	189 (25%)	79 (36%)	66 (18%)		
De facto	50 (17%)	109 (14%)	29 (13%)	52 (14%)		
Single, never married	128 (45%)	259 (34%)	56 (25%)	139 (39%)		
Separated or divorced	42 (14%)	152 (20%)	44 (20%)	75 (21%)		
Widowed	5 (1%)	24 (3%)	7 3%)	10 (2.9%)		
Prefer not to answer	9 (3%)	14 (1%)	4 (1%)	7 (2%)		
Thwarted belongingness						
INQ TB	32.51 (12.92)	35.77 (13.01)	28.45 (11.91)	40.34 (11.66)	-11.726	**<0.01**
TBS	71.89 (34.20)	29.24 (14.26)	20.59 (12.41)	34.71 (12.65)	-12.999	**<0.01**
Perceived burdensomeness (INQ PB)	13.22 (6.65)	16.20 (10.29)	9.35 (5.45)	20.26 (10.04)	-16.718	**<0.01**
Capability for suicide (ACSS-FAD)	N/A	16.04 (6.55)	14.90 (6.59)	16.79 (6.52)	-3.344	**<0.01**
Suicide ideation (SIDAS)	N/A	9.94 (12.37)	N/A	16.19 (12.18)	-24.831	**<0.01**
Suicide attempt (C-SSRS)					45.123	**<0.01**
No	N/A	499 (66%)	218 (99%)	281 (81%)		
Yes	N/A	66 (8%)	N/A	66 (18%)		

Note. Bold values indicate $p < 0.05$ for χ^2 tests or *t*-tests between Study 2 no suicidality/suicidality group

5.3.2.2 Confirmatory factor analyses (CFA) & bi-factor exploratory analysis (EFA).

For the bi-factor EFA, the general factor with two group factors was best fitting. The Explained Common Variance (ECV) for the TBS (0.87) was greater than the recommended ECV of .85 (Stucky et al., 2014; 2015), indicating that the TBS was sufficiently uni-dimensional. Additionally, the Omega Hierarchical (ωH) for the TBS (0.94) was greater than .75, indicating that the TBS total score predominantly reflected the single general factor of TB and could be interpreted as a sufficiently reliable measure of this interpersonal risk factor (Reise, Scheines, Widaman, & Haviland, 2013). The combined INQ TB and TBS items yielded a ωH of 0.95, indicating that the TBS captured the same general factor as the INQ TB.

The comparative fit indices (CFI and TLI) were excellent (>.95) for the TBS scale in the uni-dimensional CFAs and for all three TB scale models in the bi-factor EFAs. For the bi-factor EFAs, the SRMR values of absolute fit were good (<.05) across all three TB models, displaying best fit for the INQ TB and TBS models. However, the parsimony corrected fit index (RMSEA) indicated poor fit (>.08) across all three TB models in both uni-dimensional CFA and bi-factor EFA analyses (Table 5.2).

Inspection of the residual correlation matrices indicated that for the INQ TB, two items ("These days, I feel disconnected from other people" and "These days, I often feel like an outsider in social gatherings") had a correlation of 0.28 after accounting for the correlation between items through the latent factors, suggesting these items assess similar things. All residual correlations for the TBS were below 0.20 (range = -0.06 to 0.12).

Table 5.2. Study 2 fit statistics across three thwarted belongingness (TB) models using confirmatory factor (CFA) and bi-factor exploratory analyses (EFA)

Model	CFI	TLI	RMSEA (90% CI)	SRMR
Unidimensional CFA				
INQ TB (N = 662)	0.917	0.890	0.236 (0.224-0.249)	N/A
TBS (N = 578)	0.980	0.972	0.203 (0.188-0.219)	N/A
Combined (N = 578)	0.934	0.924	0.176 (0.170-0.183)	N/A
Bi-factor EFA				
INQ TB (N = 662)	0.998	0.986	0.083 (0.057-0.112)	0.009
TBS (N = 578)	0.998	0.992	0.105 (0.079-0.133)	0.009
Combined (N = 578)	0.986	0.974	0.104 (0.096-0.112)	0.020

Note. CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardised Root Mean Square Residual.

5.3.2.3 Item response theory (IRT) and reading grade analysis. Table 5.3 displays the parameter estimates for the TBS using a graded response model. Using the polytomous extension of the $S–\chi^2$ statistic, one item (4. "I feel there is no one I can talk to") was identified as misfitting at $p < 0.05$. Test information function curves for the TBS indicated that almost double the level of information was gained along the trait region associated with Θ = -1.5 to 1.5 compared to the INQ TB. However, slightly less information was gained in regions below Θ = -1.5 and above 2, suggesting that that the TBS is good at assessing individuals with moderate to high levels of thwarted belongingness, but that the INQ TB provides slightly more information in the lower and high trait regions.

The TBS consisted of 8 sentences and 49 words. It included 3 complex words (6.12%), 6.13 average words per sentence, and 1.31 syllables per word. The Flesch Kincaid Reading Ease grade for the TBS was 90.1 out of 100, with a US school grade level of 2.2 (easily understood by 8 to 9 year olds). The INQ TB consisted of 9 sentences and 91 words. It included 9 complex words (9.89%), 10.11 average words per

sentence, and 1.41 syllables per word. The Flesch Kincaid Reading Ease grade for the INQ TB was 77.6 out of 100, with a grade level of 5 (easily understood by 11 to 12 year olds).

Table 5.3. Study 2 parameter estimates for the Thwarted Belongingness Scale (TBS) using a graded response model (N = 578)

Item	*a*	*b*1	*b*2	*b*3	*b*4	*b*5	*b*6	S-χ^2	*p*
1. I feel isolated	3.31	-1.15	-0.69	-0.35	0.06	0.38	0.90	120.52	0.08
2. I don't matter to other people	4.43	-0.68	-0.16	0.12	0.47	0.80	1.28	90.01	0.31
3. Nobody cares about me	4.08	-0.41	0.08	0.39	0.73	1.10	1.64	107.60	0.08
4. I feel there is no one I can talk to	3.11	-0.87	-0.30	0.03	0.38	0.67	1.21	142.01	**0.03**
5. I don't fit in	2.96	-1.28	-0.85	-0.41	0.09	0.39	0.93	111.60	0.27
6. I don't play an important role in other people's lives	3.02	-0.76	-0.16	0.18	0.60	0.97	1.49	123.91	0.14
7. I am not close to anyone	2.85	-0.78	-0.20	0.16	0.60	0.87	1.57	122.24	0.20
8. I am alone in this world	3.00	-0.69	-0.19	0.10	0.44	0.77	1.31	128.35	0.17
Value ranges	[2.85, 4.43]	[-1.28, -0.41]	[-0.85, 0.08]	[-0.41, 0.39]	[0.06, 0.73]	[0.38, 1.10]	[0.90, 1.64]		

Note. a = item discrimination (how well an item can differentiate between examinees at different trait levels)*;* b_x = item location (where the item functions best along the trait scale)*;* $S-\chi^2$ = Pearson's chi-square; bold values indicate $p < 0.05$.

5.3.2.4 Comparison of TB scales in tests of the IPTS. Zero inflated negative binomial regression models were used to assess associations of the interpersonal risk factors (TB, PB, and their two-way interaction) with severity of suicide ideation reported in the past month as differentially measured by the INQ TB subscale and the TBS. A fifth of the participants (20%) reported a SIDAS severity score in the extreme range (≥ 21; $M = 16.19$, $SD = 12.18$) (van Spijker et al., 2014). The zero inflated negative binomial regression model with all three predictors was significant for the INQ TB subscale (LR $\chi^2 = 165.85$, $df = 3$, $p < 0.01$) and TBS (LR $\chi^2 = 165.68$, $df = 3$, $p < 0.01$). As shown in Table 5.4, the two-way interaction of TB and PB made a significant contribution in both INQ TB ($\beta = -0.14$, $p < 0.01$) and TBS models ($\beta = -0.14$, $p < 0.01$) (Figure 5-2). Respondents who reported experiencing high levels of both TB and PB had more severe levels of suicide ideation (over the past month) compared to those who reported low levels of TB and PB. Interestingly, participants reporting high levels of PB but low levels of TB had similar severity of suicide ideation, suggesting that high levels of PB confer considerable risk irrespective of TB levels.

Table 5.4. Zero inflated negative binomial regression models testing the predictions of the Interpersonal-Psychological Theory for suicidal ideation using the Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012) and Thwarted Belongingness Scale (TBS)

	INQ TB model (N = 561)			TBS model (N = 561)		
Negative binomial regression	Estimate	Wald χ^2	*p*	Estimate	Wald χ^2	*p*
Intercept	2.41	153.00	**<0.01**	2.41	158.62	**<0.01**
TB	0.17	1.25	**<0.01**	0.19	0.60	**<0.01**
PB	0.58	52.32	**<0.01**	0.57	42.52	**<0.01**
TB × PB	-0.14	0.54	**<0.01**	-0.14	0.01	**<0.01**
Logistic regression for zero inflation						
Intercept	-1.09	N/A	**<0.01**	-1.12	N/A	**<0.01**
TB	-0.29	N/A	0.08	-0.39	N/A	**0.02**
PB	-1.64	N/A	**<0.01**	-1.54	N/A	**<0.01**
TB × PB	0.35	N/A	0.06	0.38	N/A	**0.04**

Note. Estimates are unstandardised; *p* values are based on Wald χ^2 from negative binomial regression models; bold values indicate $p < 0.05$; TB = Thwarted Belongingness, PB = Perceived Burdensomeness, ×= interaction, N/A = Not applicable.

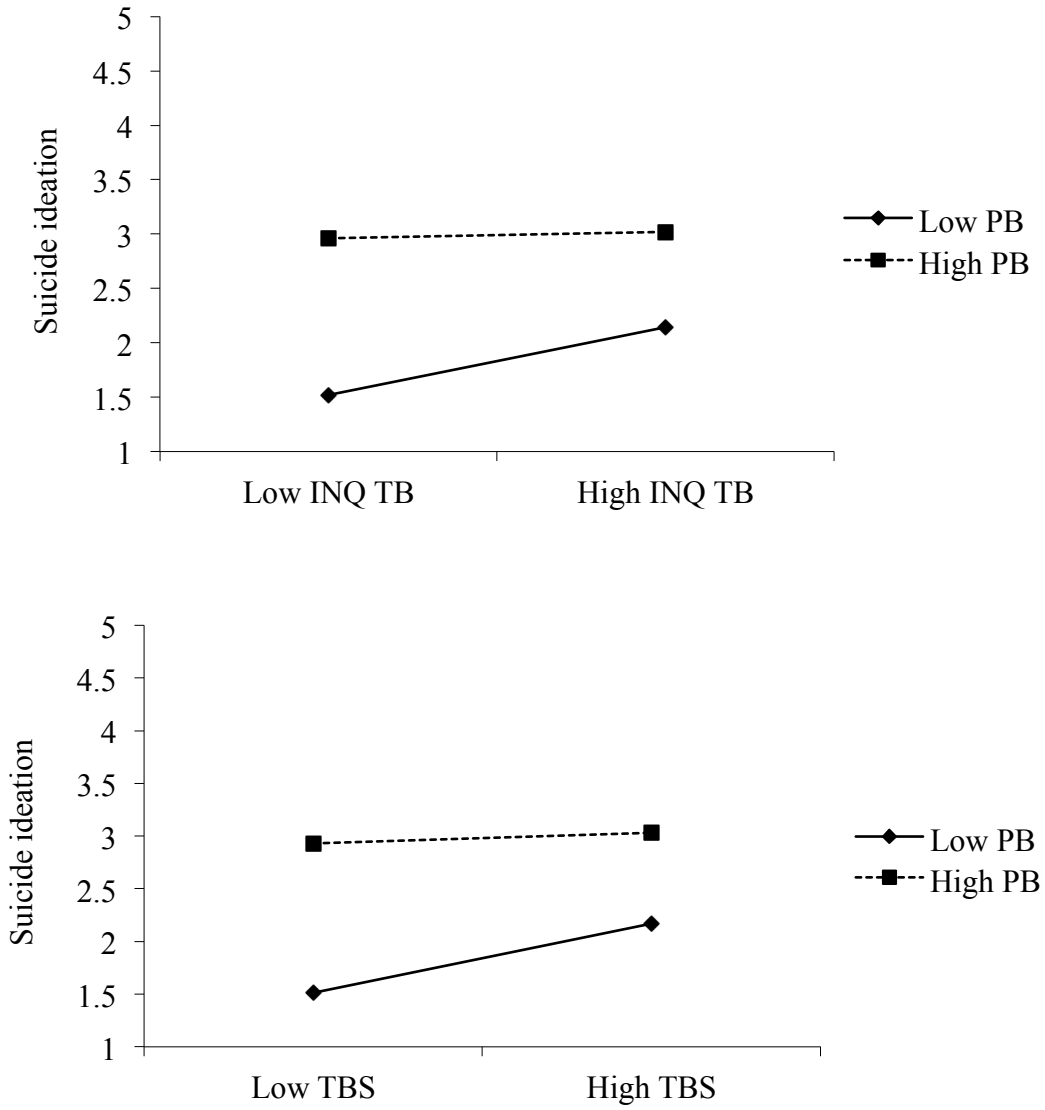

Figure 5-2. Study 2 two-way interaction between thwarted belongingness (INQ TB, top; TBS, bottom) and perceived burdensomeness on suicide ideation (past month)

Logistic regression models were used to assess associations of the interpersonal risk factors (TB, PB, CS, and their two-way and three-way interactions) with the likelihood that respondents reported suicide behaviour in the past three months. Sixty-six participants (11%) reported having 'done anything, started to do anything, or prepared to do anything to end their life' in the past three months. The full model containing all eight predictors was statistically significant for the INQ TB model, χ^2 (7, N = 561) = 116.79, $p < .001$, and the TBS model, χ^2 (7, N = 561) = 114.48, $p < 0.01$).

The INQ TB model explained between 18.8% (Cox and Snell R^2) to 36.5% (Nagelkerke R^2) of the variance in suicide attempt, and correctly classified 89.5% of cases. The TBS model explained between 18.5% (Cox and Snell R^2) to 35.8% (Nagelkerke R^2) of the variance in suicide attempt, and correctly classified 89.7% of cases. As shown in Table 5.5, the three-way interaction between TB, PB and CS was not significant in the INQ TB (β = -0.20, p = 0.28) or TBS model (β = -0.25, p = 0.16).

Table 5.5. Logistic regression models for suicide attempt versus no attempt using the Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012) and Thwarted Belongingness Scale (TBS)

INQ TB model (N = 561)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.38	0.26	1.46 [0.88, 2.44]	0.14
PB	1.27	0.22	3.56 [2.29, 5.52]	<0.01***
CS	0.59	0.24	1.81 [1.12-2.94]	0.01**
TB × PB	-0.01	0.20	0.98 [0.65-1.46]	0.93
CS × TB	-0.18	0.24	0.83 [0.51-1.35]	0.46
CS × PB	0.02	0.21	1.02 [0.67-1.54]	0.91
TB × PB × CS	-0.20	0.18	0.81 [0.56-1.18]	0.28
TBS model (N = 561)	**Estimate**	***SE***	**Odds ratio**	***p***
TB	0.19	0.24	1.21 [0.74-1.97]	0.42
PB	1.29	0.21	3.66 [2.38-5.62]	<0.01***
CS	0.56	0.23	1.75 [1.09-2.80]	0.01**
TB × PB	0.04	0.18	1.04 [0.72-1.50]	0.80
CS × TB	0.08	0.24	1.09 [0.67-1.77]	0.72
CS × PB	-0.03	0.20	0.96 [0.64-1.43]	0.85
TB × PB × CS	-0.25	0.18	0.77 [0.54-1.10]	0.16

Note. TB = Thwarted Belongingness, PB = Perceived Burdensomeness, CS = Capability for Suicide, ×= interaction. * $p < 0.05$ ** $p < 0.025$ *** $p < 0.01$.

5.4 Discussion

There is currently a need to expand the availability of valid measurement approaches for assessing interpersonal suicide risk. Additional measures can help provide enhanced identification of interpersonal risk and aid suicide screening and prevention efforts. The present study aimed to develop and validate a new self-report scale for the interpersonal risk factor of thwarted belongingness (TB) in a large community population, and provide a comparative test of the Interpersonal Psychological Theory of Suicide using this scale (IPTS; Joiner, 2005; Van Orden et al.,

2010). From an initial pool of 42 TB items, an 8-item scale (TBS) was developed through consecutive stages of refinement via expert feedback and validation studies in Australian community-based adult samples.

Confirmatory (CFA) and bi-factor exploratory analysis (EFA) supported the uni-dimensionality of the 8-item TBS, where it was found to measure a similar underlying latent construct (i.e., TB) as the Interpersonal Needs Questionnaire thwarted belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012). Model fit across the CFA and EFA TB models was difficult to discern as inconsistency was observed across fit indices. In the CFA, the Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) for the TBS suggested excellent fit compared to the INQ TB and combined INQ TB and TBS scales. In the bi-factor EFA, CFI and TLI suggested excellent fit for the TBS, the INQ TB, and combined TB scales. In addition, the Standardised Root Mean Square Residual (SRMR) measure of absolute fit was good across all the TB models in the bi-factor EFA. However, the Root Mean Square Error of Approximation (RMSEA) parsimony corrected fit index across all TB models indicated poor fit. One explanation for this inconsistency may be that the RMSEA is more sensitive to the presence of secondary dimensions, model complexity (e.g., number of items/estimated parameters) and data distribution compared to the CFI and TLI (Cook, Kallen, & Amtmann, 2009). As such, depending on the interpretational weight placed on the different indices, it could be concluded that the TBS either displays excellent fit in both uni-dimensional CFA and bi-factor EFA based on CFI and TLI indices, or similarly poor fit alongside all other TB models based on the RMSEA.

In regards to the range and level of information captured by the 8-item TBS compared to the INQ TB subscale, Item Response Theory (IRT) analysis indicated that the TBS captured approximately double the amount of information across moderate to high levels of TB compared to the INQ TB. However, this was at the expense of a

slightly narrower range, where the TBS was found to provide marginally less information in the extreme TB trait regions. This finding is particularly interesting as the TBS consisted of one less item and was approximately half the length of the INQ TB subscale, with a Flesch Kincaid Reading Ease grade indicating that the scale could be easily understood by eight to nine year olds. This finding suggests that the TBS may be a more efficient scale with greater applicability in low literacy populations compared to the INQ TB. Future studies exploring interpersonal suicide risk may benefit from using the TBS to assess TB in populations experiencing moderate to high levels of TB (e.g., clinical samples), and the INQ TB in populations expected to have low levels of TB (e.g., community samples).

The IRT findings for the two different TB scales also suggest that in order to retain uni-dimensionality as well as capture a high amount of information, TB may require individualised items/subscales for low, moderate, and high levels of the construct. This would have implications for screening individuals on their interpersonal suicide risk, as TB measures may not be sufficiently sensitive to detect TB in the extreme ranges. Here, developing a computerised adaptive version of the larger TB item bank may be a fruitful way to capture all levels of severity with sufficient precision whilst maintaining efficiency.

Tests of the IPTS hypotheses around suicide ideation provided support for the main effects of TB, perceived burdensomeness (PB) and their two-way interaction on suicide ideation (past month) when using the INQ TB subscale and TBS. Both TB models displayed similar beta-coefficients and significance levels across variables. Additionally, both significant two-way interaction effects showed that participants who experienced high levels of TB and PB had more severe levels of ideation compared to those with low levels of TB and PB. The two-way interaction effects also indicated that

participants with high levels of PB but low levels of TB had similar levels of ideation severity compared to those with high levels of TB and PB.

Tests of the IPTS hypotheses around suicide attempt provided support for the main effects of PB and capability for suicide (CS) when using the INQ TB subscale and TBS. Both models explained similar levels of variance in the suicide attempt outcome and displayed similar beta-coefficients, odds ratios, and significance levels across significant variables. Participants experiencing PB were three and a half times more likely to report a suicide attempt in the past three months, and those experiencing CS were over one and half times more likely to report a suicide attempt. Taken together, these findings provide support for the role of PB as a particularly pernicious interpersonal risk factor contributing to suicide ideation and attempt risk. When experienced at high levels, PB may confer equivalent levels of ideation risk irrespective of TB levels, and contribute double the risk to suicide attempt compared to CS. Given that PB and TB are considered amenable to change, future studies comparing the weight of risk attributed to PB and TB are needed as this could have implications on the way interpersonal suicide risk is screened and targeted for intervention (e.g., targeting PB may be given prominence over TB in high risk populations). The findings also lend support to the validity of INQ TB, although it was found to be a longer scale that captured less information than the TBS, with one item of the INQ TB identified as redundant.

5.4.1 Strengths and limitations. To my knowledge, this is the first study to provide an alternative self-report measure of TB outlined by the IPTS. As such, this study fills a much-needed gap in the IPTS and suicide literature base, and provides an additional interpersonal suicide risk screening option. Additional strengths of the study include the recruitment of two independent community-based samples during the item refinement and validation process, as well as the use of bi-factor EFA and IRT analysis

to provide a more robust assessment of uni-dimensionality and richer description of the TBS' performance compared to the INQ TB. However, the study also had several limitations. Despite recruiting community-based samples, there was an overrepresentation of females in both studies. In addition, suicide outcomes in tests of the IPTS had relatively short time frames (past month and past three months). However, given their proximal nature, these outcomes may exhibit less recall bias, and timeframes may be better aligned to the IPTS. Further validation of the TBS in other sub-samples and within longitudinal/prospective study designs are needed to further explore and support the performance of the TBS.

5.4.2 Conclusions. In this chapter, a new self-report measure for TB was developed and its psychometric properties were established through a systematic process of item selection and refinement, feedback from experts, identification of optimal items using a data-driven approach and validation in a general population sample. It was demonstrated that the TBS has the potential of providing enhanced identification of the interpersonal suicide risk factor of TB, particularly in individuals who display moderate to high levels of TB. Here, the TBS may aid in forming a robust assessment of suicide risk in conjunction with other validated interpersonal measures, with particular applicability to assessing TB in low literacy populations. In the following chapter, the TBS will be utilised alongside the INQ to assess the extent to which the interpersonal risk factors, when captured by these scales, are amenable to intervention-based change in a university student sample.

CHAPTER 6: The effects of a peer-support walking program on interpersonal suicide risk and wellbeing in university students: A pilot controlled trial

6.1 Introduction

In line with the thesis' dual aim of better identification and promoting suicide prevention through building interpersonal strengths, the present chapter focuses on the potential of utilising connectedness interventions, which may positively target feelings of thwarted belongingness and perceived burdensomeness more broadly by promoting feelings of belonging and mattering/contributing to others for suicide prevention in university settings. An existing university-based peer-support walking program ('Get Up & Go') will be introduced as a case-study of such an initiative, which aims to promote feelings of belonging and mattering/contribution in university students by providing regular opportunities for physical activity and social contact within a peer-support relationship. To evaluate the feasibility of the 'Get Up & Go' social connectedness intervention, the methods and results of a pilot controlled trial to examine the effect of the 'Get Up & Go' program in contributing to reduced interpersonal suicide risk (i.e., thwarted belongingness and perceived burdensomeness) and mental health symptoms, and increased levels of social support, school membership, wellbeing, and resilience will be presented.

University students are at elevated risk of experiencing mental health problems (Eisenberg, Gollust, Golberstein, & Hefner, 2007; Farrer et al., 2013; Stallman, 2010). Individuals aged 18 to 24 years have been identified as having the highest prevalence of mental illness in Australia (Australian Bureau of Statistics, 2007), and suicide is the most common cause of death globally for individuals aged 15 to 29 years (World Health Organization, 2014). Additionally, over three-quarters of people who experience a mental disorder in their lifetime first develop a disorder before the age of 25 years (Kessler et al., 2007). As a significant number of students begin their university

experience with pre-existing vulnerabilities (Drum, Brownson, Denmark, & Smith, 2009), early prevention is a key public health priority in this demographic.

Recently, connectedness, comprising both a subjective (i.e., sense of interpersonal closeness and relationship satisfaction) and structural component (i.e., network density and strength of ties), has been identified as a possible avenue for mental health promotion and suicide prevention in schools and universities (Whitlock et al., 2012; Whitlock et al., 2014). Feeling meaningfully connected to others has been identified as a protective factor that moderates the effect of distress on suicidality, as well as other processes central to mental and physical health problems (Drum, Brownson, Hess, Denmark, & Talley, 2017; Levi-Belz, 2015). For instance, connectedness to school has been found to be protective against suicidal thoughts and behaviours in adolescents cross-sectionally (Marraccini & Brier, 2017). Longitudinally, family connectedness has been found to be protective against suicide ideation in inpatient suicidal adolescents (Czyz, Liu, & King, 2012), and parental and family connectedness protective against suicide attempts in adolescents (Borowsky, Ireland, & Resnick, 2001; Kidd et al., 2006). Conversely, low levels of social support and interpersonal problems with family, peers, and the community are considered to be widely established risk factors for suicidal thoughts and behaviours, and other suicide-related risk factors such as alcohol and substance problems, hopelessness, and depression (King & Merchant, 2010).

In fact, the experience of loneliness and absence of reciprocally caring relationships is considered a major risk factor for the development of suicide. According to the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), active suicidal desire is caused by the simultaneous presence of: (1) thwarted belongingness (i.e., loneliness and the absence of reciprocally caring relationships), (2) perceived burdensomeness (i.e., self-hatred and the belief that one is a liability to

others), and hopelessness about these states. The development of suicide behaviour is said to result through the presence of an additional third construct: (3) capability for suicide (i.e., increased physical pain tolerance and reduced fear of death as a result of repeated exposure and habituation to physically painful and/or fear-inducing experiences). Thus, individuals who exhibit high levels of all three are said to be at most risk of lethal suicidal behaviour. Given that capability for suicide is not easily amenable to change, focusing efforts on fostering feelings of belonging (positively targeting feelings of thwarted belongingness) and mattering and contributing to others (positively targeting feelings of perceived burdensomeness) is considered an important area for suicide prevention (Stellrecht et al., 2006; Van Orden et al., 2010).

University based programs are ideally placed to provide students with prevention-based initiatives that promote student mental health and wellbeing and prevent suicide because of their capacity to increase students' sense of belonging to a caring social network (Whitlock et al., 2012). Most universities already support and provide a wide array of opportunities for students to become socially involved (e.g., sporting and interest clubs, campus-wide events, etc.). However, though many of these activities may be broadly geared towards promoting student connectedness, mental health, and wellbeing, rarely have they been empirically evaluated for their feasibility or effectiveness in influencing these outcomes. Additionally, programs that explicitly aim to alleviate student mental health burden primarily tend to be focused on identifying individuals who are most at-risk (e.g., via screening and gatekeeper training programs, increasing knowledge of warning signs), referring them to relevant professionals (e.g., referral to student counselling and other resources, lowering barriers to help-seeking), and ensuring treatment engagement (Stein et al., 2012). This places a disproportionate emphasis on assisting those in crisis as opposed to those who would benefit from prevention-based initiatives (Drum et al., 2009). As such, more prevention-based

initiatives that have been formally evaluated for their feasibility and efficacy are needed to benefit the larger student body in university settings.

The present study aimed to address this paucity of research by undertaking a pilot controlled trial to examine the feasibility of a university based peer-support walking program in reducing levels of interpersonal suicide risk (i.e., thwarted belongingness and perceived burdensomeness) and mental health symptoms, and increasing levels of social connectedness and wellbeing among university students through connecting students to a peer-supported walking buddy relationship in which they could belong and regularly contribute to. The study also aimed to explore program engagement and satisfaction quantitatively and qualitatively in the intervention group. To my knowledge, only two trials have been conducted with the specific aim of reducing interpersonal suicide risk: a pilot randomised controlled trial of a web-based psychosocial intervention targeting cognitions of perceived burdensomeness towards others in adolescents (Hill & Pettit, 2016), and a randomised trial of a peer companionship intervention in older adults (Van Orden et al., 2013). The former indicated that perceived burdensomeness could be modified via a psychosocial intervention, whilst findings of the latter trial have not yet been reported.

Given the established positive benefits of physical activity and social contact on mental health in the literature (Rebar et al., 2015; Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014; Teo, Choi, & Valenstein, 2013), it was hypothesised that participants in the intervention condition would have reduced levels of thwarted belongingness and perceived burdensomeness (primary outcomes) relative to the control at post-test. In terms of the study's secondary outcomes, it was also hypothesised that the intervention group would have reduced levels of depression, anxiety symptoms and psychological distress, and higher levels of social support, school membership, wellbeing, and resilience, relative to the control at post-test.

6.2 Method

6.2.1 Participants and procedures. Participants comprised 135 university students (68.9% female) aged 18 years and over, recruited from the Australian National University (ANU) 'Get Up & Go' peer-support walking program between July and August 2017. Sample characteristics are reported in Table 6.1. Information about the pilot evaluation study was advertised via email to all students registered for the Semester 2 iteration of the program (n = 206). Inclusion criteria were: currently an undergraduate or postgraduate student registered to take part in the Semester 2 'Get Up & Go' program. A diagram of recruitment, enrolment, and study procedures is presented in Figure 6-1.

Table 6.1. Participant demographics at baseline by condition

	Treatment (*n* = 122)		Control (*n* = 13)			
	Frequency or Mean	***%* or *SD***	**Frequency or Mean**	***%* or *SD***	***χ² / Mann-Whitney U test***	***p***
Sex					0.26	0.60
Male	36	26.7%	2	15.4%		
Female	92	68.1%	10	76.9%		
Age					1.34	0.51
18-24	98	72.6%	10	76.9%		
25-29	18	13.3%	2	15.4%		
30-39	9	6.7%	N/A	N/A		
40-49	3	2.2%	N/A	N/A		
50-59	1	0.7%	N/A	N/A		
60 and over	N/A	N/A	N/A	N/A		
Student status					3.47	0.06
Undergraduate	60	44.4%	9	69.2%		
Postgraduate	68	50.4%	3	23.1%		
International status					2.96	0.08

Domestic	47	34.8%	8	61.5%		
International	81	60.0%	4	30.8%		
Living on campus					2.76	0.09
No	80	59.3%	4	30.8%		
Yes	48	35.6%	8	61.5%		
Education					5.02	0.08
High school or associate/trade degree or diploma	56	41.5%	9	69.2%		
Bachelors degree	48	35.6%	3	23.1%		
Postgraduate degree	24	17.8%	N/A	N/A		
Employment					3.23	0.19
Full-time	12	8.9%	N/A	N/A		
Part-time	20	14.8%	4	30.8%		
Unemployed	96	71.1%	8	61.5%		
Retired	N/A	N/A	N/A	N/A		
Relationship status					0.00	1.00
In a relationship	7	5.2%	1	7.7%		
Not in a relationship	118	87.4%	11	84.6%		
Thwarted belongingness (INQ-15, TB subscale)	29.19	10.44	30.66	9.76	668.00	0.59

Perceived burdensomeness (INQ-15, PB subscale)	10.95	6.92	12.25	6.44	608.50	0.32
Thwarted belongingness (TBS)	19.10	10.94	20.63	10.50	596.50	0.54
Self-hate (SHS)	16.31	11.00	20.45	11.33	493.50	0.14
Depression & anxiety symptoms (PHQ4)	3.34	2.66	3.33	2.46	727.50	0.83
Psychological distress (DQ5)	12.24	4.58	12.41	4.16	721.00	0.82
Friend social support – Positive (SSS)	3.46	1.29	4.09	1.57	513.50	0.17
Friend social support – Negative (SSS)	8.68	1.57	9.18	1.40	573.00	0.41
Family social support – Positive (SSS)	2.86	1.29	2.45	.68	595.50	0.50
Family social support - Negative (SSS)	7.88	2.19	7.90	2.77	655.00	0.89
School membership (PSSM)	38.02	7.09	33.63	10.28	461.00	0.08
Wellbeing (WHO5)	13.94	5.47	14.16	4.96	755.00	0.99
Resilience (CD-RISC)	25.47	7.65	23.75	8.69	637.50	0.41

Note. N/A = Not applicable; *SD* = Standard deviation; χ^2 = Chi-square; *p* = significance value.

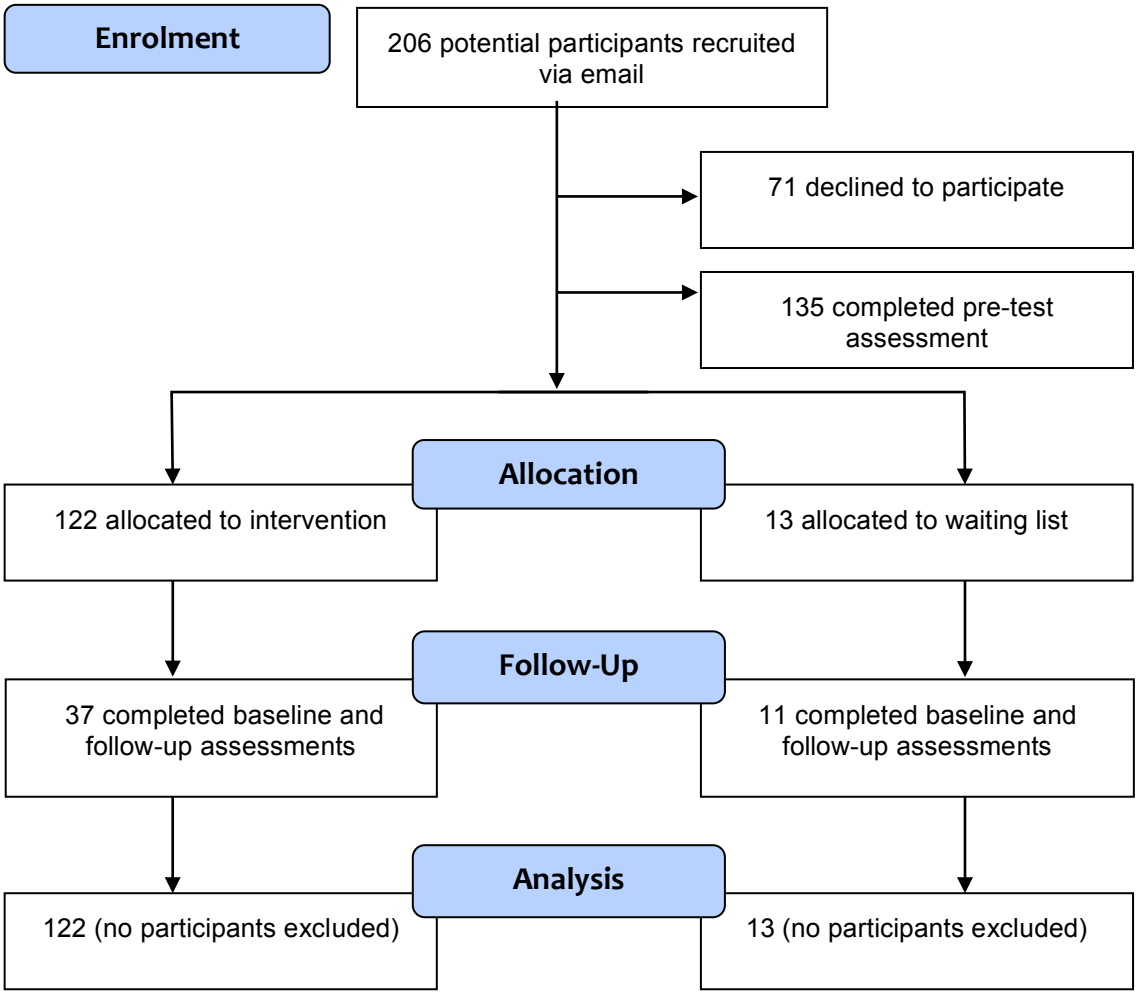

Figure 6-1. CONSORT flow diagram of recruitment, enrolment, and study procedures

The pilot study employed a two-arm, pre-post design with a waitlisted control. Participants were invited to complete two 15-minute online surveys assessing interpersonal risk factors for suicide (i.e., thwarted belongingness and perceived burdensomeness), depression and anxiety symptoms, psychological distress, social support, school membership, wellbeing, resilience, and a range of sociodemographic characteristics across two time points. As all registered students were expected to participate in the Semester 2 iteration of the program, a proportion of students were allocated to the waitlist control condition (n = 13) based on whether they had registered before a pre-determined cut-off date that would allow for a 6-week assessment period

before program commencement. Students who registered after this date were automatically allocated to the intervention condition (n = 122). Due to the limited number of early registrations, sample sizes across the two conditions were unequal. The intervention group received their baseline assessment 2 weeks prior to and 10 weeks after intervention commencement, and the control group received their pre-assessment 6 weeks prior and post-assessment 2 weeks prior to intervention commencement. For practical and ethical reasons, randomisation of participants to receive the program or not was unfeasible.

Written information about the study aims was provided to participants before they commenced the survey, along with a list of mental health resources. Informed consent was provided online. Two prizes of $50 gift cards were offered as an incentive for participants to complete the follow-up measure (administered between October and November 2017). The control group received the intervention immediately following their post assessment. The study received ethical approval from the ANU Science & Medical Delegated Ethics Review Committee (protocol 2017/242). The pilot trial was registered in the Australian New Zealand Clinical Trials Registry (Trial registration ID: ACTRN12617001637336).

6.2.2 The 'Get Up & Go' intervention. 'Get Up & Go' is a peer-support walking program offered by the Australian National University (ANU) Counselling Centre since 2006. The program aims to promote student mental health and wellbeing by providing ANU students with regular opportunities for physical activity and social contact – two recognised protective factors for depression (Rebar et al., 2015; Rosenbaum et al., 2014; Teo et al., 2013). Participants comprise both undergraduate and postgraduate ANU students who register their interest in participating as a walking partner each semester. Motivations for involvement have included social reasons (e.g., make friends), health and exercise reasons (e.g., keep fit), improving or managing mood

(e.g., reduce stress), or developing English skills and social networks. The program links participating students together as walking partners based on similar reported interests, prioritising partnerships between domestic and international students. Walks are then arranged between the students to take place on a weekly basis at a mutually convenient time and place. The intervention period runs for one university semester, where it is recommended that students walk for at least an hour a week during the semester, with walks taking place on weekdays, during daylight hours, and on or around the ANU campus. Participants are encouraged to keep up the exercise component of the program (as opposed to social only), and to move onto other exercise activities at the program's completion. Participation in the program is unlikely to increase feelings of perceived burdensomeness as participants are provided with support from the 'Get Up & Go' ANU Counselling Centre staff who monitor student progress, help students liaise with their partners and make rearrangements to program participation, and provide counselling services if needed. Since the program's inception, the number of participants has ranged from 44 to 182 per semester.

6.2.3 Measures.

Sociodemographic variables. Gender, age (18-24, 25-29, 30-39, 40-49, 50-59, 60 and over), student status (undergraduate or postgraduate), international status (domestic or international), campus living status (on or off campus), highest level of education (high school or associate/trade degree or diploma, bachelor's degree, or postgraduate degree), employment status (full-time, part-time, unemployed or retired), and relationship status (in or not in a romantic relationship) were measured.

Depression and anxiety symptoms. The Patient Health Questionnaire-4 (PHQ-4; Kroenke, Spitzer, Williams, & Löwe, 2009), consisting of four items that measure how often an individual has been bothered by symptoms of depression and anxiety over the past two weeks on a scale from 0 (*not at all*) to 3 (*nearly every day*) was used. Higher

scores indicate more severe symptoms of depression and anxiety (range 0-12). In this sample, the PHQ-4 demonstrated good internal consistency at baseline (α = .86) and post-test (α = .88).

Psychological distress. The Distress Questionnaire-5 (DQ5; Batterham et al., 2016), consisting of five items that measure how often an individual felt overwhelmed by worries, hopeless, upset by social settings, trouble staying focused, and interference at work or home due to anxiety or fear over the past 30 days on a scale from 1 (*never*) to 5 (*always*) was used. Higher scores indicate greater psychological distress (range 5-25). In this sample, the DQ5 demonstrated good internal consistency at baseline (α = .87) and excellent levels at post-test (α = .90).

Interpersonal risk factors. Thwarted belongingness (TB) and perceived burdensomeness (PB) were measured using the INQ-15 (Van Orden, Cukrowicz, et al., 2012) consisting of nine items that assess TB and six that assess PB on a scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher ratings indicate greater TB (range 9-63) and PB (range 6-42). At baseline, the INQ-15 (α = .88) and TB subscale (α = .87) displayed good internal consistency, and the PB subscale had excellent internal consistency (α = .94). At post-test, the INQ-15 (α = .93), TB subscale (α = .91), and PB subscale (α = .95) displayed excellent internal consistency.

TB was additionally measured using a newly developed scale, the Thwarted Belongingness Scale (TBS; Ma, Batterham, Calear, & Sunderland, in submission), consisting of eight items that assess TB on a scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher ratings indicate greater TB (range 8-56). PB was additionally measured using the newly developed Self-Hate Scale (SHS; Turnell, Fassnacht, Batterham, Calear, & Kyrios, in submission) consisting of seven items that assess self-hatred (e.g., ‘not proud of myself,’ ‘ am a failure,’ ‘hate myself’) on a scale from 1 (*not at all true for me*) to 7 (*very true for me*). Higher ratings indicate greater levels of self-

hatred (range 7-49). At baseline and post-test, the TBS (α = .94; .95) and SHS scales (α = .95; .92) displayed excellent internal consistency.

Wellbeing. The World Health Organisation (Five) Well-Being Index (WHO-5; World Health Organization, 1998) consisting of five items that measure how often an individual has been feeling cheerful, calm, active, fresh, and that daily life is filled with interesting things over the last two weeks on a scale from 0 (*at no time*) to 5 (*all of the time*) was used. Higher scores indicate better well-being (range 0-25). In this sample, it demonstrated excellent internal consistency at baseline (α = .91) and good levels at post-test (α = .88).

Resilience. The Connor-Davidson Resilience Scale (CD-RISC10; Campbell-Sills & Stein, 2007; Connor & Davidson, 2003), consisting of 10 items that measure how much an individual agrees with their ability to adapt to and cope with situations over the last month from *0* (*not true at all*) to 4 (*true nearly all the time*) was used. Higher scores indicate greater resilience (range 0-40). In this sample, it demonstrated excellent internal consistency at baseline (α = .92) and post-test (α = .91).

Social support. The Supportive and Negative Interactions with Relatives and Friends scale (Schuster, Kessler, & Aseltine, 1990) consisting of 10 items that measure the frequency of supportive and negative interactions from family and friends on a scale from 0 (*never*) to 3 (*often*) was used. Supportive and negative interactions were summed separately for family (2 items supportive, 3 items negative) and friends (2 items supportive, 3 items negative), with higher scores indicating greater supportive or negative interactions respectively. At baseline, the supportive subscales demonstrated good internal consistency for family (Spearman-Brown = .82) and acceptable levels for friends (Spearman-Brown = .78), whilst the negative subscales demonstrated acceptable levels for family (Spearman-Brown = .79) and poor levels for friends (Spearman-Brown = .58). At post-test, the supportive subscales demonstrated acceptable internal

consistency for family (Spearman-Brown = .74) and good levels for friends (Spearman-Brown = .86), and the negative subscales displayed good levels for family (Spearman-Brown = .80) and questionable levels for friends (Spearman-Brown = .69).

School membership. The Psychological Sense of School Membership (PSSM; Goodenow, 1993; Hagborg, 1994) consisting of 11 items that measure how much an individual agrees with statements about their sense of belonging to the school (e.g., feel part of, treated with respect) on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*) was used. In this study, the PSSM was adapted for the ANU context. Higher scores indicate greater sense of school membership (range = 11-55). In this sample, it demonstrated good internal consistency at baseline ($\alpha = .88$) and excellent levels at post-test ($\alpha = 0.94$).

Feedback. A feedback form on the 'Get Up & Go' program was administered to the intervention group ($n = 122$) at post-test. The feedback form consisted of a series of closed and open-ended questions assessing the level of participation in the program (e.g., how many weeks, how often during the week, how long), partner and program satisfaction (e.g., satisfaction with interactions, level of partner connectedness), program benefits (e.g., new strategies and skills, positive experience to meet other students, received help, supported studies/work), and areas for improvement (e.g., what was most useful or enjoyable and how could Get Up & Go be improved in future semesters?).

6.2.4 Analysis. Group differences at baseline were examined using chi-square statistics for dichotomous variables, and Mann-Whitney U tests for continuous variables. Where applicable, Yates correction for continuity was used to adjust for expected cell frequencies below 5.

To assess the effect of the intervention on each outcome measure in comparison to the control group, linear mixed model repeated measures analyses was used. Primary

and secondary outcomes were analysed on an intention-to-treat basis, using all available measurement points for each participant irrespective of program adherence or trial dropout. Models included the fixed effects of time (pre-test and post-test), condition (intervention and control), and the interaction between time × condition. A significant interaction between time × condition would indicate a significant change in the outcome variables attributable to the intervention. Within-person variation was modelled using an unstructured covariance matrix and degrees of freedom were estimated using Satterthwaite's approximation. To explore whether dosage effects influenced primary and secondary outcomes, models were reanalysed with the addition of the fixed effect of dosage (hours of program participation) and its two and three-way interactions with time and condition. Cohen's *d* effect sizes were calculated using the formula provided by Morris and DeShon (2002) for independent group pre-post test designs where the pooled pre-test standard deviation is used to weight differences between pre-post means.

Participant engagement and satisfaction with the 'Get Up & Go' peer-support walking program was assessed quantitatively and qualitatively via a series of closed-and open-ended questions in the intervention group. Qualitative data was coded for main themes using inductive thematic analysis (Braun & Clarke, 2006). All statistical analyses were conducted using SPSS v21 (IBM Corp, 2012).

6.2.4.1 Power calculation. G*Power version 3.1.3 (Faul, Erdfelder, Buchner, & Lang, 2009) was used to assess achieved power for the primary study analysis (change in thwarted belongingness and perceived burdensomeness from baseline to post-test) prior to recruitment. Effect size estimates were obtained from a previous study of mountain hiking in high-risk suicide patients on hopelessness and depression (Sturm et al., 2012), as this was the only reference study available that employed a walking

intervention to reduce suicide risk. To detect a large effect between the two groups (d = 1.4) with 80% power and an alpha of 0.05, a total sample size of 20 was needed.

6.3 Results

6.3.1 Sample characteristics. Missing data due to incomplete post-intervention assessments occurred at a high rate, with 35% of participants (n = 48) completing the post-intervention assessment. This was attributable to participant dropout particularly in the intervention group. Participants who completed the post-intervention were more likely to be a domestic student than an international student (χ^2 = 4.80, p = 0.02) and significantly differed on level of completed education (χ^2 = 10.45, p = 0.01). No significant differences were found between the control and the intervention group across all measures (Table 6.1). Pre and post-test scores for the primary and secondary outcomes among post-test completers are shown in Table 6.2.

6.3.2 Feasibility of 'Get Up & Go.'

6.3.2.1 Change in primary outcomes between groups. No significant interaction effects between time × condition were found for thwarted belongingness measured by the INQ-15 TB subscale (p = 0.79, Cohen's d = -0.02) or the TBS scale (p = 0.74, Cohen's d = 0.07), or for perceived burdensomeness measured by the INQ-15 PB subscale (p = 0.73, Cohen's d = -0.20) in the linear mixed model repeated measures analyses. While the time × condition interaction was not significant for self-hate, a component of perceived burdensomeness (F(1, 47.25) = 3.96, p = 0.05, Cohen's d = -0.57), a medium effect size was found. The main effect of condition was found to be significant in the self-hatred mixed model (p = 0.01) (Table 6.3). No dosage effects were found.

6.3.2.2 Change in secondary outcomes between groups. A significant interaction between time × condition was found for psychological distress (F(1, 47.80) = 5.35, p = 0.02) and social support in the form of positive friendship interactions (F(1, 49.94) = 7.65, p < 0.01) (Figure 6-2). Effect sizes indicated that the intervention had a

small effect on reducing levels of psychological distress (Cohen's d = -0.32) and a large effect on increasing levels of positive friendship interactions (Cohen's d = 0.82) in the intervention group. The main effect of time was additionally found to be significant in the psychological distress model (p = 0.01), indicating that both the control and intervention groups experienced a decrease in psychological distress over their participation in the study across the different periods. No significant interaction effects between time × condition were found for depression and anxiety symptoms (p = 0.56, Cohen's d = -0.07), negative friend social interactions (p = 0.21, Cohen's d = 0.70), positive family social interactions (p = 0.43, Cohen's d = -0.37), negative family social interactions (p = 0.41, Cohen's d = 0.10), school membership (p = 0.74, Cohen's d = -0.05), wellbeing (p = 0.66, Cohen's d = 0.09), or resilience (p = 0.94, Cohen's d = -0.01) (Table 6.3). Additionally, no dosage effects were found.

Table 6.2. Observed pre-and post-test scores by condition among post-test completers

Time	Treatment (*n* = 37)		Control (*n* = 11)	
	Mean	***SD***	***Mean***	***SD***
Thwarted belongingness (INQ-15, TB subscale)				
Pre	29.19	10.44	30.66	9.76
Post	28.90	11.43	30.63	10.47
Perceived burdensomeness (INQ-15, PB subscale)				
Pre	10.95	6.92	12.25	6.44
Post	12.22	8.29	14.90	9.70
Thwarted belongingness (TBS)				
Pre	19.10	10.94	20.63	10.50
Post	19.79	12.28	20.54	11.74
Self-hate (SHS)				
Pre	16.31	11.00	20.45	11.33
Post	15.71	8.23	26.27	12.97
Depression & anxiety symptoms (PHQ4)				
Pre	3.34	2.66	3.33	2.46
Post	3.63	3.14	3.81	2.99
Psychological distress (DQ5)				
Pre	12.24	4.58	12.41	4.16
Post	11.58	4.62	13.18	4.30
Friend social support – Positive (SSS)				
Pre	3.46	1.29	4.09	1.57
Post	3.64	1.53	3.09	1.30
Friend social support – Negative (SSS)				
Pre	8.68	1.57	9.18	1.40
Post	8.82	1.95	8.27	1.90
Family social support – Positive (SSS)				
Pre	2.86	1.29	2.45	0.68
Post	2.92	1.26	2.90	0.94
Family social support -Negative (SSS)				
Pre	7.88	2.19	7.90	2.77
Post	8.15	2.20	7.90	2.58

School membership (PSSM)				
Pre	38.02	7.09	33.63	10.28
Post	39.87	9.49	36.00	7.73
Wellbeing (WHO5)				
Pre	13.94	5.47	14.16	4.96
Post	14.37	5.25	14.09	5.16
Resilience (CD-RISC)				
Pre	25.47	7.65	23.75	8.69
Post	26.57	7.04	25.00	6.01

Note. SD = Standard Deviation

Table 6.3. Mixed model repeated measure estimates for the 'Get Up & Go' peer support walking program on primary and secondary outcomes in university students

	Unstandardised estimate	*SE*	*df*	*t*	*p*	Cohen's *d*
Thwarted belongingness (INQ-15, TB subscale)						
Time (post-test vs. pre-test)	0.32	1.32	51.53	0.24	0.80	
Condition (intervention vs. control)	1.32	3.61	63.42	0.36	0.71	
Time × Condition	0.76	2.94	49.89	0.26	0.79	-0.02
Perceived burdensomeness (INQ-15, PB subscale)						
Time (post-vs. pre-)	-1.53	1.23	50.41	-1.24	0.21	
Condition (intervention vs. control)	2.42	2.87	52.75	0.84	0.40	
Time × Condition	-0.93	2.73	48.38	-0.34	0.73	-0.20
Thwarted belongingness (TBS)						
Time (post-vs. pre-)	-0.67	1.39	47.18	-0.48	0.63	
Condition (intervention vs. control)	0.97	3.89	63.44	0.25	0.80	
Time × Condition	1.00	3.10	47.64	0.32	0.74	0.07

Self-hate (SHS)						
Time (post-vs. pre-)	0.42	1.28	52.35	0.33	0.74	
Condition (intervention vs. control)	10.18	3.19	53.00	3.18	**<0.01**	
Time × Condition	-6.06	3.04	47.25	-1.99	0.05	-0.57
Depression & anxiety symptoms (PHQ4)						
Time (post-vs. pre-)	-0.09	0.38	49.85	-0.25	0.80	
Condition (intervention vs. control)	0.38	0.97	64.24	0.39	0.69	
Time × Condition	-0.51	0.89	49.48	-0.57	0.56	-0.07
Psychological distress (DQ5)						
Time (post-vs. pre-)	1.15	0.46	49.08	2.47	**0.01**	
Condition (intervention vs. control)	2.46	1.47	68.32	1.66	0.10	
Time × Condition	-2.43	1.05	47.80	-2.31	**0.02**	-0.32
Friend social support – Positive (SSS)						
Time (post-vs. pre-)	-0.19	0.18	49.10	-1.06	0.29	
Condition (intervention vs. control)	-0.59	0.47	61.54	-1.25	0.21	
Time × Condition	1.13	0.41	49.94	2.76	**<0.01**	0.82

Friend social support – Negative (SSS)						
Time (post-vs. pre-)	-0.01	0.27	49.20	-0.06	0.95	
Condition (intervention vs. control)	-0.36	0.64	54.41	-0.57	0.56	
Time × Condition	0.76	0.60	50.19	1.27	0.21	0.70
Family social support – Positive (SSS)						
Time (post-vs. pre-)	-0.17	0.15	50.04	-1.14	0.25	
Condition (intervention vs. control)	-0.18	0.40	56.83	-0.46	0.64	
Time × Condition	-0.27	0.34	47.79	-0.78	0.43	-0.37
Family social support -Negative (SSS)						
Time (post-vs. pre-)	-0.13	0.26	46.43	-0.51	0.61	
Condition (intervention vs. control)	0.12	0.72	64.75	0.17	0.85	
Time × Condition	-0.48	0.59	46.57	-0.82	0.41	0.10
School membership (PSSM)						
Time (post-vs. pre-)	-1.59	1.21	50.85	-1.31	0.19	

Condition (intervention vs. control)	-3.46	2.90	59.03	-1.19	0.23	
Time × Condition	-0.89	2.71	53.04	-0.32	0.74	-0.05
Wellbeing (WHO5)						
Time (post-vs. pre-)	-0.41	0.77	61.11	-0.53	0.59	
Condition (intervention vs. control)	-0.47	1.76	53.87	-0.26	0.78	
Time × Condition	0.80	1.85	54.88	0.43	0.66	0.09
Resilience (CD-RISC)						
Time (post-vs. pre-)	-1.11	0.99	63.36	-1.12	0.26	
Condition (intervention vs. control)	-1.87	2.25	57.00	-0.83	0.40	
Time × Condition	0.15	2.38	58.44	0.06	0.94	-0.01

Note. × = interaction, *SE* = Standard Error, *df* = degrees of freedom, bolded values indicate $p \leq 0.05$.

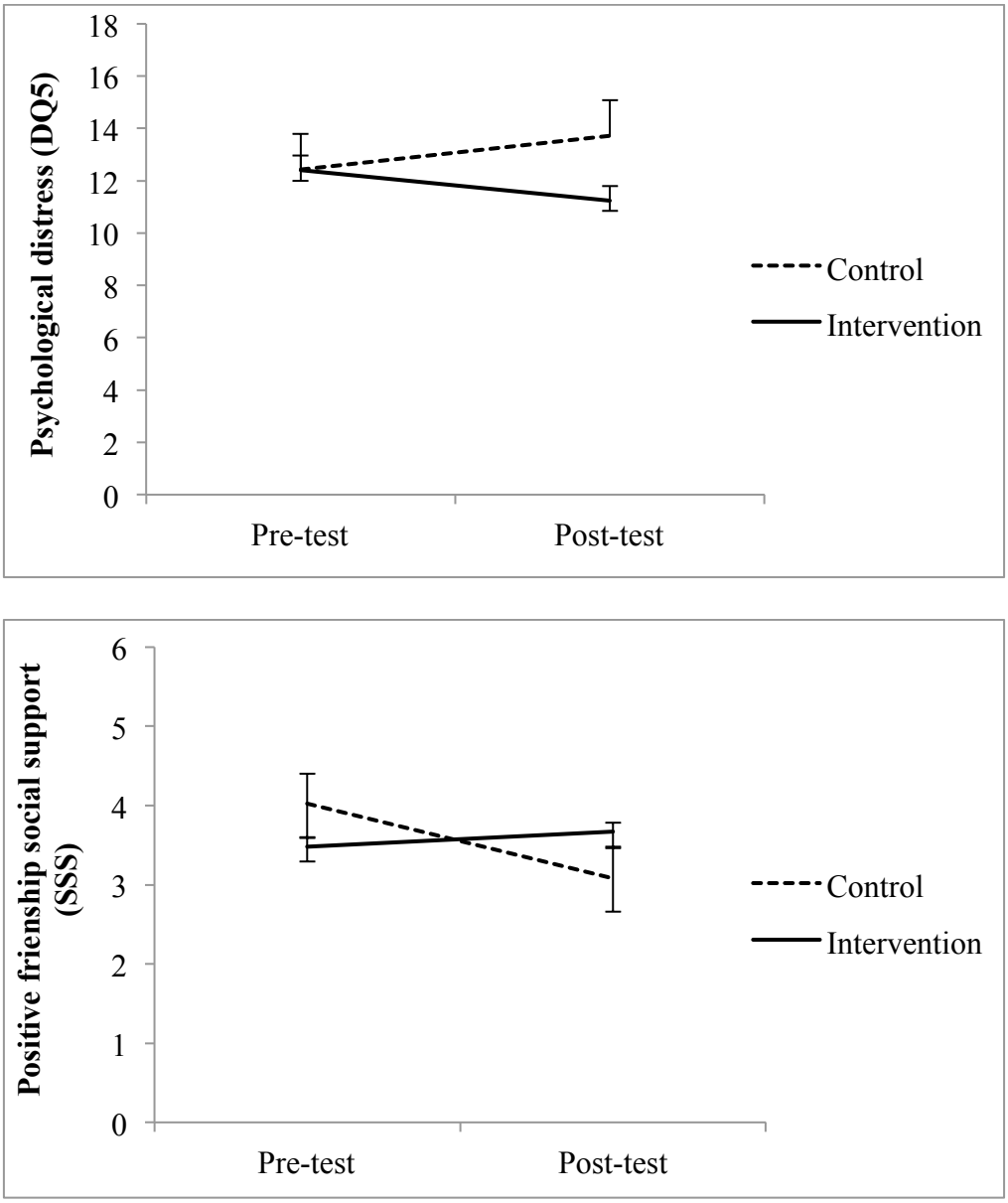

Figure 6-2. The effect of the 'Get Up & Go' peer support walking program on psychological distress and positive friendship social support

6.3.3 Engagement & Satisfaction with 'Get Up & Go.'

6.3.3.1 Program usage. There were 37 to 39 complete responses for the program usage questions. Participation in the physical activity and social contact component of the program ranged from 0 to 11 weeks, with the mean number of completed weeks being 5.24 (*SD* = 2.75; median = 6). The majority of participants (*n* = 27, 72.9%) completed 4 or more weeks of the program. Nine participants (24.3%) completed only 1 to 3 weeks of the program, and one participant (2.7%) reported 0

weeks. The majority of participants reported walking with their partner once a week (*n* = 33, 84.6%). One participant reported walking two to three times a week (2.6%), and five participants reported not being able to walk at all during the week (12.8%). Session times ranged from 30 minutes (*n* = 3, 7.7%) to 2 hours or more (*n* = 1, 2.6%), where the majority of participants reported walking for one hour (*n* = 24, 61.5%) or 1.5 hours (n = 5, 12.8%) each session. Six participants reported not being able to walk with their partner at all (15.4%). Two participants in the control condition (15.4%) and 11 participants in the intervention condition (8.1%) reported having participated in the 'Get Up & Go' walking program previously.

6.3.3.2 Partner satisfaction. There were 38 completed responses to the partner satisfaction questions. On a scale from 0 (*extremely unsatisfied/disconnected*) to 10 (*extremely satisfied/connected*) participants reported that, on average, they were satisfied with the interactions (*mean* = 7.31, *SD* = 2.63) and how connected (*mean* = 6.23, *SD* = 2.90) they felt with their walking partner. When asked how likely they were to continue their relationship with their walking partner after 'Get Up & Go,' a fifth of the participants (*n* = 8, 21.1%) reported it was highly unlikely or unlikely, over a third (*n* = 14, 36.8%) reported being undecided, and less than half (*n* = 16, 42.1%) reported they were likely or highly likely to continue the relationship.

6.3.3.3 Program satisfaction. There were 30 to 33 completed responses to the program satisfaction questions (Table 6.4). The majority (85%) of participants reported that the program was beneficial on at least one of the four dimensions assessed: discovered new strategies and skills, meeting other students had been positive, received help with an issue, attending supported studies/work. Thirty-six participants completed questions asking them to rate the overall usefulness and level of satisfaction with the program on a four-point scale (unsatisfactory, fair, very good, and excellence). Over half of the participants (*n* = 22, 61.1%) rated the program as being very good or

excellent in its overall usefulness and applicability to them and in their overall level of satisfaction with the experience.

6.3.3.4 Qualitative feedback. Twenty-six participants provided qualitative feedback to the question: "what was most useful or enjoyable to you about 'Get Up & Go' this semester?" Themes of participant responses fell into five main categories including:

- Getting to know someone new and build friendships. E.g. *"Meeting someone new, yet with similar interests. It's somehow easier to talk to a stranger about some personal things than people who are close to sometimes."*
- Having something to look forward to. E.g, *"...[it] also gave [me] something to look forward [to]."*
- Benefitting from being matched with an international student as a local student or vice versa as this allowed opportunities for greater peer-support. E.g., *"... I found it rewarding to be able to assist another student, especially an international student."*
- Influences on health and wellbeing. E.g., "*My walking partner always made me feel better."*
- Being able to get out and explore new areas around Canberra. E.g., *"I'm a new student so I explored many new spots on campus or even around Canberra that was so enjoyable during [a] very beautiful Spring."*

In a separate qualitative question asking about additional program benefits, eleven participants provided a response. These were centred on being able to be active, sightsee and learn about new places and cultures, chat with someone and make new friends, and practice communication skills. One participant wrote, "*Walking and chatting around campus means getting away from people, crowds and most importantly*

our mobile phones! It made me appreciate littler things in life more – things like nature, real conversation."

6.3.3.5 Program issues. Twenty-five participants provided qualitative responses to the question: "how could 'Get Up & Go' be improved in future semesters?" Suggestions included:

- Pairing partners and commencing the program early on
- Matching partners based on their timetables (e.g., considering the availability of undergraduate vs. postgraduate students, and students with part-time vs. full-time study loads and on vs. off campus living arrangements)
- Providing students with information about surrounding walking paths and their expected times, and topics to talk about
- Incorporating a walking diary and sending more frequent reminders regarding participation in the program
- Adding more interactive features to the program (e.g., meet and greet events, social gatherings, recreational games, swapping partners half-way through)

Ten participants provided program improvement responses in the additional comments box, where suggestions included:

- Extending the length of the program so that the program starts earlier in the semester and runs across a longer period.
- Better matching of participants based on their shared interests, and possibly incorporating a vetting process to ensure there's a connection between participants as there were issues regarding different expectations of program engagement.

- That the program can be an additional source of stress for participants with severe mental or physical health issues if they feel obligated to ‘keep up’ with their partner.

Table 6.4. Participant satisfaction with the 'Get Up & Go' peer-support walking program

	n (%)		
How has participating in the Get Up & Go peer-support walking program this semester benefitted you?	**Not true**	**Somewhat true**	**Very true**
'I have discovered new strategies and skills'	11 (34.4)	17 (53.1)	4 (12.5)
'Meeting other students with similar issues has been positive for me'	8 (26.7)	15 (50.0)	7 (23.3)
'I received help with an issue that had been bothering me'	15 (46.9)	14 (43.8)	3 (9.4)
Attending has supported me to continue my studies/work	10 (30.3)	17 (51.5)	6 (18.2)

6.4 Discussion

Aspects of campus life can increase students' sense of belonging to a caring social network, which in turn, has been associated with decreased suicidal behaviour (Whitlock et al., 2012). As such, belonging, connectedness, and mattering/contributing to others serve as meaningful targets for the promotion of mental health in university settings. This study aimed to investigate the feasibility of a university-based peer-support walking program in contributing to decreased levels of interpersonal suicide risk (i.e., thwarted belongingness and perceived burdensomeness), decreased depression and anxiety symptoms and psychological distress, and increased levels of social support, school membership, wellbeing and resilience in university students through connecting students to a peer-supported walking buddy relationship in which they could belong and regularly contribute to. Contrary to expectations, participation in the 'Get Up & Go' peer-support walking program did not significantly contribute to decreased levels of thwarted belongingness or perceived burdensomeness (primary outcomes) compared to a waitlist control, although a medium effect (Cohen's d = -0.57) was found for reducing self-hate. Significantly decreased levels of psychological distress (d = -0.32) and increased levels of social support in the form of positive friendships (d = 0.82) compared to a waitlist control were also observed. Psychological distress was also found to significantly decrease over time in the intervention group.

The decrease in levels of psychological distress and increase in positive friendship support evidenced in this study are promising preliminary findings. For instance, research has shown that the promotion of positive friendships can protect against psychological distress and contribute to better social and university adjustment in ethnically diverse and first-year university students (Buote et al., 2007; Rodriguez, Mira, Myers, Morris, & Cardoza, 2003). These findings may help program coordinators enhance the efficacy of peer-support walking programs like 'Get Up & Go' and inform

the development of new university-based mental health and wellbeing initiatives. For example, program coordinators may wish to build on the program's ability to foster positive friendship supports by combining regular physical exercise and social contact with additional evidence-based activities that target mental health outcomes more specifically, such as introducing psycho-educational components (e.g., recognising mental health problems in self and others, help-seeking for mental health problems).

Based on participant feedback, finding ways to further strengthen students' experience of positive friendship supports and other aspects of connectedness (e.g., sense of belonging to the university community) may be a meaningful way to enhance program effectiveness. Incorporating ways for students to learn new strategies and skills in the program may also help to further support them in their studies and work. More deliberate and structured program delivery in the form of extending the length of the program, identifying better ways to match partners based on their shared interests and availability, and incorporating more interactive features into the program (e.g., a walking diary and social events) may have helped the current iteration of the program reduce some of the barriers to program engagement and adherence and contributed to improved student mental health outcomes.

Given the paucity of studies investigating the effect of connectedness-based interventions on interpersonal suicide risk, it is clear that more research is needed. In particular, studies that aim to better identify underlying mechanisms of change for thwarted belongingness and perceived burdensomeness would aid their reduction in future interventions. In this regard, the medium effect found for self-hate is promising and suggests that this aspect of perceived burdensomeness may benefit from being targeted in larger trials.

6.4.1 Strengths and limitations. This pilot controlled trial is among the first aiming to reduce interpersonal suicide risk factors in university students using an

intervention, adding to the limited intervention-based research on thwarted belongingness and perceived burdensomeness. However, consideration also needs to be given to the limitations of the study. First, the sample may not be representative of the larger population of university students in the study recruitment area, limiting generalisability of the findings. Second, completion of the post-test assessment was low among those in the intervention group. Future feasibility and evaluation studies may benefit from employing participant incentives in order to recruit and retain a larger proportion of the student population. Third, due to ethical considerations (i.e., all registered students were expected to receive the 'Get Up & Go' peer-support walking intervention in Semester 2) and delays in participant recruitment, a temporally defined control group was used and randomisation of the participants was not possible. This may have contributed to the observed cohort/time effect for psychological distress, limiting conclusions about the intervention's effect on psychological distress. Fourth, the design of the program meant that it was not possible to distinguish whether observed effects were due to social interactions or physical activity. Fifth, the sample was not selected on the basis of clinical symptoms, so changes in TB and PB may not have a measurable effect on suicidal thoughts or behaviours and it was not possible in this pilot trial to measure suicide thoughts or behaviours due to ethical and pragmatic constraints in the current delivery context. Finally, the study was underpowered; however moderate effect sizes on interpersonal, social, and distress outcomes suggest the intervention is likely to be beneficial, although further evaluation is recommended.

6.4.2 Conclusions. Developing programs that enhance social connectedness in university settings is important for the promotion of mental health and prevention of suicide. In this pilot study, physical activity and social contact delivered in the form of a peer-support walking program were found to help decrease levels of psychological distress and increase positive friendship social support in a sample of university

students. This study demonstrated potential for a social connectedness intervention in reducing risk of mental health problems and interpersonal risk for suicide in a university setting, and contributes to the paucity of literature on building interpersonal strengths for suicide prevention.

CHAPTER 7: Conclusions

7.1 Introduction

Suicide is a phenomenon that bears a significant public health impact worldwide, and there is a need for better identification of risk and protective factors for suicide and more accurate prediction of its development (Franklin et al., 2017). The aim of the current project was to promote suicide prevention through: (1) better understanding and identification of interpersonal risk factors for suicide, as outlined by a recent predictive model of suicide: the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010), and (2) exploring ways to build interpersonal strengths.

As noted in previous chapters, the IPTS is one of the first theories of suicide to provide testable predictions regarding the development of suicide from passive suicide ideation to lethal suicide attempt. Specifically, the IPTS posits that suicidal behaviour arises through the combination of three interpersonal risk factors: thwarted belongingness (TB; the experience that one is alienated from friends, family, or other valued social circles), perceived burdensomeness (PB; the view that one's existence is a burden on friends, family members, and/or society), and capability for suicide (CS; one's ability to overcome the inherent drive for self-preservation and engage in lethal self-injury through repeated exposure and habituation to physically painful and/or fear-inducing experiences) (Van Orden et al., 2010). The presence of TB and PB is theorised to contribute to the development of passive desire for suicide (i.e., passive ideation), and when combined together with a sense of hopelessness, develops into active desire for suicide (i.e., active ideation). However, the combination of active suicidal desire and CS is required for progression to suicide attempt (Van Orden et al., 2010).

This chapter presents a broad summary of the research findings arising from this thesis, followed by a discussion of their implications in relation to the thesis' aim of

better understanding and identifying interpersonal risk factors and building strengths. The chapter then closes with conclusions and recommendations for future research utilising the IPTS for suicide prevention.

7.2 Summary of the research findings

The collection of studies arising from this thesis stemmed from a systematic review of the predictions of the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) regarding the development of suicide ideation and attempt (Chapter 2). Contrary to expectations, mixed evidence across the theory's main predictions was found. In particular, results showed that the effect of perceived burdensomeness on suicide ideation was the most tested and supported relationship. The theory's other predictions, particularly in terms of critical interaction effects, were less strongly supported. Several critical gaps in the literature base were identified, including the need to: (a) explore whether the IPTS is more explanatory in certain subgroups compared to others, (b) conduct longitudinal studies testing the IPTS interaction effects over time, (c) expand the availability of valid measurement approaches for the interpersonal risk factors, particularly for TB given the mixed support identified for its associations with suicidality compared to PB in the review, and (d) explore the extent to which the interpersonal risk factors are amenable to change.

To address some of the gaps identified in the systematic review, several studies were conducted. First, a latent class analysis study was conducted to test the generalisability of the IPTS across different subgroups of individuals based on their patterns of risk (Chapter 3). Results showed that groups with highly elevated mental health symptoms reported the highest levels of thwarted belongingness and perceived burdensomeness, whilst tests of the IPTS interactions provided partial support for the theory, primarily in young adults with elevated mental health symptoms. A lack of

support found for the IPTS predictions across the subgroups and full sample raised some questions around the broad applicability of the theory in this study.

Second, a longitudinal study on an Australian clinical sample (N = 331) was conducted to test the IPTS hypotheses in relation to suicide ideation and suicide attempt cross-sectionally and longitudinally at six-month follow-up in a population with elevated suicide risk (Chapter 4). Little is currently known about the nature of the interpersonal risk factors and their relationship with suicide ideation and attempt over time as few studies have tested the IPTS longitudinally. Results showed that perceived burdensomeness was associated with suicide ideation and attempt cross-sectionally and at six-months follow-up, despite a significant reduction in the prevalence of suicide ideation and attempt reported at follow-up. Thwarted belongingness and capability for suicide were associated with suicidality cross-sectionally only and no critical interaction effects were found. Support for the role of perceived burdensomeness in contributing to passive suicide ideation and suicide attempt over time was identified. From this study, it was apparent that perceived burdensomeness might serve as a relevant therapeutic target for the prevention of suicidal behaviours in clinical settings.

Third, a study to develop and validate a new self-report measure for thwarted belongingness (TBS) was undertaken to promote better identification of TB, which was found to be underrepresented in tests of the IPTS (Chapter 2), attributed possibly to issues around its adequate measurement. The psychometric properties of the TBS and its performance in tests of the IPTS predictions were compared to the Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012) (Chapter 5). Exploratory and confirmatory factor analyses supported the uni-dimensionality of the TBS and item response theory analysis indicated that the TBS captured more information over a slightly narrower range than the INQ TB. Preliminary support was also provided for the IPTS predictions when

using the TBS. Findings from this study suggested that the TBS may provide enhanced identification of thwarted belongingness, in comparison to the INQ TB, particularly in individuals who display moderate to high levels of this interpersonal risk factor.

Lastly, a pilot controlled trial of a university-based peer-support walking program ('Get Up & Go') was conducted to investigate its feasibility in contributing to decreased interpersonal suicide risk (i.e., reduced thwarted belongingness and perceived burdensomeness), decreased symptoms of depression, anxiety and psychological distress, and increased levels of social support, school membership, wellbeing and resilience (Chapter 6). A significant, small reduction in psychological distress and a large increase in positive friendship social support was found in the intervention group compared to a waitlist control. No differences were found between the groups in regards to interpersonal suicide risk or the additional secondary outcomes. Findings from this study may help program coordinators enhance the efficacy of peer-support walking programs like 'Get Up & Go' and inform the development of new university-based mental health and wellbeing initiatives that focus on building student connectedness.

7.3 Implications of the research findings

7.3.1 Better understanding and identification of interpersonal risk factors.

In line with findings from the IPTS systematic review (Chapter 2; Ma et al., 2016), the studies in the current thesis found mixed support for the theory's predictions regarding the two-way interaction prediction between thwarted belongingness (TB) and perceived burdensomeness (PB) in contributing to suicide ideation, and the three-way interaction between thwarted belongingness (TB), perceived burdensomeness (PB), and capability for suicide (CS) in contributing to suicide attempt. Across the studies testing these IPTS predictions (Chapters 3-5), the role and specificity of the two-way interaction between TB and PB on suicide ideation was largely supported in two community-based samples, but was not supported cross-sectionally or longitudinally in a clinical sample. No

support was found in any of the studies for the IPTS three-way interaction prediction. Limitations around power to find such three-way effects on suicidal behaviour remains a challenge, although the review also found little evidence for this effect and effect sizes are typically very small.

In regards to the significant two-way interaction found between TB and PB on suicide ideation, akin to prior cross-sectional studies (Kleiman, Riskind, et al., 2014; O'Keefe et al., 2014; Van Orden et al., 2008), the differential contribution of TB and PB within the interaction was observed across the two community-based samples studied. Participants who reported high levels of PB but low levels of TB were found to have similar severity of suicide ideation as respondents reporting high levels of both TB and PB. These findings suggested that high levels of PB might confer considerable risk to the development of suicide ideation irrespective of levels of TB. In addition, similar to Christensen et al's (2013) findings from a cross-sectional study of the IPTS in a large community-based sample, the two-way interaction was found to be applicable in certain age groups and not others. Here, it was found to be significant in a subgroup of young individuals (18-29) with highly elevated mental health symptoms, but not in subgroups of older individuals (30+) or when tested in the full sample (Chapter 3; Ma, Batterham, Calear, & Han, 2018). These findings suggest that the theoretical constructs might be more strongly associated with suicide ideation in this particular demographic. The lack of cross-sectional and longitudinal support for the IPTS critical interaction effects in the clinical sample, on the other hand, mirrored those from previous prospective studies of the IPTS in clinical populations (Miller et al., 2016; Teismann et al., 2016; Teismann et al., 2017). The non-significant findings from this and prior prospective studies highlighted the need for additional longitudinal research testing the full predictions of the IPTS in clinical samples to further explore the role and clinical applicability of the interpersonal risk factors over time.

Findings from a recent systematic review and meta-analysis of the IPTS (Chu et al., 2017), which builds on the work of the IPTS systematic review presented in Chapter 2, may shed some light on the mixed support found for the IPTS interaction predictions in this thesis. This systematic review and meta-analysis conducted on 122 samples found that whilst some support was provided for these two- and three-way interactions, effect sizes were generally small and only significant when suicide attempt was measured continuously (e.g., number of attempts) and not dichotomously (e.g., presence or absence of suicide behaviour), despite it being dichotomous in nature. As suicide attempt was measured dichotomously in the community-based samples, and both suicide ideation and attempt outcomes treated dichotomously in the clinical sample, this may have contributed to the distinct pattern of support/non-support identified. Though Chu et al. (2017) recommend future tests of the IPTS utilise continuous measures only, future high-powered studies may be needed to explore this explanatory and possibly conceptually-based discrepancy between the interpersonal risk factors and suicidal thoughts and behaviours as measured across a variety of suicide assessments (continuous and dichotomous) to further clarify their distinct and unique contributions. However, it is not sufficient to test the theory on the basis of broad continuous measures of "suicide risk" outcomes, as the theory proposes distinct hypotheses for suicidal ideation and suicidal behaviour.

Despite mixed support found for the IPTS two-way interaction between TB and PB on suicide ideation, and the lack of support found for the IPTS three-way interaction between TB, PB and CS on suicide attempt in the present thesis, associations between the main effects of interpersonal risk factors and suicidality were consistently supported. These findings suggest that the interpersonal risk factors may serve as valuable targets for suicide prevention and intervention as main effects. Support was provided for the association between TB, PB, and mental health symptom severity

among people with suicidal ideation. Here, high levels of TB and PB were found only in subgroups reporting suicide ideation in the past month, and the highest levels of TB and PB in subgroups with high levels of mental health symptoms.

These associations were further supported in tests of the IPTS predictions, where PB was consistently highlighted as a potentially pernicious risk factor that may contribute to a greater amount of risk (especially when experienced at high levels) to the development of suicide ideation and attempt when compared to the effects of TB and CS. For instance, when testing suicide ideation outcomes, PB was found to be significantly associated with suicide ideation across community and clinical samples, and TB with suicide ideation in a community-based sample. Longitudinally, PB was found to be a significant predictor of suicide ideation at baseline and six month follow-up in a clinical sample, where a one standard deviation increase in PB was associated with two times increased odds of reporting suicide ideation at baseline and six-months follow-up (Chapter 4).

When testing suicide attempt outcomes, PB and CS were found to be significantly associated with suicide attempt across community and clinical samples. Cross-sectionally in a community-based sample, the presence of PB was associated with three and a half times odds of reporting a suicide attempt in the past three months, and CS with over one and half times odds of reporting a suicide attempt (Chapter 5). Longitudinally, PB was also found to be a significant predictor of suicide attempt at baseline and six-month follow-up in a clinical sample (Chapter 4). Here, a one standard deviation increase in PB was associated with just under three times increased odds of reporting a suicide attempt in the past year at baseline and at six-months follow-up. In this study, CS was also found to be a significant predictor of suicide attempt at baseline, and was associated with one and a half times increased odds of reporting a suicide attempt in the past year.

Given that the interpersonal risk factors of PB and TB are considered amenable to change, findings around the differential weight of risk attributed to PB and its contribution to both suicide ideation and attempt risk may have important implications on the way suicide risk is screened and targeted for intervention. For example, targeting PB may be given prominence over TB in high-risk and clinical settings. Interventions that target TB, on the other hand, may be more suitable for prevention-based initiatives delivered in low-risk populations, such as in programs that aim to reduce social isolation and promote mental health and wellbeing more broadly in the community.

Lastly, although a new self-report measure for TB, the Thwarted Belongingness Scale (TBS; Ma et al., in submission), was developed in Chapter 5 to explore whether explanatory disparities between the interpersonal risk factors were attributable to measurement related issues, tests of the IPTS comparing the TBS against the Interpersonal Needs Questionnaire thwarted belongingness subscale in a community-based sample (INQ TB; Van Orden, Cukrowicz, et al., 2012) yielded similar results. This was despite the TBS being found to provide approximately double the information about TB in comparison to the INQ TB. These findings suggest that TB may require individualised items/subscales for low, moderate, and high levels of the construct, and/or additional conceptualisation of TB for better prediction of this interpersonal risk factor. Future research in the measurement of these interpersonal constructs may explore the use of computerised adaptive testing, the incorporation of domain specific sources of belonging (e.g., family, peer, bullying, abuse, etc.), extending conceptualisations of belonging to domains beyond immediate interpersonal relationships (e.g., culture, spirituality), identifying thresholds at which TB (and PB) become pernicious (e.g., at the extreme end of the spectrum and/or based on individual differences in thresholds), and investigating the extent to which the absence of belonging is equivalent to the construct of TB.

Given the present findings and status of the IPTS evidence base, the question of whether we are any better at predicting the development of suicide, and in particular, its progression from active suicide desire (i.e., suicidal thoughts) to lethal attempt, remains unclear due to the mixed nature and paucity of evidence supporting the predictions of the IPTS. As the value in theories of suicidal behaviour is in their ability to identify shared factors that predict whether any particular individual is likely to die by suicide (Gunn & Lester, 2014), consistent performance of the IPTS' predictions is needed before the model can be meaningfully applied to predict the development of suicide in high-risk populations and clinical settings. This is particularly the case for the prediction that suicide attempts only occur in the presence of high TB, PB, CS, and hopelessness, which has gained limited empirical support. Nevertheless, support for the interpersonal risk factors as main effects has indicated that they may serve as valuable targets in suicide prevention and intervention initiatives in conjunction with other evidence-based risk and protective factors. Future studies designed with the aim of overcoming the existing methodological limitations of IPTS research are needed to explore the full extent of the theory's theoretical and clinical utility.

7.3.2 Promoting suicide through building interpersonal strengths. In Chapter 1 it was highlighted that research on the protective factors of suicide has been comparatively sparse to that for risk factors for suicide. As such, one of the aims of this project was to explore ways to build interpersonal strengths. As mentioned in Chapter 6, connectedness has been identified as a possible avenue for the promotion of mental health and prevention of suicide in schools and universities (Whitlock et al., 2012; Whitlock et al., 2014). However, there is currently a paucity of research investigating the effect of connectedness-based interventions on interpersonal suicide risk. Such investigation is sorely needed to explore the extent to which the interpersonal risk

factors are amenable to change, as well as identify possible underlying mechanisms of change.

In this thesis, findings from a pilot controlled trial of a university-based peer-support walking program found that participation contributed to increased levels of positive friendship social support (Cohen's $d = 0.82$) and decreased levels of psychological distress ($d = -0.32$) in university students. These findings coincide with suggestions regarding the potential of university based programs to increase students' sense of belonging to a caring social network (Whitlock et al., 2012). They also provide promising preliminary findings in the context of previous research showing that the promotion of positive friendships may be protective against psychological distress and contribute to better social and university adjustment in ethnically diverse and first-year university students (Buote et al., 2007; Rodriguez et al., 2003).

However, findings from this pilot controlled study also indicated that whilst levels of friendship social support and psychological distress were targeted, the program did not significantly contribute to decreased levels of interpersonal suicide risk (i.e., TB or PB), or depression and anxiety, or to increased levels of school membership, wellbeing, and resilience. These findings suggest that connectedness-based programs such as this may benefit from incorporating ways to target these specific factors. For example, program coordinators may wish to explore combining regular physical exercise and social contact with evidence-based psycho-educational mental health components such as cognitively challenging negative beliefs about oneself in regards to belonging and burden (e.g., Hill & Pettit, 2016). Given the lack of research in this area, it is clear that future studies focused on implementing, evaluating, and enhancing the effectiveness of connectedness-based suicide prevention programs are imperative for promoting suicide prevention and building strengths in the community.

7.4 Conclusions and future directions

Previous research on the Interpersonal Psychological Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) has been limited by the use of cross-sectional designs, undergraduate samples with low levels of suicidal ideation and suicide attempts that were primarily Caucasian and female, and evaluation of suicide ideation only (where suicide attempt was often underpowered) (Chu et al., 2017; Ma et al., 2016). In addition, there has been a relative lack of studies identifying protective factors for suicide. The studies arising from this thesis aimed to address some of these limitations by providing some of the first tests of the IPTS' two- and three-way predictions across subgroups derived from a population-based sample (Chapter 3) and longitudinally in a clinical sample (Chapter 4). This thesis also provided the first study to develop and validate a new self-report measure for the interpersonal risk factor of thwarted belongingness (Chapter 5), and added to the limited intervention and strengths-based research on the interpersonal risk factors for suicide prevention (Chapter 6).

Overall, mixed findings regarding the two- and three-way IPTS interactions in this thesis highlight the critical need for additional IPTS studies designed to overcome some of the methodological limitations described above. This body of work needs to be conducted in order to help refine the IPTS by better identifying the types of people and/or specific classes of suicidal behaviour where interpersonal risk is critical. Further investigation into how TB and PB develop over time and the conditions/contexts under which they become critical drivers of suicidal behaviour is important for identifying and mitigating suicide risk. Here, examining individual differences in the influence of interpersonal risk factors on suicidal behaviours may help to further reveal the mechanisms by which some people become suicidal while others do not. Different versions of the Interpersonal Needs Questionnaire (10, 12, 15, 18, and 25-item; Van Orden, Cukrowicz, et al., 2012) and Acquired Capability for Suicide Scale (ACSS; Van

Orden et al., 2008) may influence associations found between the interpersonal risk factors and suicide outcomes Consequently, future research comparing and utilising the best available and validated measures of the interpersonal risk factors in tests of the IPTS are needed for better prediction of interpersonal suicide risk, and for use in the design and evaluation of connectedness-based suicide prevention and intervention programs to promote interpersonal strengths in the community.

To conclude, suicide remains a significant public health problem worldwide. There is considerable potential in reducing interpersonal risk factors to prevent suicides. However, more effective interventions are needed, but these will only be established through greater understanding of the processes by which interpersonal risk factors interact with vulnerable psychological states to engender suicidal thoughts and behaviours.

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APPENDIX A Systematic review of the Interpersonal Psychological Theory of Suicide data collection sheet

Enter NR if not reported/insufficient information; NA if not applicable

#	*Variable Name*	*Coding*

GENERAL

1A	**Study #**	
1B	**First author**	
1C	**Reviewer Initials**	
1D	**Date of review (day/month)**	

EXCLUSION CRITERIA (tick any that apply)

2A	**No direct predictor measure of IPTS components (i.e., thwarted belongingness, perceived burdensomeness, or acquired capability)**	
2B	**No direct outcome measure of suicidal thoughts or behaviours**	
3	**Article not in English**	
4	**No original data reported (review, commentary, editorial, etc.)**	
5A	**Case control study**	
5B	**Qualitative study**	
6	**Not published after 2005**	
7	**Not peer-reviewed**	

PAPER DETAILS

8	**Year of paper**	
9	**Country the study was conducted in**	

STUDY CHARACTERISTICS

10	**IPTS component measured & scale used**			
Thwarted belongingness	Perceived burdensomeness	Acquired capability	Other	
Additional information:				
11	**Type of suicide-related thoughts and behaviours measured & scale used**			
Ideation	Attempt	Other		
Additional information:				
12	**Study design**			
Cross-sectional survey	Longitudinal survey	Trial	Other	
Additional information:				

SAMPLE CHARACTERISTICS

13	**Total number of participants**	
14	**Number of completers**	
15	**Recruitment setting**	

Hospital (in-patient)	Mental health clinic (out-patient)	Primary care	School/university
Community	Online	Decedents	Other

Additional information:

16	**Sub population**				
Adolescents	No sub-population	Older adults	Indigenous	Specific ethnic group	
Refugee	Clinical	Detainee	Military	Other	

Additional information:

17	**Recruitment method**	
18	**Participant age: *mean (SD)* or *median* or *range***	
19	**Participant gender (% females)**	

FINDINGS

20	**Findings regarding confirmation or contention of IPTS components and hypotheses**

If reported, summarise findings:

If reported, summarise limitations:

REVIEWER COMMENTS

21	**Additional comments**

APPENDIX B Study characteristics and the support/non-support of the Interpersonal Psychological Theory of Suicide (N = 66)

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Hospital (in-patient), n = 5										
Conner, K. R.	2007	U.S.A	TB, PB	SA	CS	131	Clinical	41.8 (9.6)	52.7%	Partially
Joiner, T. E.	2009 (2)	U.S.A	TB×PB, TB×AC, TB×PB×AC	SA	CS	313	Clinical & Military	22.1 (2.7)	18%	Yes
Monteith, L. L.	2013	U.S.A	TB, PB, TB×PB, PB×AC, TB×AC, TB×PB×AC	SI, SA	CS	181	Clinical & Military	38.1 (10.8)	51.8%	Partially
Kene, P.	2014	U.S.A	AC	SA	CS	100	Clinical	35.8 (11.4)	37%	Yes
Czyz, E. K.	2015	U.S.A	TB, PB, AC, TB×PB, TB×AC, PB×AC, TB×PB×AC	SA	L	376	Adolescents	15.59 (1.31)	72%	No
Mental health clinic (out-patient), n = 15										

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Van Orden, K. A.	2006	U.S.A	PB	SI, SA	CS	343	Clinical	26.5 (9.3)	55%	Yes
Van Orden, K. A.	2008 (3)	U.S.A	PB, AC, PB×AC	Suicide risk	CS	153	Clinical	26.2 (9.3)	54.2%	Partially
Garza, M. J.	2010	U.S.A	PB	SI	CS	61	Specific ethnic group	34.5 (12.0)	100%	Yes
Anestis, M. D.	2011	U.S.A	TB×PB×AC	SA	CS	492	Clinical	26.9 (10.3)	55.1%	Yes
Wong, J. Y.	2011	U.S.A	TB, PB, TB×PB	SI	CS	293	Specific ethnic group	19.1 (2.5)	66.5%	Partially
You, S.	2011	U.S.A	TB	SI, SA	CS	814	Clinical	39 (11.3)	28%	Yes
Bryan, C. J.	2012 (1)	U.S.A	TB, PB, AC, PB×AC	Suicidality	CS	137	Military	28.1 (7.4)	6.3%	Partially
Bryan, C. J.	2012 (2)	U.S.A	TB, PB, AC, PB×AC	Suicidality	CS	55	Clinical & Military	28.4 (8.2)	12.1%	Partially

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Kanzler, K. E.	2012	U.S.A	PB	SI	CS	103	No sub-pop	41.91 (13.4)	65.2%	Yes
Bryan, C. J.	2013 (a2)	U.S.A	TB, PB, AC	Suicide risk	CS	219	Military	27.8 (7.4)	8.2%	Yes
Bryan, C. J.	2013 (c)	U.S.A	PB	SI	CS	97	Clinical & Military	34.1 (8.6)	39.2%	No
Davidson, C. L.	2013	U.S.A	TB, PB TB×PB	SI	CS	60	Clinical	26.1 (9.6)	61.6%	Partially
Wilson, K. G.	2013	Canada	TB, PB	SI	CS	303	Clinical	47.4 (10.2)	62.3%	Yes
Hawkins, K. A.	2014	U.S.A	TB, PB, AC	SI, SA	CS	215	Clinical	26.47 (10.0)	65.4%	Partially
Ribeiro, J. D.	2014	U.S.A	AC	Suicidal symptoms	CS	527	Clinical	27.7 (10.6)	59.2%	Yes
Primary Care, n = 4										
Cukrowicz, K. C.	2011 (2)	U.S.A	PB	SI	CS	105	Older adults	70.8 (7.6)	74.2%	Yes
Jahn, D. R.	2011	U.S.A	PB	SI	CS	106	Older adults	70.9 (7.6)	74.3%	Yes

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Cukrowicz, K. C.	2013	U.S.A	TB, PB, TBxPB	SI	CS	239	Older adults	72.4 (6.9)	60.3%	Partially
Nsamenang, S.A.	2013	U.S.A	TB, PB	Suicidal behaviour	CS	101	Other	42.1 (12.8)	71%	Yes
School / University, n = 27										
Van Orden, K. A.	2008 (1)	U.S.A	TB, PB, TB×PB	SI	CS	309	No sub-pop	19 (2.3)	74%	Partially
Brown, M. R.	2009 (1)	U.S.A	PB	SI, SA	CS	170	Other	19 (NR)	75.2%	Yes
Brown, M. R.	2009 (2)	U.S.A	PB	SI, SA	CS	181	Other	19 (NR)	62.9%	Yes
Davidson, C. L.	2009	U.S.A	TB, PB, AC	SI	CS	129	No sup-pop	20.1 (NR)	65.1%	Yes
Davidson, C. L.	2010	U.S.A	TB, PB, TB×PB, TB×AC, PB×AC, TB×PB×AC	SI	CS	115	Specific ethnic group	20.3 (NR)	67.8	Yes
Davidson, C. L.	2011	U.S.A	TB, PB	SI	CS	269	No sub-pop	19.5 (NR)	71.3%	Partially

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Rasmussen, K. A.	2011	U.S.A	TB, PB, AC	SI	CS	452	No sub-pop	19.8 (3.1)	65.6%	Yes
Timmons, K. A.	2011 (2)	U.S.A	TB	SA	CS	1482	Adolescents	16.6 (1.2)	59%	Yes
Hill, R. M.	2012	U.S.A	TB, PB	SI	CS	198	No sub-pop	21.2 (4.4)	59.6%	Partially
Lamis, D. A.	2012	U.S.A	TB, PB	SI	CS	628	Specific ethnic group	19.2 (1.2)	100%	Partially
Cole, A. B.	2013	U.S.A	TB, PB	SI	CS	156	Indigenous	22.8 (NR)	75.6%	Partially
Hill, R. M.	2013	U.S.A	TB, PB	SI	CS	499	No sub-pop	20.4 (4.3)	73.1%	Partially
Kleiman, E. M.	2013	U.S.A	TB, PB	SI, SA	CS	585	No sub-pop	21.2 (5.1)	82%	Partially
Lamis, D. A.	2013	U.S.A	TB, PB	SI	CS	994	No sub-pop	19.3 (1.3)	69.5%	Partially
Wang, K. T.	2013	U.S.A	TB, PB	SI	CS	466	Specific ethnic group	26.3 (4.9)	49.5%	Yes
Zhang, J.	2013	China	TB, PB, AC	SI	CS	439	No sub-pop	20.6 (1.3)	58.3%	Partially
Davis, M. T.	2014 (a)	U.S.A	TB	SI	CS	434	No sub-pop	19.9 (1.9)	100%	Yes

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Davis, M. T.	2014 (b)	U.S.A	TB, PB	SI	CS	334	Other	19.6 (3.3)	72.2%	Partially
Kleiman, E. M.	2014 (a)	U.S.A	TB, PB	SI	L	245	Other	20.0 (3.0)	79.2%	Partially
Kleiman, E. M.	2014 (b)	U.S.A	TB, PB, TB×PB	SI	L	171	No sub-pop	20.6 (3.8)	70%	Partially
O'Keefe, V. M.	2014	U.S.A	TB, PB, TB×PB	SI	CS	171	Indigenous	23.0 (NR)	77%	Partially
Zaroff, C. M.	2014	China	PB	SI	CS	273	No sub-pop	18.8 (1.0)	62%	Yes
Baams, L.	2015	U.S.A	TB, PB	SI	CS	876	Other	18.3 (1.8)	53.7%	Partially
Ploskonka, R. A.	2015	U.S.A	TB	SI	CS	249	No sub-pop	20.1 (1.4)	60.2%	Partially
Poindexter, E. K.	2015	U.S.A	TB, PB	SI	CS	254	Other	19.5 (3.2)	55.3%	Partially
Ribeiro, J. D.	2015	U.S.A	AC	Suicidality	CS	1208	Military	30 (4.9)	8.3%	Yes
Silva, C.	2015	U.S.A	PB	SI	CS	140	Other	19.5 (1.8)	71.4%	Yes
Community, n = 8										
Joiner, T. E.	2009 (1)	U.S.A	TB, PB, TB×PB	SI	CS	815	Other	19-26	54%	Partially
Bryan, C. J.	2010	U.S.A	TB, PB, AC, TB×PB, PB×AC, TB×AC,	Suicide behaviours	CS	88	Military	18-24	37.5%	Partially

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
			TB×PB×AC							
Smith, P. N.	2010	U.S.A	AC	SA	CS	44	Clinical	SI = 33.07 (14.03)SA = 28.60 (11.98)C = 20.36 (2.17)	SI = 66.7%. SA = 53.3%. C = 42.9%	Yes
Cukrowicz, K. C.	2011 (1)	U.S.A	PB	SI	CS	57	Older adults	74.1 (7.5)	56.1%	Yes
Cramer, R. J.	2012	AUS	TB, PB, AC	SI, suicide potential	CS	307	Other	31.8 (11.0)	11.7%	Yes
Bryan, C. J.	2013 (b)	U.S.A	TB	SI	CS	273	Military	25.9 (5.9)	18.3%	Partially
Christensen, H.	2013	AUS	TB, PB, TB×PB, AC×SI	SI, SA	CS	6133	No sub-pop	28-72	51.5%	Partially
Christensen, H.	2014	AUS	TB, PB, AC, TB×PB	SI, SA	CS	1167	No sub-pop	34.7 (NR)	58%	Yes
Online, n = 2										
Woodward, E. N.	2014	U.S.A	PB	SI	CS	210	LGBT	36.1 (13.9)	52.9%	Partially

Author	Year	Country	IPTS constructs	Outcome	Study design	N	Sub-pop	Age	% F	IPTS supported?
Kim, S.	2015	South Korea	TB, PB	SI	CS	201	LGBT	25.8 (5.9)	41.2%	Partially
Other, n = 5										
Ireland, J. L.	2012	UK	AC	SI, SA	CS	191	Detainee	31 (10.01)	100%	Partially
Bryan, C. J.	2013 (a1)	U.S.A	TB, PB, AC	Suicide risk	CS	348	Military	24.5 (4.8)	10.3%	No
Smith, P. N.	2013	U.S.A	AC	SI	CS	399	Detainee	35.2 (11.0)	0%	No
Simlot, R.	2013	U.S.A	TB, PB, AC	Suicidality	CS	38	Detainee	31.8 (10.2)	0%	Partially
Shelef, L.	2014	Israel	AC	SI	CS	168	Military	19.7 (1)	40.4%	Yes

Note. TB = Thwarted belonging, PB = Perceived burdensomeness, AC = Acquired capability, SI = Suicidal ideation, SA = Suicidal attempt, CS = Cross-sectional, L = Longitudinal, C = Control group, × = interaction, (a) and (b) after year differentiate studies from the same first author with the same year, (1) -(3) differentiate studies within the same paper (i.e., study 1).

APPENDIX C References to articles included in the systematic review

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APPENDIX D Ethics approval for the Thwarted Belongingness Scale expert panel study

From: aries@anu.edu.au
To: Jennifer Ma
Cc: Human.Ethics.Officer@anu.edu.au; Philip Batterham
Subject: Human Ethics Protocol 2016/247
Date: Wednesday, 24 August 2016 2:32:22 PM

THIS IS A SYSTEM-GENERATED E-MAIL. PLEASE DO NOT REPLY. SEE BELOW FOR E-MAIL CONTACT DETAILS.

Dear Ms Jennifer Ma,

Protocol: 2016/247
Interpersonal screening for suicide risk: The development of a scale for thwarted belongingness

I am pleased to advise you that your Human Ethics application received approval by the Chair of the Science and Medical DERC on 24/08/2016.

For your information:

1. Under the NHMRC/AVCC National Statement on Ethical Conduct in Human Research we are required to follow up research that we have approved. Once a year (or sooner for short projects) we shall request a brief report on any ethical issues which may have arisen during your research or whether it proceeded according to the plan outlined in the above protocol.

2. Please notify the committee of any changes to your protocol in the course of your research, and when you complete or cease working on the project.

3. Please notify the Committee immediately if any unforeseen events occur that might affect continued ethical acceptability of the research work.

4. Please advise the HREC if you receive any complaints about the research work.

5. The validity of the current approval is five years' maximum from the date shown approved. For longer projects you are required to seek renewed approval from the Committee.

All the best with your research,

Human Ethics Officer
Research Integrity & Compliance
Research Services Division
Level 2, Birch Building 36
Science Road, ANU
The Australian National University
Acton ACT 2601

T: 6125-3427
E: human.ethics.officer@anu.edu.au
W: https://services.anu.edu.au/research-support/ethics-integrity

APPENDIX E Ethics approval for the Thwarted Belongingness Scale pilot and validation study

From: aries@anu.edu.au
Subject: Human Ethics Protocol 2016/387 - Approval
Date: 23 September 2016 at 10:44 am
To: jennifer.ma@anu.edu.au
Cc: human.ethics.officer@anu.edu.au, u4435982@anu.edu.au

THIS IS A SYSTEM-GENERATED E-MAIL. PLEASE DO NOT REPLY. SEE BELOW FOR E-MAIL CONTACT DETAILS.

Dear Ms Jennifer Ma,

Protocol: 2016/387
Interpersonal screening for suicide risk: Validation of a new scale for thwarted belongingness and tests of the Interpersonal Psychological Theory of Suicide

I am pleased to advise you that your Human Ethics application received approval by the Chair of the HREC on the 23/09/2016.

For your information:

1. Under the NHMRC/AVCC National Statement on Ethical Conduct in Human Research we are required to follow up research that we have approved. Once a year (or sooner for short projects) we shall request a brief report on any ethical issues which may have arisen during your research or whether it proceeded according to the plan outlined in the above protocol.

2. Please notify the committee of any changes to your protocol in the course of your research, and when you complete or cease working on the project.

3. Please notify the Committee immediately if any unforeseen events occur that might affect continued ethical acceptability of the research work.

4. Please advise the HREC if you receive any complaints about the research work.

5. The validity of the current approval is five years' maximum from the date shown approved. For longer projects you are required to seek renewed approval from the Committee.

All the best with your research,

Human Ethics Officer
Research Integrity & Compliance
Research Services Division
Level 2, Birch Building 36
Science Road, ANU
The Australian National University
Acton ACT 2601

T: 6125-3427
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W: https://services.anu.edu.au/research-support/ethics-integrity

APPENDIX F Expert panel email invitation

Dear <expert panel member>,

Given your significant research and/or clinical work in the area of suicide prevention, we would like to invite you to participate in the following study. This study is being conducted under the supervision of **Dr. Philip Batterham and Dr. Alison Calear** at the Centre for Mental Health Research, the Australian National University, as part of a Doctor of Philosophy.

The study aims to construct a **self-report instrument measuring thwarted belongingness,** within the framework of the Interpersonal-Psychological Theory of Suicide (Joiner, 2005).

Participation will take between **15-20 minutes** of your time, and consists of answering a few questions about the relevance and significance of items included in the newly developed thwarted belongingness measure.

If you are unable to participate in this study, we would greatly appreciate if you forwarded this study onto any affiliated researchers (e.g., post-doctorate students) or clinicians who would be willing and qualified to complete the study.

If you are interested in participating in this study, please click the following link: <survey link>

Or copy and paste the URL below into your internet browser: <survey link>

Thank you for your time and consideration. Please do not hesitate to contact me if you have any further questions or queries.

Kind Regards,

Jennifer Ma
Primary Investigator
Centre for Mental Health Research

Research School of Population Health
ANU College of Medicine, Biology and Environment
Room 13, Building 63 Eggleston Road, The Australian National University
Canberra ACT 2601 Australia
T: +61 2 6125 6370
F: +61 2 6125 0733
Email: Jennifer.ma@anu.edu.au

Follow the link to opt out of future emails: <Opt out link>

APPENDIX G Expert panel participant information sheet

Participant Information Sheet

Researcher:

This research is being conducted by Jennifer Ma, a PhD student from the Centre for Mental Health Research located within the Research School of Population Health at the Australian National University.

Project Title: Interpersonal screening for suicide risk: The development of a scale for thwarted belongingness.

General Outline of the Project:

- **Description and Methodology:** The Centre for Mental Health Research is conducting a study to develop a self-report instrument for measuring thwarted belongingness. As part of the process, we are inviting expert researchers and clinicians in the area of suicide prevention to advise on the items we have constructed.
- **Participants:** The online survey is recruiting both Australian and international suicide prevention experts, who have been identified by our research team as possessing relevant expertise. Approximately 10 experts will be involved in this project.
- **Use of Data and Feedback:** The information collected from this survey will be used to inform the construction of our thwarted belongingness measure, and will be presented as a preliminary thwarted-belongingness measure in the form of a research thesis submitted to the ANU Research School of Population Health as part of the primary researcher's Doctor of Philosophy. The data may also be used for publication in relevant academic journals and conferences. Aggregate feedback on the outcomes of the expert input process will be available on request from the researchers by email and disseminated through peer-reviewed publications and conference presentations.

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in the project is **voluntary** and you may, without negative consequences, decline to take part, or **withdraw from the study at any point before the completion of the survey**, by discontinuing the survey. You can decline to answer any questions presented. Your data will only be used if your survey is submitted. Data will be re-identifiable, allowing withdrawal until before the work is prepared for publication. If you do withdraw, your data will be deleted.
- **What does participation in the research request of you?** You will be asked a few brief questions about the relevance and significance of scale items and, utilising your expertise, will be asked to comment on any changes you would make.
- **Location and Duration:** The research will be conducted online, and requires you to respond on only one occasion. The survey will take approximately 10 minutes to complete.
- **Risks:** We do not foresee any risks or hazards associated with this study. However, if you do find it upsetting to discuss content relating to thwarted belongingness, we suggest that you stop filling out the survey immediately. For participants wishing to access psychological support, please contact Lifeline Australia on 13 11 14 or your local health provider. Further, as per the nature of this research, your responses will be identifiable to the research panel but individuals will not be identifiable in any publication of the research.
- **Benefits:** The results of this study will be used to develop a measure of thwarted belongingness with the aim of enhancing the treatment and prevention of mental health problems. This research may benefit you directly by providing a measure for thwarted belongingness that may inform your clinical practice or contribute to your research.

Exclusion criteria:

- **Participant Limitation:** Participants must be experts in the field of suicide prevention, as determined by the research team, and be fluent in English to be eligible to participate in this research.

Confidentiality:

- **Confidentiality:** Since you are providing responses based on your expertise, data will be collected in a manner that enables identification of personal information. However, only researchers involved in this project will have access to the data to conduct data analyses. All information provided will be kept strictly confidential and private, as far as the law allows, and stored under password protection.

Privacy Notice:

Privacy Statement

- **Security of the website:** Users should be aware that the World Wide Web is an insecure public network that gives rise to a potential risk that a user's transactions are being viewed, intercepted or modified by third parties or that data which the user downloads may contain computer viruses or other defects. The Qualtrics privacy policy can be found here: https://www.qualtrics.com/privacy-statement/
- **Purpose of data collection:** This information is being sought for a research project entitled Interpersonal screening for suicide risk: The development of a scale for thwarted belongingness. The researcher is Jennifer Ma (Jennifer.ma@anu.edu.au, +61 2 6125 6370, Centre for Mental Health Research, Building 63 Eggleston Road, The Australian National University). The project aims to develop a self-report scale for feelings of thwarted belongingness. The information you provide will only be used for the purpose for which you have provided it. It will not be disclosed without your consent.
- **Security of the data:** The data will be kept secure on the researcher's password protected Qualtrics account database. Only researchers involved in the study will have access to the data. Security of personal information will be maintained in accordance with legal, contractual and ethical protocols and requirements during collection, analysis, and preparation of results. The Qualtrics security policy can be found here: https://www.qualtrics.com/security-statement/. Data will be stored for a minimum of five years from the date of last publication arising from the research. Data will only be published or presented in de-identified, aggregate form. After this time, the data may be destroyed or archived for future use by the Centre for Mental Health Research. Archived data will be de-identified.

Queries and Concerns:

- **Contact Details for More Information:** If you have any queries about the project or further requests for information, please feel free to contact the primary investigator or primary supervisor:

  Jennifer Ma
  Primary Investigator
  Centre for Mental Health Research
  Research School of Population Health
  ANU College of Medicine, Biology and Environment
  Room 13, Building 63 Eggleston Road
  The Australian National University
  Canberra ACT 2601 Australia
  T: +61 2 6125 6370
  F: +61 2 6125 0733
  Email: Jennifer.ma@anu.edu.au

  Dr. Philip Batterham
  Primary Research Supervisor
  Centre for Mental Health Research
  Research School of Population Health
  ANU College of Medicine, Biology and Environment
  Building 63 Eggleston Road, The Australian National University
  Canberra ACT 2601 Australia
  T: +61 6125 1031
  Email: philip.batterham@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress related to this study or otherwise, please do not hesitate to contact any of the following established state and national based mental health service providers if you are located in Australia:

  Lifeline Australia: 13 11 14 (24 hours), www.lifeline.org.au
  Kids Helpline (for people aged 25 and under): 1800 55 1800 (24 Hours)
  Suicide call-back service: 1300 659 467 (24 hours),

www.suicidecallbackservice.org.au

New South Wales: NSW Health or 1800 011 511
Victoria: Vic Health or 1300 651 251 (SuicideLine)
Queensland: QLD Health or 13 43 25 (referral service)
Western Australia: WA Health or 1800 676 822 (metro) or 1800 552 002 (rural/remote)
South Australia: SA Health or 13 14 65 (crisis team)
Tasmania: TAS Health or 1800 332 388 (crisis team)
Australian Capital Territory: ACT Health or 1800 629 354 (crisis team)
Northern Territory: NT Health or 1800 682 288 (crisis team)

Mental health information lines:
beyondblue: 1300 22 4636 (24 hours), www.beyondblue.org.au
SANE: 1800 187 263 (9-5), www.sane.org

If you are located overseas, please contact your local health care provider.

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2016/247). If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

APPENDIX H Participant information sheet for the Thwarted Belongingness Scale pilot study

Thwarted Belongingness Pilot Study Participant Information Sheet

Researcher:
Hello, my name is Jennifer Ma. I am a PhD student at the Centre for Mental Health Research located within the Research School of Population Health at the Australian National University. For my PhD project I am interested in looking at how interpersonal relationships can play a role as both risk and protective factors to suicide and mental health problems.

Project Title: Interpersonal screening for suicide risk: Validation of a new scale for thwarted belongingness and tests of the Interpersonal Psychological Theory of Suicide.

General Outline of the Project:

- **Description and Methodology:** Feelings of not belonging (i.e., thwarted belongingness) have been linked to the development of suicide-related thoughts. For my PhD project, I aim to develop and validate a self-report scale for feelings of thwarted belongingness, as well as look at how various risk and protective factors play a role in the development of suicide and mental health problems. The project will involve the completion of a 10-minute anonymous online questionnaire.
- **Participants:** We will be recruiting participants from Facebook who are: 1) over 18 years of age, 2) currently living in Australia, and 3) fluent in English. We hope to involve 700 participants in the study.
- **Use of Data and Feedback:** Data will be used in my PhD thesis, publications, and presentations. The results will also be shared in aggregate form on the study's Facebook page.

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this project is **voluntary** and you may, without negative consequences, decline to take part or **withdraw from the research at any point before completion of the survey** without providing an explanation by discontinuing the survey. You can also decline to answer any questions presented. If you choose to withdraw your data will be deleted.
- **What does participation in the research entail?** Participation in this project will involve completing a 10-minute anonymous online questionnaire. The questionnaire consists of questions about feelings of burden and belonging in interpersonal relationships, as well as some demographic details.
- **Location and Duration:** The research will be conducted online, and you will only be required to complete the questionnaire once. The questionnaire will take approximately 10-15 minutes to complete.
- **Risks:** Due to the sensitive nature of the questions, some participants may find recalling thoughts and feelings around burdensomeness and belonging in interpersonal relationships distressing. If you experience any distress related to this study or otherwise, please do not hesitate to contact Lifeline Australia on 13 11 14 or your local health provider.
- **Benefits:** Though it is unlikely that personal benefit will be gained from participating in this research, your participation will help contribute to understanding how thwarted belongingness may be better measured, as well as how certain risk and protective factors play a role in the development of suicide and mental health problems.

Exclusion criteria:

- **Participant Limitation:** We are only including participants in the study who are: 1) over 18 years of age, 2) currently living in Australia, and 3) fluent in English.

Confidentiality:

- **Confidentiality:** No personal identifying information will be collected from participants as the survey is anonymous. Only the researchers involved in the study will have access to the data, and all information will be kept strictly

confidential and private, as far as the law allows. Data will only be published or presented in aggregate form.

Privacy Notice:

- **Privacy Statement:** In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:
    - Access or seek correction to their personal information;
    - Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.
- **Security of the website:** Users should be aware that the World Wide Web is an insecure public network that gives rise to a potential risk that a user's transactions are being viewed, intercepted or modified by third parties or that data which the user downloads may contain computer viruses or other defects. The Qualtrics privacy policy can be found here: https://www.qualtrics.com/privacy-statement/
- **Purpose of data collection:** This information is being sought for a research project entitled Interpersonal screening for suicide risk: Validation of a new scale for thwarted belongingness and tests of the Interpersonal Psychological Theory of Suicide. The researcher is Jennifer Ma (Jennifer.ma@anu.edu.au, +61 2 6125 6370, Centre for Mental Health Research, Building 63 Eggleston Road, The Australian National University). The project aims to develop and validate a self-report scale for feelings of thwarted belongingness, as well as examine how various risk and protective factors play a role in the development of suicide and mental health problems. The information you provide will only be used for the purpose for which you have provided it. It will not be disclosed without your consent.
- **Security of the data:** The data will be kept secure on the researcher's password protected Qualtrics account database. Only researchers involved in the study will have access to the data. Security of personal information will be maintained in accordance with legal, contractual and ethical protocols and requirements during collection, analysis, and preparation of results. The Qualtrics security policy can be found here: https://www.qualtrics.com/security-statement/. Data will be stored for a minimum of five years from the date of last publication arising from

the research. Data will only be published or presented in aggregate form. After this time, the data may be destroyed or archived for future use by the Centre for Mental Health Research.

Queries and Concerns:

- **Contact Details for More Information:** If you have any queries about the project or further requests for information, please feel free to contact the primary investigator or primary supervisor:

Jennifer Ma
Primary Investigator
Centre for Mental Health Research
Research School of Population Health
ANU College of Medicine, Biology and Environment
Room 13, Building 63 Eggleston Road
The Australian National University
Canberra ACT 2601 Australia
T: +61 2 6125 6370
F: +61 2 6125 0733
Email: Jennifer.ma@anu.edu.au

Dr. Philip Batterham
Primary Research Supervisor
Centre for Mental Health Research
Research School of Population Health
ANU College of Medicine, Biology and Environment
Building 63 Eggleston Road, The Australian National University
Canberra ACT 2601 Australia
T: +61 6125 1031
Email: philip.batterham@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress related to this study or otherwise, please do not hesitate to contact any of the following established state and national based mental health service providers:

Lifeline Australia: 13 11 14 (24 hours), www.lifeline.org.au
Kids Helpline (for people aged 25 and under): 1800 55 1800 (24 Hours)
Suicide call-back service: 1300 659 467 (24 hours),
www.suicidecallbackservice.org.au

New South Wales: NSW Health or 1800 011 511
Victoria: Vic Health or 1300 651 251 (SuicideLine)
Queensland: QLD Health or 13 43 25 (referral service)
Western Australia: WA Health or 1800 676 822 (metro) or 1800 552 002 (rural/remote)
South Australia: SA Health or 13 14 65 (crisis team)
Tasmania: TAS Health or 1800 332 388 (crisis team)
Australian Capital Territory: ACT Health or 1800 629 354 (crisis team)
Northern Territory: NT Health or 1800 682 288 (crisis team)

Mental health information lines:
beyondblue: 1300 22 4636 (24 hours), www.beyondblue.org.au
SANE: 1800 187 263 (9-5), www.sane.org

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2016/387). If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

APPENDIX I Participant information sheet for the Thwarted Belongingness Scale validation study

Large Community-based Study Participant Information Sheet

Researcher:
Hello, my name is Jennifer Ma. I am a PhD student at the Centre for Mental Health Research located within the Research School of Population Health at the Australian National University. For my PhD project I am interested in looking at how interpersonal relationships can play a role as both risk and protective factors to suicide and mental health problems.

Project Title: Interpersonal screening for suicide risk: Validation of a new scale for thwarted belongingness and tests of the Interpersonal Psychological Theory of Suicide.

General Outline of the Project:

- **Description and Methodology:** Feelings of not belonging (i.e., thwarted belongingness) have been linked to the development of suicide-related thoughts. For my PhD project, I aim to develop and validate a self-report scale for feelings of thwarted belongingness, as well as look at how various risk and protective factors play a role in the development of suicide and mental health problems. The project will involve the completion of a 30-min anonymous online questionnaire.
- **Participants:** We will be recruiting participants from Facebook who are: 1) over 18 years of age, 2) currently living in Australia, and 3) fluent in English. We hope to involve 700 participants in the study.
- **Use of Data and Feedback:** Data will be used in my PhD thesis, publications, and presentations. The results will also be shared in aggregate form on the study's Facebook page.

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this project is **voluntary** and you may, without negative consequences, decline to take part or **withdraw from the research at any point before completion of the survey** without providing an explanation by discontinuing the survey. You can also decline to answer any questions presented. If you choose to withdraw your data will be deleted.
- **What does participation in the research entail?** Participation in this project will involve completing a 30-min anonymous online questionnaire. The questionnaire consists of questions about feelings of burden and belonging in interpersonal relationships, social support and resilience, past suicide and mental health history, as well as some demographic details.
- **Location and Duration:** The research will be conducted online, and you will only be required to complete the questionnaire once. The questionnaire will take approximately 25-40 minutes to complete.
- **Risks:** Due to the sensitive nature of the questions, some participants may find recalling thoughts and feelings around burdensomeness and belonging in interpersonal relationships and history of suicide distressing. If you experience any distress related to this study or otherwise, please do not hesitate to contact Lifeline Australia on 13 11 14 or your local health provider.
- **Benefits:** Though it is unlikely that personal benefit will be gained from participating in this research, your participation will help contribute to understanding how thwarted belongingness may be better measured, as well as how certain risk and protective factors play a role in the development of suicide and mental health problems.

Exclusion criteria:

- **Participant Limitation:** We are only including participants in the study who are: 1) over 18 years of age, 2) currently living in Australia, and 3) fluent in English.

Confidentiality:

- **Confidentiality:** No personal identifying information will be collected from participants as the survey is anonymous. Only the researchers involved in the study will have access to the data, and all information will be kept strictly

confidential and private, as far as the law allows. Data will only be published or presented in aggregate form.

Privacy Notice:

Privacy Statement

In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:

- Access or seek correction to their personal information;
- Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.

- **Security of the website:** Users should be aware that the World Wide Web is an insecure public network that gives rise to a potential risk that a user's transactions are being viewed, intercepted or modified by third parties or that data which the user downloads may contain computer viruses or other defects. The Qualtrics privacy policy can be found here: https://www.qualtrics.com/privacy-statement/
- **Purpose of data collection:** This information is being sought for a research project entitled Interpersonal screening for suicide risk: Validation of a new scale for thwarted belongingness and tests of the Interpersonal Psychological Theory of Suicide. The researcher is Jennifer Ma (Jennifer.ma@anu.edu.au, +61 2 6125 6370, Centre for Mental Health Research, Building 63 Eggleston Road, The Australian National University). The project aims to develop and validate a self-report scale for feelings of thwarted belongingness, as well as examine how various risk and protective factors play a role in the development of suicide and mental health problems. The information you provide will only be used for the purpose for which you have provided it. It will not be disclosed without your consent.
- **Security of the data:** The data will be kept secure on the researcher's password protected Qualtrics account database. Only researchers involved in the study will have access to the data. Security of personal information will be maintained in accordance with legal, contractual and ethical protocols and requirements during collection, analysis, and preparation of results. The Qualtrics security policy can be found here: https://www.qualtrics.com/security-statement/. Data will be

stored for a minimum of five years from the date of last publication arising from the research. Data will only be published or presented in aggregate form. After this time, the data may be destroyed or archived for future use by the Centre for Mental Health Research.

Queries and Concerns:

- **Contact Details for More Information:** If you have any queries about the project or further requests for information, please feel free to contact the primary investigator or primary supervisor:

Jennifer Ma
Primary Investigator
Centre for Mental Health Research
Research School of Population Health
ANU College of Medicine, Biology and Environment
Room 13, Building 63 Eggleston Road
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Canberra ACT 2601 Australia
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F: +61 2 6125 0733
Email: Jennifer.ma@anu.edu.au

Dr. Philip Batterham
Primary Research Supervisor
Centre for Mental Health Research
Research School of Population Health
ANU College of Medicine, Biology and Environment
Building 63 Eggleston Road, The Australian National University
Canberra ACT 2601 Australia
T: +61 6125 1031
Email: philip.batterham@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress related to this study or otherwise, please do not hesitate to contact any of the following established state and national based mental health service providers:

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Kids Helpline (for people aged 25 and under): 1800 55 1800 (24 Hours), https://kidshelpline.com.au
Suicide call-back service: 1300 659 467 (24 hours), www.suicidecallbackservice.org.au

New South Wales: NSW Health or 1800 011 511
Victoria: Vic Health or 1300 651 251 (SuicideLine)
Queensland: QLD Health or 13 43 25 (referral service)
Western Australia: WA Health or 1800 676 822 (metro) or 1800 552 002 (rural/remote)
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Mental health information lines:
beyondblue: 1300 22 4636 (24 hours), www.beyondblue.org.au
SANE: 1800 187 263 (9-5), www.sane.org

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2016/387). If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

APPENDIX J Expert panel questionnaire and 42-item thwarted belongingness pool

A state of thwarted belongingness is said to occur when our fundamental need for belonging is unmet (Joiner, 2005). According to Joiner, thwarted belongingness is said to comprise of two facets: (1) loneliness, an affectively laden cognition that one has too few social connections, and (2) the absence of reciprocal caring relationships (i.e., where individuals feel cared about and demonstrate care of another). It is viewed as a dynamic cognitive-affective state that is influenced by inter and intrapersonal factors such as experiencing family conflict, living alone, possessing few social supports, and being prone to interpret others' behaviour as rejection (Van Orden et al., 2010).

Please read each item and score it for its relevance in representing the concept of thwarted belongingness. Please feel free to provide additional comments on item relevance, wording, as well as additional items or concept suggestions.

The items will be preceded by the following information:

Please rate on the scale below, how you have been feeling recently about the following:

All items are rated on a 7-point scale from 1 (*not at all true for me*) to 7 (*very true for me*). Scores are coded such that higher ratings indicate greater thwarted belongingness (as per the INQ). The rating scale is shown below:

Not at all true for me 1	2	3	Somewhat True for me 4	5	6	True for Me 7

[Items]

Item 1: Nothing I do matters

Irrelevant	Indirectly Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
☐	☐	☐	☐	☐

Optional comments about the relevance of this item and its wording:

_____

_____

_____

Item 2: It wouldn't make a difference to anyone or anything if I was dead, things would just go on without me

Item 3: I don't have meaningful relationships with others

Item 4: I don't play an important role in other people's lives

Item 5: I don't matter to other people

Item 6: Nobody cares about me

Item 7: Nobody would look for me if I didn't show up

Item 8: I am alone in this world

Item 9: I am isolated

Item 10: There is no one I can talk to

Item 11: I have no one I can turn to

Item 12: I am not close to anyone

Item 13: I feel excluded by others

Item 14: People shun me

Item 15: I don't fit in

Item 16: I wish others were more concerned about my welfare

Item 17: People don't pay attention to me

Item 18: I often feel rejected by others

Item 19: Society doesn't want people like me

Item 20: I don't get the chance to show love to others around me

Item 21: I don't contribute to the well-being of others

Item 22: I don't get to use my skills to make a difference in society

Item 23: I don't contribute to something larger than myself

Item 24: I don't contribute to anything in a meaningful way

Item 25: Life is all around me, but I don't feel a part of it

Item 26: I am searching for some connection, but cannot find it

Item 27: Though there are people who care about me, they don't understand what I'm going through

Item 28: I don't live the life I want to live with others

Item 29: I frequently experience bullying or abuse

Item 30: I am verbally abused by others around me

Item 31: I am physically abused by others around me

Item 32: I am manipulated by others around me

Item 33: My needs are deprived by others around me

Item 34: Others see me as worthless

Item 35: I am belittled by others close to me

Item 36: People in my life don't support me

Item 37: It is too painful to be around others

Item 38: I don't receive love from others around me

Item 39: I don't feel welcome where I live

Item 40: I cannot reach out and communicate with those around me

Item 41: I cannot do much to help myself

Item 42: I cannot do much to make a difference in my life

In your opinion, do the items taken as a whole adequately cover the construct of thwarted belongingness?

Yes	No
☐	☐

Aside from the items listed above, can you suggest any other items or concepts that may be used to assess thwarted belongingness?

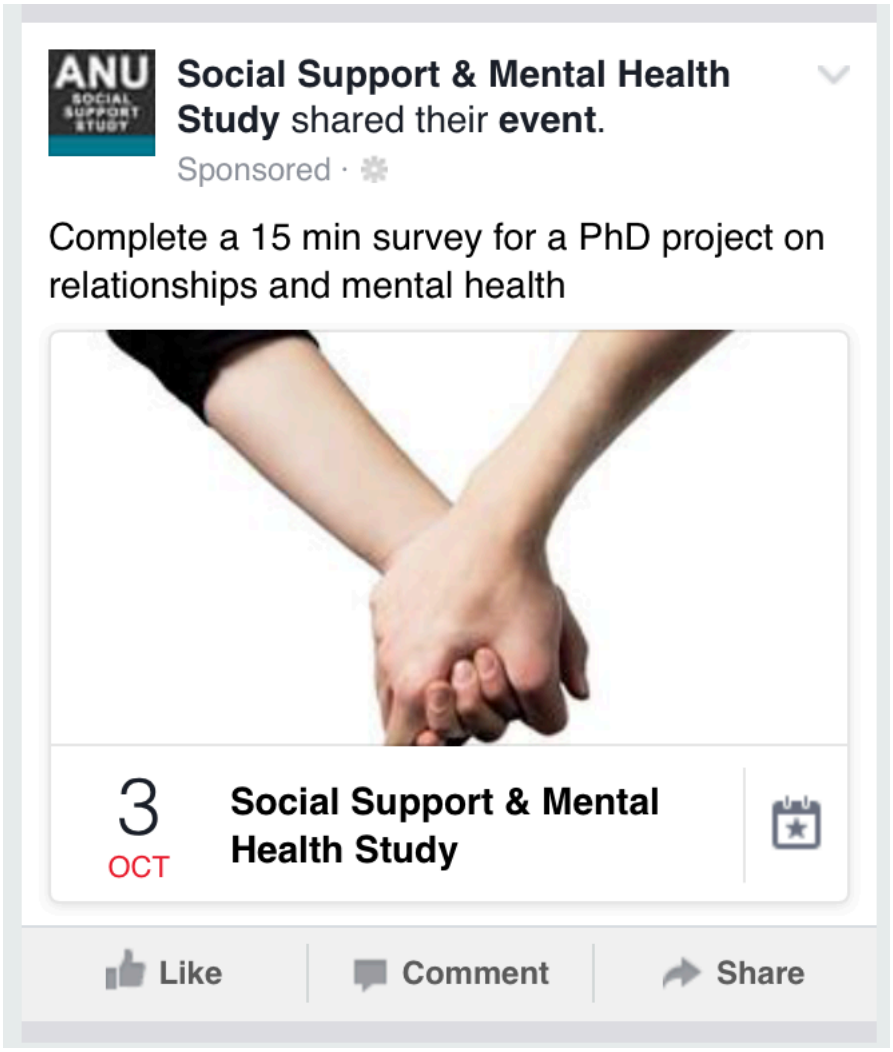
_____

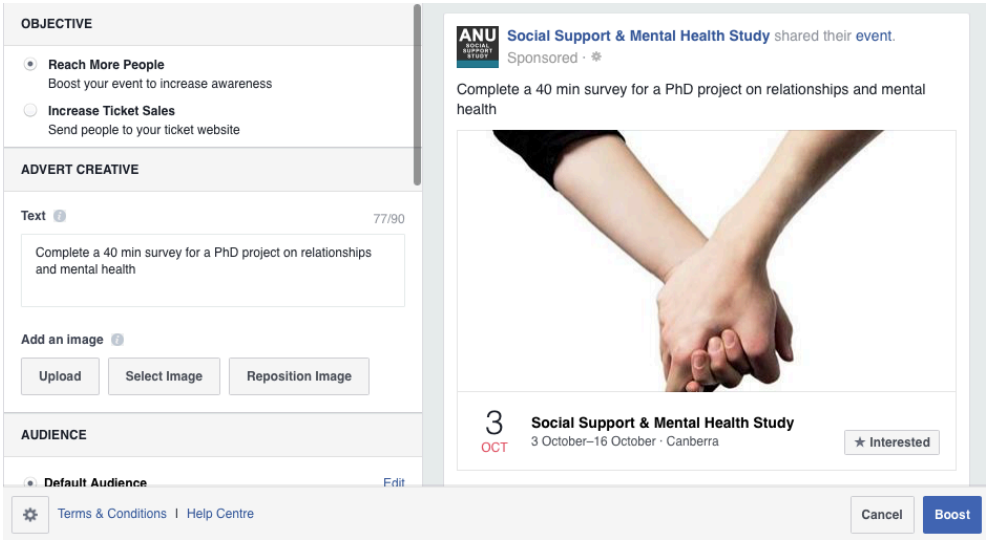
_____

_____

APPENDIX K Facebook page for the Thwarted Belongingness Scale study

APPENDIX L Facebook advertisements for the Thwarted Belongingness Scale pilot and validation studies





APPENDIX M Study 1 factor loadings for one factor solution of 22-item Thwarted Belongingness Scale (TBS) pool and 9-item Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012)

Thwarted belongingness item	Factor loading
1. I have no one I can turn to	**.863**
2. I am not close to anyone	**.849**
3. I don't play an important role in other people's lives	**.845**
4. I feel there is no one I can talk to	**.843**
5. I don't fit in	**.841**
6. I feel isolated	**.836**
7. I don't matter to other people	**.833**
8. Life is all around me, but I don't feel a part of it	**.831**
9. Nobody cares about me	**.820**
10. I don't have meaningful relationships with others	**.807**
11. These days, I am close to other people (INQ TB)	**.806**
12. I feel excluded by others	**.803**
13. I often feel rejected by others	**.790**
14. I am alone in this world	**.785**
15. I am searching for some connection, but cannot find it	**.784**
16. I cannot reach out and communicate with those around me	**.782**
17. These days, I feel there are people I can turn to in times of need (INQ TB)	.778
18. These days, I feel like I belong (INQ TB)	.776
19. I don't receive love from others around me	.775
20. These days, I feel disconnected from other people (INQ	.749

TB)	
21. Nobody would look for me if I didn't show up	.744
22. It wouldn't make a difference to anyone or anything if I was dead, things would just go on without me	.739
23. Society doesn't want people like me	.737
24. I don't get the chance to show love to others around me	.734
25. These days, other people care about me (INQ TB)	.734
26. Though there are people who care about me, they don't understand what I'm going through	.725
27. These days, I have at least one satisfying interaction every day (INQ TB)	.707
28. These days, I am fortunate to have many caring and supportive friends (INQ TB)	.698
29. These days, I rarely interact with people who care about me (INQ TB)	.670
30. These days, I often feel like an outsider in social gatherings (INQ TB)	.640
31. I don't feel welcome where I live	.582

Note. Bold values indicate items with ≥ 0.78 loading.

APPENDIX N Study 1 inter-item correlations between 16 items with highest factor loadings

TBS item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. No one turn to	-															
2. Not close	**.84****	-														
3. No importance	**.72****	**.73****	-													
4. No one talk to	**.88****	**.78****	.69**	-												
5. Don't fit in	.67**	.68**	.66**	.67**	-											
6. Isolated	**.71****	**.70****	.69**	**.75****	**.75****	-										
7. Don't matter	**.71****	.68**	**.85****	.68**	.67**	.64**	-									
8. Not part of life	.66**	.68**	**.72****	.67**	**.73****	**.75****	.67**	-								
9. Nobody cares	**.72****	**.70****	**.79****	.67**	.61**	.60**	**.86****	.61**	-							
10. No meaningful	**.70****	**.76****	**.79****	.68**	.63**	.64**	**.74****	.67**	**.71****	-						
11. Close to others	**.71****	**.76****	.62**	**.70****	.64**	.63**	.58**	.63**	.66**	.66**	-					
12. Excluded	.68**	.64**	.66**	.66**	**.75****	.69**	.65**	.66**	.61**	.58**	.58**	-				
13. Rejected	.66**	.60**	.65**	.63**	**.79****	.68**	.66**	.62**	.60**	.60**	.54**	**.84****	-			
14. Alone	**.70****	**.70****	.65**	.65**	.64**	**.70****	.64**	.63**	.65**	.68**	.62**	.56**	.59**	-		
15. No connection	.67**	.66**	.66**	.66**	.65**	.68**	.61**	**.75****	.59**	.61**	.63**	.60**	.58**	.65**	-	
16. Can't communicate	.69**	.64**	.60**	**.70****	.66**	.64**	.64**	.66**	.63**	.58**	.63**	.62**	.62**	.60**	.58**	-

Note. **Correlation is significant at the 0.01 level (2-tailed); significant correlations ≥ 0.70 are in bold.

APPENDIX O Study 2 uni-dimensional confirmatory factor analysis model for the Thwarted Belongingness Scale (TBS), N = 578

TBS item		Estimate	*S.E.*	*p*
TBS1	I feel isolated	2.10	0.12	<0.01
TBS2	I don't matter to other people	2.68	0.15	<0.01
TBS3	Nobody cares about me	2.55	0.14	<0.01
TBS4	I feel there is no one I can talk to	1.69	0.08	<0.01
TBS5	I don't fit in	1.95	0.10	<0.01
TBS6	I don't play an important role in other people's lives	1.63	0.08	<0.01
TBS7	I am not close to anyone	1.66	0.08	<0.01
TBS8	I am alone in this world	1.52	0.08	<0.01

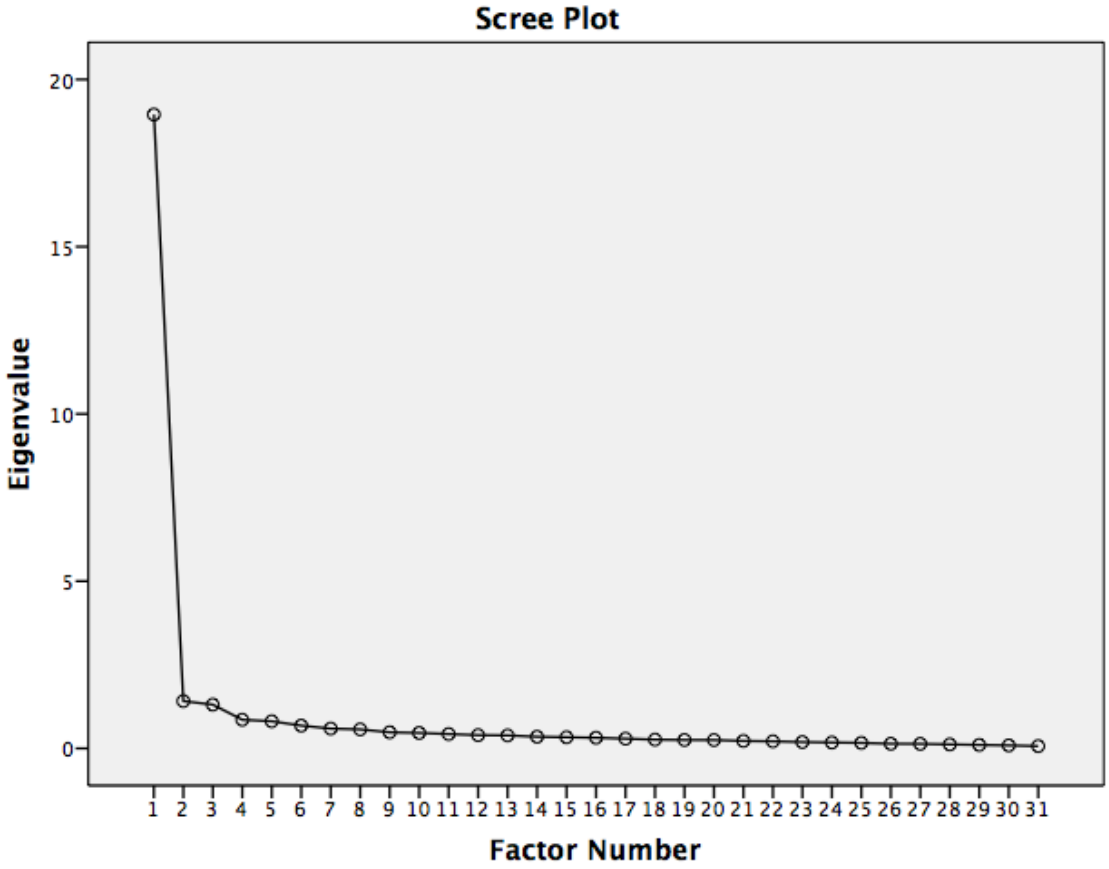
Note. Estimates are unstandardised.

APPENDIX P Study 2 bi-factor exploratory analysis model for the Thwarted Belongingness Scale (TBS), N = 578

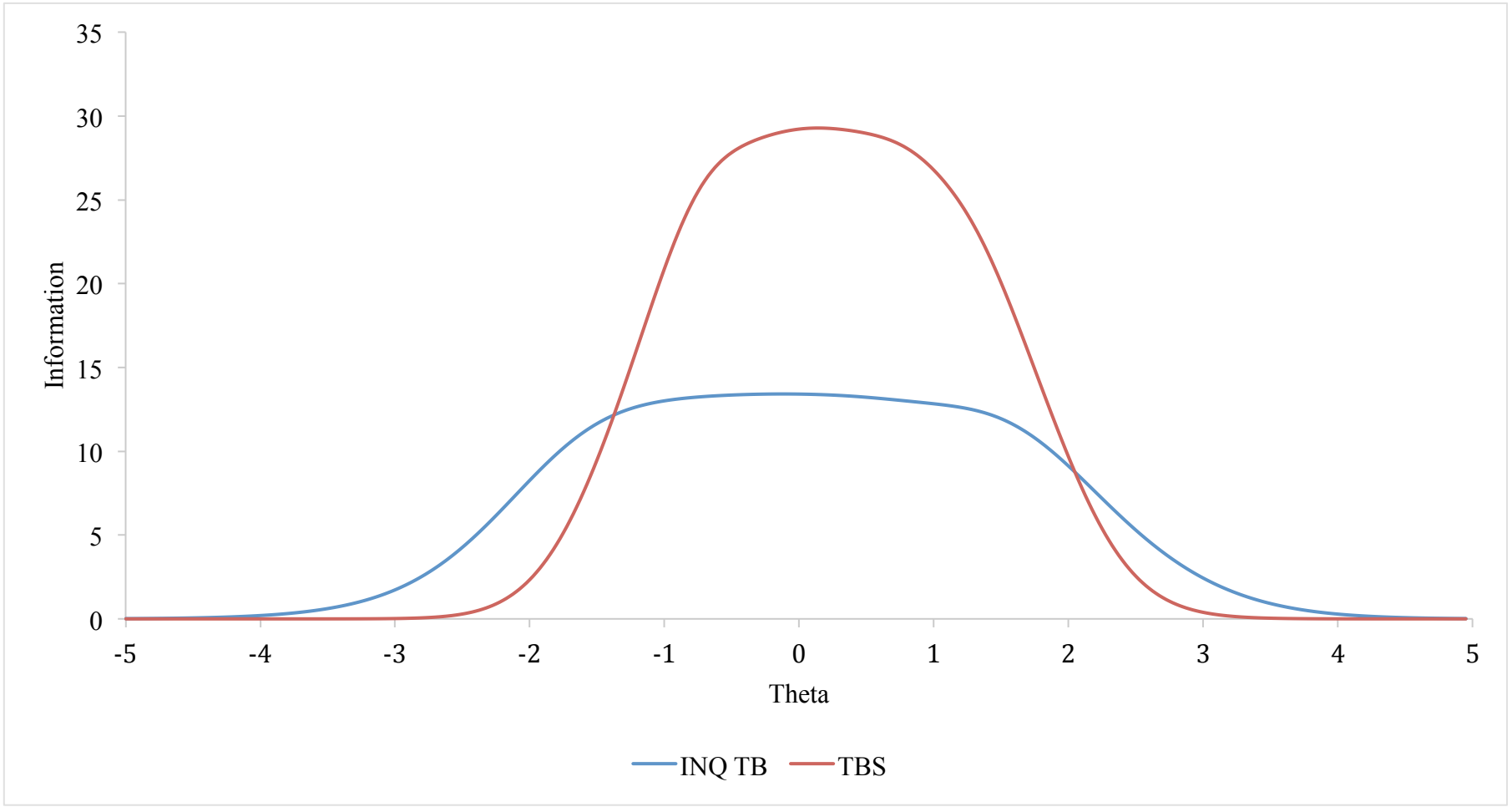
TBS Item		General Factor	Group Factor 1	Group Factor 2	Residual
TBS1	I feel isolated	**0.82**	-0.02	**0.48**	0.08
TBS2	I don't matter to other people	**0.93**	**-0.18**	0.04	0.09
TBS3	Nobody cares about me	**0.94**	**-0.21**	-0.05	0.06
TBS4	I feel there is no one I can talk to	**0.83**	**0.11**	**0.22**	0.23
TBS5	I don't fit in	**0.80**	0.004	**0.42**	0.16
TBS6	I don't play an important role in other people's lives	**0.86**	0.10	-0.005	0.24
TBS7	I am not close to anyone	**0.88**	**0.44**	-0.01	0.02
TBS8	I am alone in this world	**0.81**	0.006	**0.21**	0.28
Eigenvalue		5.97	0.30	0.51	

Note. General Factor = Thwarted belongingness; bold values indicate $p < 0.05$.

APPENDIX Q Study 1 scree plot of 22 Thwarted Belongingness Scale (TBS) and 9 Interpersonal Needs Questionnaire Thwarted Belongingness subscale items (INQ TB; Van Orden, Cukrowicz, et al., 2012)



APPENDIX R Study 2 test information function curves for the Thwarted Belongingness Scale (TBS) and Interpersonal Needs Questionnaire Thwarted Belongingness subscale (INQ TB; Van Orden, Cukrowicz, et al., 2012)



APPENDIX S Thwarted Belongingness Scale (TBS)

Please rate on the scale below, how you have been feeling recently about the following:

Not at all true for me 1	2	3	Somewhat True for me 4	5	6	True for Me 7

1. I feel isolated
2. I don't matter to other people
3. Nobody cares about me
4. I feel there is no one I can talk to
5. I don't fit in
6. I don't play an important role in other people's lives
7. I am not close to anyone
8. I am alone in this world

Scoring: Total scores are calculated as the sum of the eight items (range 8-56)

APPENDIX T Ethics approval for the ‘Get Up & Go’ study

From: aries@anu.edu.au
Subject: Human Ethics Protocol 2017/242 - Approval
Date: 8 May 2017 at 3:27 pm
To: jennifer.ma@anu.edu.au
Cc: human.ethics.officer@anu.edu.au, u4435982@anu.edu.au

THIS IS A SYSTEM-GENERATED E-MAIL. PLEASE DO NOT REPLY. SEE BELOW FOR E-MAIL CONTACT DETAILS.

Dear Ms Jennifer Ma,

Protocol: 2017/242
An evaluation of the Australian National University Counselling Centre’s ‘Get Up & Go’ peer-support walking program

I am pleased to advise you that your Human Ethics application received approval by the Chair of the Science and Medical DERC 26 April 2017 on 08/05/2017.

Chair's Comment:
Throughout the two groups are treated equivalently except for the timing of the “post” measures so inferences to intervention effects are limited.

For your information:

1. Under the NHMRC/AVCC National Statement on Ethical Conduct in Human Research we are required to follow up research that we have approved. Once a year (or sooner for short projects) we shall request a brief report on any ethical issues which may have arisen during your research or whether it proceeded according to the plan outlined in the above protocol.

2. Please notify the committee of any changes to your protocol in the course of your research, and when you complete or cease working on the project.

3. Please notify the Committee immediately if any unforeseen events occur that might affect continued ethical acceptability of the research work.

4. Please advise the HREC if you receive any complaints about the research work.

5. The validity of the current approval is five years' maximum from the date shown approved. For longer projects you are required to seek renewed approval from the Committee.

All the best with your research,

Human Ethics Officer
Research Integrity & Compliance
Research Services Division
Level 2, Birch Building 36
Science Road, ANU
The Australian National University
Acton ACT 2601

T: 6125-3427
E: human.ethics.officer@anu.edu.au
W: https://services.anu.edu.au/research-support/ethics-integrity

APPENDIX U 'Get Up & Go' study trial registration

From: info@actr.org.au
Subject: Your ACTRN (registration number): ACTRN12617001637336
Date: 18 December 2017 at 12:04 pm
To: jennifer.ma@anu.edu.au

Dear Jennifer Ma,

Re: A controlled trial evaluation of the Australian National University Counselling Centre's 'Get Up & Go' peer-support walking program on interpersonal suicide risk and wellbeing in students

Thank you for submitting the above trial for inclusion in the Australian New Zealand Clinical Trials Registry (ANZCTR).

Your trial has now been successfully registered and allocated the ACTRN: ACTRN12617001637336

Web address of your trial: http://www.ANZCTR.org.au/ACTRN12617001637336.aspx
Date submitted: 20/11/2017 8:11:27 PM
Date registered: 18/12/2017 12:04:30 PM
Registered by: Jennifer Ma
Principal Investigator: Jennifer Ma

****Please note that as your trial was registered after the first participant was enrolled, it does not fulfil the criteria for prospective registration and will therefore be marked as being Retrospectively Registered on our website.****

If you have already obtained Ethics approval for your trial, please send a copy of at least one Ethics Committee approval letter to info@actr.org.au or by fax to (+61 2) 9565 1863, attention to ANZCTR.

Note that updates should be made to the registration record as soon as any trial information changes or new information becomes available. Updates can be made at any time and the quality and accuracy of the information provided is the responsibility of the trial's primary sponsor or their representative (the registrant). For instructions on how to update please see http://www.anzctr.org.au/Support/HowToUpdate.aspx.

Please also note that the original data lodged at the time of trial registration and the tracked history of any changes made as updates will remain publicly available on the ANZCTR website.

The ANZCTR is recognised as an ICMJE acceptable registry (http://www.icmje.org/faq.pdf) and a Primary Registry in the WHO registry network (http://www.who.int/ictrp/network/primary/en/index.html).

If you have any enquiries please send a message to info@actr.org.au or telephone +61 2 9562 5333.

Kind regards,
ANZCTR Staff
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F: +61 2 9565 1863
E: info@actr.org.au
W: www.ANZCTR.org.au

ANZCTR
Australian New Zealand Clinical Trials Registry

APPENDIX V Participant information sheet for the 'Get Up & Go' study

'Get Up & Go' Study Participant Information Sheet

Researcher:
Hello, my name is Jennifer Ma. I am a PhD student at the Centre for Mental Health Research, located in the Research School of Population Health at the Australian National University. For my PhD project I am interested in looking at how interpersonal relationships play a role as both risk and protective factors to mental health problems and suicide.

Project Title: An evaluation of the Australian National University Counselling Centre's 'Get Up & Go' peer-support walking program

General Outline of the Project:

- **Description and Methodology:** Research has shown that aspects of campus life can increase students' sense of belonging to a caring social network, which in turn is associated with increased wellbeing and decreased suicidal behaviour. The present project aims to evaluate the 'Get Up and Go' peer-support walking program for its efficacy in promoting mental health and wellbeing and contributing to decreased levels of interpersonal suicide risk (i.e., thwarted belongingness and perceived burdensomeness). The project will involve the completion of a 15-minute online questionnaire at baseline and follow-up.
- **Participants:** We will be recruiting undergraduate and postgraduate students who have registered to take part in the 'Get Up & Go's' Semester 2 cohort. We hope to involve 120 students in the study. Participation in the Semester 2 'Get Up & Go' program will not be influenced by whether you participate in this study.
- **Use of Data and Feedback:** Data will be used in my PhD thesis, publications, and presentations. The results will also be shared via email in aggregate form by the ANU Counselling Centre.

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this project is **voluntary** and you may, without negative consequences, decline to take part or **withdraw from the research at any point before completion of the survey** without providing an explanation by discontinuing the survey. You can also decline to answer any questions presented. If you choose to withdraw your data will be deleted.
- **What does participation in the research entail?** Participation in this project will involve completing a 15-minute online questionnaire over two time points. You will be allocated into one of two groups: one group will complete a baseline and follow-up measure 3-4 weeks before the program commences in Semester 2, and one group will complete a baseline measure 1-week before the program commences in Semester 2 and a follow-up measure after participating in the 8-week 'Get Up & Go' program. The questionnaire will consist of questions about feelings of belonging and burden in interpersonal relationships, mental health and wellbeing, as well as some demographic details.
- **Location and Duration:** The research will be conducted online, and you will be required to complete the questionnaire over two time points: at baseline and post-intervention. The questionnaire will take approximately 15 minutes to complete. The total time requested of you in this research is 30 minutes.
- **Risks:** Due to the sensitive nature of the questions, some participants may find recalling thoughts and feelings around belonging and burdensomeness in interpersonal relationships and their experience of mental health symptoms distressing. If you experience any distress related to this study or otherwise, please do not hesitate to contact Lifeline Australia on 13 11 14, your local health provider, or refer to the established state and national based mental health service providers listed below.
- **Benefits:** This study will provide the first evaluation of the Get Up & Go' peer support walking program. The findings will help us make improvements to the program, and inform research regarding protective factors for mental health and suicide, and the development of suicide prevention programs.

Exclusion criteria:

- **Participant Limitation:** We are only including participants in the study who are registered for the 'Get Up & Go' peer-support walking program to be run in Semester 2, 2017.

Confidentiality:

- **Confidentiality:** Only the researchers involved in the study will have access to the data, and all information will be kept strictly confidential and private, as far as the law allows. Any personally identifiable information (i.e., email addresses) will be removed from the dataset by the researchers. Data will only be published or presented in aggregate form.

Privacy Notice:

- **Privacy Statement:** In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:
    - Access or seek correction to their personal information;
    - Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.
- **Security of the website:** Users should be aware that the World Wide Web is an insecure public network that gives rise to a potential risk that a user's transactions are being viewed, intercepted or modified by third parties or that data which the user downloads may contain computer viruses or other defects. The Qualtrics privacy policy can be found here: https://www.qualtrics.com/privacy-statement/
- **Purpose of data collection:** This information is being sought for a research project entitled: An evaluation of the Australian National University Counselling Centre's 'Get Up & Go' peer-support walking program. The researcher is Jennifer Ma (Jennifer.ma@anu.edu.au, +61 2 6125 6370, Centre for Mental Health Research, Building 63 Eggleston Road, The Australian National University). The project aims to identify mental health promotion and suicide prevention-based initiatives that include belonging / connectedness components, and to evaluate these for their efficacy in contributing to decreased levels of interpersonal suicide risk (i.e., thwarted belongingness and perceived

burdensomeness), as well as promote mental health and wellbeing more broadly. The information you provide will only be used for the purpose for which you have provided it. It will not be disclosed without your consent.

- **Security of the data:** The data will be kept secure on the researcher's password protected Qualtrics account database. Only researchers involved in the study will have access to the data. Security of personal information will be maintained in accordance with legal, contractual and ethical protocols and requirements during collection, analysis, and preparation of results. The Qualtrics security policy can be found here: https://www.qualtrics.com/security-statement/. Data will be stored for a minimum of five years from the date of last publication arising from the research. Data will only be published or presented in aggregate form. After this time, the data may be destroyed or archived for future use by the Centre for Mental Health Research and the ANU Counselling Centre.

Queries and Concerns:

- **Contact Details for More Information:** If you have any queries about the project or further requests for information, please feel free to contact the following people:

Jennifer Ma
Primary Investigator
Centre for Mental Health Research
Research School of Population Health
ANU College of Medicine, Biology and Environment
Room 13, Building 63 Eggleston Road
The Australian National University
Canberra ACT 2601 Australia
T: +61 2 6125 6370
F: +61 2 6125 0733
Email: Jennifer.ma@anu.edu.au

Associate Professor Philip Batterham
Primary Research Supervisor
Centre for Mental Health Research
Research School of Population Health

ANU College of Medicine, Biology and Environment
Building 63 Eggleston Road, The Australian National University
Canberra ACT 2601 Australia
T: +61 6125 1031
Email: philip.batterham@anu.edu.au

Moira Turnbull
'Get Up and Go' Coordinator and Student Counsellor
ANU Counselling Centre
18 North Road, The Australian National University
Acton ACT 2601 Australia
T: +61 2 6125 2442
Email: counselling.centre@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress related to this study or otherwise, please do not hesitate to contact any of the following established state and national based mental health service providers:

  Lifeline Australia: 13 11 14 (24 hours), www.lifeline.org.au
  Kids Helpline (for people aged 25 and under): 1800 55 1800 (24 Hours)
  Suicide call-back service: 1300 659 467 (24 hours),
  www.suicidecallbackservice.org.au

  New South Wales: NSW Health or 1800 011 511
  Victoria: Vic Health or 1300 651 251 (SuicideLine)
  Queensland: QLD Health or 13 43 25 (referral service)
  Western Australia: WA Health or 1800 676 822 (metro) or 1800 552 002 (rural/remote)
  South Australia: SA Health or 13 14 65 (crisis team)
  Tasmania: TAS Health or 1800 332 388 (crisis team)
  Australian Capital Territory: ACT Health or 1800 629 354 (crisis team)
  Northern Territory: NT Health or 1800 682 288 (crisis team)

  Mental health information lines:
  beyondblue: 1300 22 4636 (24 hours), www.beyondblue.org.au

SANE: 1800 187 263 (9-5), www.sane.org

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2017/242). If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

APPENDIX W 'Get Up & Go' study control group pre-test email

Dear <participant name>,

Thank you for your interest in participating in a study to evaluate the effects of the Get Up & Go peer-support walking program. This study will help us make improvements to the program and help inform research on the protective factors for mental health, benefitting students and the ANU community.

For this study, you will be asked to complete a short online questionnaire which will take approximately 15 minutes on two occasions, at the beginning and at the end of a 4 week period (both before you start walking). The questionnaire will consist of questions about feelings of belonging and burden in interpersonal relationships, mental health and wellbeing, as well as some demographic details.

Please follow the link below to complete the first online survey:
<Survey link>

Or copy and paste the URL below into your internet browser: <Survey link>

The survey link will be open for a duration of 4 days commencing from today. At the end of the 4 week period, an additional email will be sent to you containing a link to the follow-up survey.

If you have any have questions regarding this study, please do not hesitate to contact me.

Kind regards,

The Get Up & Go team

Follow the link to opt out of future emails: <Opt out link>

APPENDIX X 'Get Up & Go' study control group post-test email

Dear <participant name>,

Thank you again for your interest in the Get Up & Go evaluation study we're running for the first time this semester to evaluate the mental health and wellbeing effects of the program.

We thank you for your consideration of and participation in the first 15-minute online questionnaire.

Please follow the following link to the second (and last)
<Survey link, titled 15-minute online questionnaire>

Or copy and paste the URL below into your internet browser:
<Survey link>

After we've received your response, we plan for everyone to start walking in Week 5 (21st August) and will be sending your walking partner's contact details very soon so you can get in touch with them.

In the meantime, please don't hesitate to contact us if you have any questions.

Kind regards,

The ANU Get Up & Go team

If you would like to opt out of the Get Up & Go evaluation study, please click here: <Opt out link>

APPENDIX Y 'Get Up & Go' study intervention group pre-test email

Dear <participant name>,

Thank you again for registering to be part of Semester 2's Get Up & Go walking program!

You may have heard that we're running a study to formally evaluate the mental health and wellbeing effects of Get Up & Go for the first time this semester. This evaluation will involve completing two 15-minute online questionnaires at the beginning and end of the program.

If you would like to take part in this exciting research, please follow the link to the first <Survey link, titled 15-minute online questionnaire>

Or copy and paste the URL below into your internet browser:
<Survey link>

If you would like to opt out of future evaluation emails, please click here:
<Opt out link>

After we've received your response, we plan for everyone to start walking in Week 5 (21st August) and will be sending your walking partner's contact details very soon so you can get in touch with them.

In the meantime, please don't hesitate to contact us if you have any questions.

Kind regards,

The ANU Get Up & Go team

APPENDIX Z 'Get Up & Go' study intervention group post-test email and incentive reminder

Get Up & Go study: Complete the final survey to enter the draw to win 1 of 2 $50 gift cards

Dear <participant name>,

We are offering the opportunity to win 1 of 2 $50 Coles eGiftcards for participants who have completed the final 15-minute online survey.

If you'd like to enter the draw, all you need to do is complete the following survey before the 17th November, 2017: <Survey link, titled 15-minute online questionnaire>

Alternatively, you can copy and paste the URL below into your internet browser: <Survey link>

If you have already completed the follow-up survey, you will automatically be entered into the draw. The two winners will be randomly drawn and sent their eGiftcard by email on the 20th November.

Kind regards,

The ANU Get Up & Go team

Please note. Participation in this project is voluntary and you may, without negative consequences, decline to take part or withdraw from the research at any point before completion of the survey without providing an explanation by discontinuing the survey. You can also decline to answer any questions presented. If you choose to withdraw your data will be deleted. If you'd like to opt out of future emails about the Get Up & Go evaluation study, please click here: <Opt out link>