Dynamic Measurement of Interpersonal Factors, Suicidal Thoughts and Self-Injury

Michael Kyron, Bachelor of Science (Honours)

This thesis is presented for the degree of Doctor of Philosophy of The University of Western Australia

School of Psychological Science

2018
ABSTRACT

Background: Suicide risk is dynamic. Yet, assessments of suicide and its risk factors have largely relied on static predictors. By focusing on dynamic risk factors and understanding the relationships with fluctuations in risk, there is potential to improve the precision of prediction and thereby assist the targeting of treatments and preventive efforts. Thus, the current dissertation explores the dynamic relationship between interpersonal risk factors and suicidal ideation, and how prediction can be enhanced within a clinical setting.

Methods and Results: First, an experimental paradigm was used to test key theoretical predictions of an interpersonal model of suicide in two studies. Positive and negative changes in interpersonal factors were experimentally manipulated by providing varied interpersonal feedback to participants, and a desire to escape from the task was repeatedly measured. In both samples, a change from negative interpersonal feedback to positive feedback was associated with a decreased desire to escape from the task, while a negative change resulted in an increased desire to escape.

To complement the experimental studies, a daily index measured self-reported suicidal thinking, mood, and interpersonal circumstances amongst inpatients at a psychiatric hospital. Cross-lagged panel designs were used to assess the relationships between factors over time, finding interpersonal factors to be associated with suicidal thinking over several days within a clinical setting. Latent-class growth-analysis determined how factors changed over time, and whether suicidal ideation trajectories could be predicted. Suicidal thoughts and interpersonal factors in the days prior to incidents of non-suicidal self-injury were measured and used to predict outcomes. Further, assessing interpersonal factors at admission assisted in differentiating which patients showed improvements over the course of therapy, and those that had stable and high suicidal thoughts. Of the inpatients that entered the clinic with no
suicidal thoughts, interpersonal factors significantly predicted the majority which would go on to develop suicidal thoughts during their stay. Changes in interpersonal factors and suicidal thinking in the days prior to non-suicidal self-injury predicted 23% of all cases (specificity = 98.7%).

**Conclusions:** Suicidal ideation research can be strengthened by examining predictors in a dynamic manner. Interpersonal factors may be a key driving force behind the development of suicidal thoughts over short-term periods and could enhance the prediction of adverse outcomes within a clinical setting. Clinical staff could track patient progress to ensure dangerous short-term variations in suicide risk do not occur, and interpersonal factors could be targeted to reduce suicidal desire. Fluctuations in suicidal thinking may represent difficulties regulating emotion and assist prediction of related maladaptive strategies to ease distress, such as non-suicidal self-injury. Future research should look to explore how dynamic assessment of suicidal thoughts and interpersonal factors can differentiate those who attempt suicide and those that do not. In addition, it should look at how distal factors, such as personality and distress tolerance, may interact with dynamic factors to assist in early prediction of adverse outcomes.
THESIS DECLARATION

I, Michael Kyron, certify that:

This thesis has been substantially accomplished during enrolment in the degree.

This thesis does not contain material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution.

No part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of The University of Western Australia and where applicable, any partner institution responsible for the joint-award of this degree.

This thesis does not contain any material previously published or written by another person, except where due reference has been made in the text.

The work(s) are not in any way a violation or infringement of any copyright, trademark, patent, or other rights whatsoever of any person.

The research involving human data reported in this thesis was assessed and approved by The University of Western Australia Human Research Ethics Committee. Approval #: RA/4/1/5635

Written patient consent has been received and archived for the research involving patient data reported in this thesis.

The work described in this thesis was funded by the ARC Linkage grant LP150100503.

This thesis contains published work and/or work prepared for publication.

Signature: 

Date: 19/11/2018
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS...........................................................................................................1

LIST OF TABLES AND FIGURES..........................................................................................2

AUTHOURSHIP DECLARATION...............................................................................................5

Chapter

1. GENERAL INTRODUCTION.............................................................................................7

2. STUDY 1 & 2: Dynamic changes in a desire to escape from interpersonal adversity:
   An experimental assessment of the interpersonal theory of suicide
   A. ABSTRACT (STUDY 1)............................................................................................16
   B. INTRODUCTION(STUDY 1)..................................................................................17
   C. METHOD (STUDY 1)..............................................................................................20
   D. DISCUSSION & RESULTS (STUDY 1).................................................................25
   E. INTRODUCTION (STUDY 2)..................................................................................30
   F. METHOD (STUDY 2)..............................................................................................31
   G. DISCUSSION & RESULTS (STUDY 2).................................................................32
   H. GENERAL DISCUSSION.........................................................................................37
   I. FOREWORD TO CHAPTER 3..................................................................................42

3. STUDY 3: Daily assessments of interpersonal factors to predict suicidal ideation and
   non-suicidal self-injury
   A. ABSTRACT.............................................................................................................44
   B. INTRODUCTION.....................................................................................................45
   C. METHOD ..................................................................................................................49
   D. RESULTS................................................................................................................54
   E. DISCUSSION............................................................................................................65
   F. FOREWORD TO CHAPTER 5..................................................................................72

4. STUDY 4: Assessing interpersonal and mood factors to predict trajectories of suicidal
   ideation within an inpatient setting
   A. ABSTRACT............................................................................................................74
B. INTRODUCTION ...........................................................................................75

C. METHOD .......................................................................................................78

D. RESULTS ......................................................................................................83

E. DISCUSSION ...............................................................................................91

5. GENERAL DISCUSSION..............................................................................101

A. REFERENCES .............................................................................................121

APPENDIX

1. STUDY 2, Dynamic changes in a desire to escape from interpersonal adversity: A fluid experimental assessment of the interpersonal theory of suicide, Published format.

..................................................................................................................136

2. STUDY 3, Daily assessment of interpersonal factors to predict suicidal ideation and non-suicidal self-injury in psychiatric inpatients. Journal of consulting and clinical psychology, Published format.

..................................................................................................................149
ACKNOWLEDGEMENTS

First and foremost, I would like to thank my supervisor Andrew Page for his continued and timely support. The care you shown during this process has been a motivating factor and made me glad to have undertaken this work. You go above and beyond what is expected of a supervisor, and working with you has been a breeze. Many thanks to co-supervisor Geoff Hooke, who has made this research as easy and entertaining as possible. Both of you have provided great memories, and hopefully there are more opportunities to work together in the future. Thank you to Perth Clinic and Moira Munro for providing the opportunity to conduct research at a state of the art psychiatric facility. This research is supported by an Australian Government Research Training Program (RTP) Scholarship and an Australian Research Council Linkage Grant.

I would like to dedicate this work to my grandfather, George Kyron. Although you may not be around to see me complete this like you wished, everything I am able to achieve comes from the hard work you put in to make life as easy as possible for your family. To my parents, Arthur and Anastasia, you have taken a leaf out of the same book and provided unbridled support which has made everything achievable. To my grandmother Lorna, brother Dean and my partner Fiona, thanks for always being a shoulder to lean on and supporting me. I appreciate everything you all do.
LIST OF TABLES AND FIGURES

Table 1: Linear Regression with changes in interpersonal factors from round 3 to round 6 predicting changes in desire to quit................................................................................................................. 29

Table 2: Linear regression with changes in interpersonal factors from round 3 to round 6 predicting changes in a desire to quit for switch conditions ................................................................. 36

Table 3: Results of a hierarchical binomial regression assessing the association between changes in suicidal ideation, thwarted belongingness, perceived burdensomeness and an interaction between interpersonal variables over two days in predicting NSSI incidents................................................................. 64

Table 4: Pearson correlations between ideation and predictors at admission ........................................ 84

Table 5: Hierarchical linear regressions predicting suicidal ideation at admission (left) and discharge (right) reported by patients........................................................................................................ 88

Table 6: Results of a binomial regression assessing the degree to which thwarted belongingness, perceived burdensomeness, hopelessness, depressed mood, and/or anxious mood predicted stable high or improvement suicidal ideation trajectories defined by LCGA .................................................. 89

Table 7: Classification result of improvement and stable high groups using mood related factors, hopelessness and interpersonal factors as predictors. ....................................................... 89

Table 8: Logistic regression predicting the development of suicidal thoughts during inpatients’ stay ................................................................................................................................................. 90

Table 9: Classification results of ideation and no ideation groups using mood related factors, hopelessness and interpersonal factors as predictors ..................................................... 91

Figure 1: Self-reported ratings across Phase 1 (Rounds 1-3) to Phase 2 (Rounds 4-6) for all four groups. Panel A shows changes in burdensomeness, while Panel B shows changes in belongingness. ......................................................................................................................................................... 27

Figure 2: Self-reported desire to quit scores over both phases (Phase 1 = Rounds 1-3, Phase 2 = Rounds 4-6) for the four groups................................................................................................................................................. 28
Figure 3: Self-reported ratings across Phase 1 (Rounds 1-3) to Phase 2 (Rounds 4-6) for all four groups. Panel A shows changes in belongingness, while Panel B shows changes in perceived burdensomeness.

Figure 4: Self-reported desire to quit scores over Phase 1 (Rounds 1-3) and Phase 2 (Rounds 4-6) for the four groups.

Figure 5: Cross-Lagged Panel Analysis of suicidal ideation and burdensomeness on day 1 (IDEATION 1, BURDEN 1), day 2 (IDEATION 2, BURDEN 2) and day 3 (IDEATION 3, BURDEN 3). All correlations are shown, with significant results asterisked and boldfaced (*p < .05, **p < .001).

Figure 6: Cross-Lagged Panel Analysis of suicidal ideation and thwarted belongingness on day 1 (IDEATION 1, BELONG 1), day 2 (IDEATION 2, BELONG 2) and day 3 (IDEATION 3, BELONG 3). All correlations are shown, with significant results asterisked and boldfaced (*p < .05, **p < .001).

Figure 7: Cross-Lagged Panel Analysis of suicidal ideation and the interaction between perceived burdensomeness and thwarted belongingness on day 1 (IDEATION 1, INTERACTION 1), day 2 (IDEATION 2, INTERACTION 2) and day 3 (IDEATION 3, INTERACTION 3). All correlations are shown, with significant results asterisked and boldfaced (*p < .05, **p < .001).

Figure 8: Cross-Lagged Panel Analysis of suicidal ideation and burdensomeness on day 1 (IDEATION 1, BURDEN 1), day 2 (IDEATION 2, BURDEN 2) and day 3 (IDEATION 3, BURDEN 3).

Figure 9: Cross-Lagged Panel Analysis of suicidal ideation and thwarted belongingness on day 1 (IDEATION 1, BELONG 1), day 2 (IDEATION 2, BELONG 2) and day 3 (IDEATION 3, BELONG 3). Panel A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*p < .05, **p < .001).
**Figure 10:** Cross-Lagged Panel Analysis of suicidal ideation and the interaction between perceived burdensomeness and thwarted belongingness on day 1 (IDEATION 1, INTERACTION 1), day 2 (IDEATION 2, INTERACTION 2) and day 3 (IDEATION 3, INTERACTION 3). Panel A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*p < .05, **p < .001).

**Figure 11:** Standardized self-reported mean scores between patients who did and did not engage in NSSI in self-reported suicidal ideation (Panel A), perceived burdensomeness (Panel B), thwarted belongingness (Panel C) and an interaction between interpersonal variables (Panel D) over time (T0 = date of incident, T - 1 = 1 day prior, T - 2 = 2 days prior, T + 1 = 1 day after an incident). Error bars represent standard error.

**Figure 12:** Illustration of a reciprocal relationship between interpersonal factors and suicidal thoughts.

**Figure 13:** Changes over each quarter of patients’ stay at the clinic, from admission to discharge, in ideation (Panel A), thwarted belongingness (Panel B), perceived burdensomeness (Panel C), depression (Panel D), anxiety (Panel E), and hopelessness (Panel F). Each line represents the trajectories of suicidal thoughts of groups determined by LCGA. Note: A = Admission, Q = Quartile, D = Discharge.

**Figure 14:** An interpersonal model of suicide for patients with brief or continuous suicidal thoughts.

**Appendix 1:** Pattern matrix from a principal components analysis of items representing burdensomeness and belongingness using a direct oblimin rotation.
AUTHORSHIP DECLARATION: CO-AUTHORED PUBLICATIONS

This thesis contains work that has been published and prepared for publication.

<table>
<thead>
<tr>
<th>Details of the work:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Location in thesis:</td>
<td>Chapter 3, Study 3 (pg.41)</td>
</tr>
<tr>
<td>Student contribution to work:</td>
<td>The data were collected as part of routine hospital data collection at Perth Clinic and provided to the student by Geoffrey Hooke. The data were formatted to allow analyses, analysed, interpreted and presented by the student. The literature review, method, results and discussion sections were written by the student and feedback on content was provided by Andrew Page (principal supervisor).</td>
</tr>
</tbody>
</table>
| Co-author signatures and dates: | Geoff Hooke: 9/11/2018  
Andrew Page: 19/11/2018 |

<table>
<thead>
<tr>
<th>Details of the work:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted for publishing in “Cognitive Therapy and Research” as a research paper on 13th February 2019: Dynamic Changes in a Desire to Escape from Interpersonal Adversity: A Fluid Experimental Assessment of the Interpersonal Theory of Suicide</td>
<td></td>
</tr>
<tr>
<td>Location in thesis:</td>
<td>Chapter 2, Study 1 &amp; 2, (pg.15)</td>
</tr>
<tr>
<td>Student contribution to work:</td>
<td>The experimental task was created by Andrew Page and Werner Stritzke, and implemented by honours students Anna Badcock, Elliot Baker-Young and the PhD candidate. The data were formatted to allow analyses, analysed, interpreted and presented by the student. The literature review, method, results and discussion sections were written by the student and feedback on content was provided by Andrew Page (principal supervisor) and Werner Stritzke.</td>
</tr>
</tbody>
</table>
| Co-author signatures and dates: | Anna Badcock: 16/11/2018  
Elliot Baker-Young: 16/11/2018  
Werner Stritzke: 16/11/2018 |
Details of the work:
Submitted to “Journal of Affective Disorders” as a research paper on 12\textsuperscript{th} November 2018:
Assessing Interpersonal and Mood Factors to Predict Trajectories of Suicidal Ideation within an Inpatient Setting

Location in thesis:
Chapter 4, Study 4, (pg.69)

Student contribution to work:
The data were collected as part of routine hospital data collection at Perth Clinic and provided to the student by Geoffrey Hooke.
The data were formatted to allow analyses, analysed, interpreted and presented by the student. The literature review, method, results and discussion sections were written by the student and feedback on content was provided by Andrew Page (principal supervisor).

Co-author signatures and dates:

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoff Hooke</td>
<td>9/11/2018</td>
</tr>
<tr>
<td>Andrew Page</td>
<td>19/11/2018</td>
</tr>
</tbody>
</table>

Student signature
Date: 19/11/2018

I, Andrew Page, certify that the student statements regarding their contribution to each of the works listed above are correct

Coordinating supervisor signature
Date: 19/11/2018
General Introduction

Suicide is a leading cause of death globally, yet it still remains a poorly understood and difficult to predict behaviour. Adequate prediction allows for high-risk patients to be correctly identified and early intervention to occur using scarce clinical resources. In addition, understanding what causes changes in suicidal ideation allows for specific targets during therapy. Both understanding and prediction of suicide have been limited by the over-reliance on static measures of suicide in research and clinical assessments. According to the Fluid Vulnerability Theory of Suicide (FVT; Rudd, 2006), changes in risk factors of suicide can trigger short-term, high risk periods where an individual is more likely to attempt suicide. Using static and isolated measurements limits clinical assessments of suicide by potentially missing high risk periods (Bryan & Rudd, 2016). Yet, few studies have routinely monitored the progress of psychiatric patients’ suicidal thoughts over the course of therapy, some of whom are at a heightened risk of attempting and completing suicide. A recent meta-analysis on the prediction of suicidal outcomes noted that less than 1% of research into suicide risk factors is focused on time frames of a week or less, which is an important period for clinicians tasked with making decisions about the short-term risk of their patients (Franklin et al., 2017). The current dissertation aims to dynamically assess suicide and putative risk factors to achieve two goals: firstly, determining whether changes in risk factors drive suicidal thinking; and secondly, how prediction of suicidal thinking and related self-injurious behaviours can be enhanced in a clinical setting.

1. Why Do People Consider Suicide?

Many risk factors are associated with an increased desire to die by suicide. Prior research has noted that a history of suicide behaviours (Coryell & Young, 2005; Christiansen & Jensen, 2009) and a diagnosis of a mental health condition (Harris & Barraclough, 1997; Nock et al., 2009) have strong associations with future suicidal thinking. Further, a host of
interpersonal factors have been linked to a desire to suicide, such as social isolation (Duberstein et al., 2004; Wyder, Ward, & De Leo, 2009), family conflict (Brent et al., 1994; Duberstein, Conwell, Conner, Eberly, & Caine, 2004), unemployment (Brown, Beck, Steer, & Grisham, 2000) and physical illness (Walker et al., 2008; Timonen et al., 2002). Although these risk factors may be proximally related to suicidal thoughts, in isolation they are often limited in their prediction of suicide (Van Orden et al., 2010). A variety of risk factors must be looked at simultaneously to determine their influence on suicidal thinking.

To address this issue, the Interpersonal Psychological Theory of Suicidal Behaviour (IPTS: Joiner, 2005) looked to combine a number of interpersonal risk factors into a cohesive and testable theory. In particular, it suggests that two factors are key in the development of suicidal thoughts; perceived burdensomeness, when an individual feels they are a burden on friends, family and wider society to the point of self-hated (e.g., such as due to unemployment and physical illness); and thwarted belongingness, which occurs when an individual desire to feel socially connected and supported is not met (e.g., loneliness and family conflict). The theory suggests that it is perceptions of interpersonal circumstances that are most important, rather than actual social networks. Both perceived burdensomeness and thwarted belongingness are regarded as related, yet unique constructs, which are prone to change over time and together contribute to an active desire to suicide (Van Orden et al., 2010). Further, it is when a sense of hopelessness develops regarding these states that an individual may begin to desire suicide as a means to escape from adversity.

The interpersonal psychological theory of suicidal behaviour has inspired a large amount of research, with some predictions receiving stronger support than others. A systematic review by Ma et al., (2016) found that in 83% of studies found a significant relationship between perceived burdensomeness ($N = 69$) and suicidal ideation, and 40% of studies assessing thwarted belongingness ($N = 55$). For instance, in a large community
sample, suicidal ideation was significantly predicted by thwarted belongingness and perceived burdensomeness even when controlling for depression and anxiety (Christensen, Batterham, Soubelet, & Mackinnon, 2013). Likewise, both interpersonal factors have been found to predict suicidal ideation in university (Zhang, Lester, Zhao, & Zhou, 2013) and clinical samples of young adults (Joiner et al., 2009). In contrast, another study of university undergraduates found only perceived burdensomeness significantly predicted suicidal ideation (Van Orden, Witte, Gordon, Bender, & Joiner, 2008). A common finding amongst these studies was that an interaction between both factors was found to be associated with higher levels of suicidal thoughts than either factor alone, although this attracted less empirical attention than either factor alone (Chu et al., 2017; Ma et al., 2016).

2. **The Dynamic Nature of Interpersonal Factors and Suicidal Thoughts**

Despite strong cross-sectional evidence, the interpersonal psychological theory of suicidal behaviour has not been validated in a dynamic manner. That is, few studies have tracked interpersonal factors and suicidal ideation concurrently, and determined whether they are responsible for driving changes in suicide. The theory itself focuses more on how interpersonal factors are associated with suicide risk, rather than changes over time. Based on cross-sectional research, Van Orden, Witte, Gordon, Bender, and Joiner (2008) suggest a linear relationship may occur whereby ideation is a product of current thwarted belongingness and perceived burdensomeness. Other perspectives can be gleaned from suicide theories specifically addressing the dynamic nature of suicidal thoughts. The fluid vulnerability theory (Rudd, 2006) suggests acute episodes or sharp fluctuations in suicidality may rather be triggered by an increase in risk factors, and minimized when aggravating factors are resolved. Static risk factors, such as personality and a history of trauma may better summarize a central tendency or vulnerability to suicide, while dynamic or proximal risk factors (i.e., interpersonal factors) may better predict changes in suicide risk. Both theories
are therefore compatible in addressing the dynamic nature of suicidal thoughts and associated risk factors, and may be useful in clinical interventions for suicide.

Recent research has found that not only does suicidal ideation change over short periods of time, it often occurs concurrently with a number of risk factors. Ben-Zeev, Young, and Depp (2012) recruited 31 depressed inpatients to self-report their suicidal ideation and a number of risk factors several times daily, finding sadness, tension and boredom predicted future ideation over short-term periods. Extending these findings, Kleiman et al. (2017) tracked suicidal thoughts, interpersonal factors, and feelings of hopelessness of clinical patients every six hours for several weeks. Thwarted belongingness, perceived burdensomeness, and hopelessness were correlated with changes in suicidal ideation.

However, the study was limited in that it did not assess important interactions between interpersonal factors implicated in the theory, which are suggested to result in higher levels of suicidal ideation than either factor in isolation. Further, the authors suggest the need to assess relationships over longer periods of time (i.e., days), given they only assessed the extent to which interpersonal factors predicted changes in ideation only hours later. The effects of changes in interpersonal circumstances on suicidal ideation may not always be immediate. Rather, ruminating over one’s interpersonal difficulties may act to heighten distress over time (Nepon, Flett, Hewitt, & Molnar, 2011). Not only would such a situation indicate interpersonal factors are a precursor to changes in ideation, it also allows more time for interventions by clinical staff to minimize risk of suicide. In sum, Kleiman et al. (2017) provided important insights into the fluid nature of suicidal ideation, and future research should follow suit.
3. The Effects of Adverse Interpersonal Circumstances on Self-Injurious Behaviours

Self-injury refers to a deliberate action to hurt one’s own body. One concern within an inpatient setting is non-suicidal self-injury (NSSI), which involves self-harm without an explicit intent to die. Although different from suicide attempts, which involve intent to die with varied lethality, there are some important similarities in behaviours. Both NSSI and suicide attempts are seen as methods to escape from intolerable distress, with suicide attempts being a permanent method and NSSI temporary (Muehlenkamp & Kerr, 2010). Thus, the underlying mechanisms may be similar, with the heightened distress associated with suicidal thoughts and behaviours potentially also heightening the risk of an individual engaging in non-suicidal self-injury. If interpersonal adversity generated sufficient distress to drive suicidal thinking, it could also have harmful behavioural consequences in the form of self-injury (Joiner, Ribeiro, & Silva, 2012).

Non-suicidal self-injury causes direct, but mostly temporary harm to the person engaging in the act (e.g., pain and tissue damage associated with cutting/burning). However, it may have more insidious effects by establishing a pathway to suicide over time. According to the Interpersonal Theory of Suicide, a person will not act on their suicidal desire unless they overcome an innate fear of death and pain. An individual can overcome both aspects by repeatedly engaging in provocative (e.g., combat exposure) and painful experiences (e.g., contact sport, fighting; Van Orden et al., 2010). Non-suicidal self-injury may be a particularly effective mechanism to habituate to the physical and emotional pain associated with the act of suicide. As such, regularly engaging in NSSI may increase a risk of attempting suicide by reducing a fear of pain or death associated with suicide. Indeed, research has found NSSI to be significantly associated with future suicide attempts and an acquired capability to suicide (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). In a longitudinal assessment,
General Introduction

Willoughby, Heffer, and Hamza (2015) found the frequency of NSSI to be associated with increases in self-reported acquired capability over time. Although logical inferences could be made regarding the mediating role of acquired capability, this has seldom been assessed empirically. Therefore, NSSI may have direct and indirect harmful consequences, and prediction should be enhanced to allow for early intervention.

Similar to the development of suicidal thoughts, interpersonal adversity may be associated with a heightened risk of self-harming. That is, negative interpersonal circumstances may generate significant distress, heightening the risk of an individual turning to self-harm as a means to reduce distress. For instance, Turner, Cobb, Gratz, and Chapman (2016) asked individual’s with a history of NSSI to track life events on a daily basis, finding NSSI was more likely on days interpersonal conflict occurs. Similar patterns are also evident with regard to suicide attempts. In a study of patients who had attempted suicide, Bagge, Glenn, and Lee (2013) found negative life events were frequent prior to an attempt, particularly those interpersonal in nature. In a comparable study assessing circumstances prior to suicide attempts, Bagge, Littlefield, and Glenn (2017) asked patients who had attempted suicide to recall their emotions each hour for the 48 hours prior to an attempt. Several risk factors were found to increase within six hours of a suicide attempt, such as feeling lonely, dissatisfied, scared, and hostile. Taken together, these studies suggest heightened distress is common prior to self-harm, with interpersonal adversity potentially driving distress.

4. Trajectories of Change in Suicidal Thoughts and How Prediction Can Be Enhanced

Isolated longitudinal assessments may broadly indicate how an individual’s suicidal thoughts change over long periods of time, but it ignores potentially important trends which
could more clearly indicate a person’s suicide risk. For instance, two patients may have identical suicidal ideation at isolated points, but one may have stable and pervasive suicidal thoughts, while the other may have thoughts that fluctuate. Preliminary studies tracking suicidal ideation over the course of an inpatient psychiatric admission have indicated that not only does it help with the identification of patients who are not responsive to therapy; it can assist in the prediction of adverse events. The benefits of assessing interpersonal factors to predict changes in suicidal ideation during therapy were noted in recent research by Hains, Janackovski, Deane, and Rankin (2018). In particular, they found perceived burdensomeness at admission to be a significant predictor of suicidal ideation at discharge, and fully mediate the effects of hopelessness and depression. While this speaks to strong relationship between suicidal ideation and interpersonal factors noted in prior cross-sectional research, isolated measurement may misrepresent a patient’s suicide risk if on the day prior they had markedly different levels of suicidal thoughts.

The use of trajectory analysis in prior research has suggested benefits in improving suicide risk assessments. For instance, Czyz and King (2015) tracked the suicidal ideation of patients with a history of suicide in the months following their discharge from hospital. They found those with pervasive and high suicidal thoughts were at the highest risk of attempting suicide again. Further, of a series of risk factors measured at admission, they found hopelessness (i.e., feelings or beliefs that adverse life circumstances will not change; Beck, Brown, Berchick, Stewart & Steer, 2006) significantly predicted trajectories. Thus, this indicates the benefits of using trajectory analysis to improve risk assessments in research and clinical settings, and also how simultaneously measuring risk factors can enhance prediction. In another example of research using trajectory analysis, Restifo, Kashyap, Hooke, and Page (2015) tracked the suicidal thoughts of inpatients in the first week of their stay at a psychiatric hospital. Patients with pervasively high suicidal thoughts were at the highest risk
of engaging in non-suicidal self-injury. In addition, they found depressive symptoms and suicidal ideation at admission significantly predicted suicide ideation trajectories. These studies point to the benefit of assessing trajectories in suicide research to improve risk assessments.

No studies to date have assessed trajectories over a full course of therapy and how they can be predicted through measuring risk factors of suicide. Clinicians would benefit from knowledge of which patients may be resistant to therapeutic strategies early in the course of therapy through accurate risk assessment at admission. In addition, knowing which factors are associated with improvements in suicidal thoughts provides targets for clinicians to reduce suicide risk. Beyond risk assessments, continuously tracking suicidal thoughts allows for clinicians to identify which patients are tracking toward negative outcomes, and how they can be provided with the necessary skills and resources to cope before being discharged from hospital (Shimokawa, Lambert, & Smart, 2010). This is particularly important since it is estimated that the majority of individual’s who attempt suicide receive some form of psychiatric care prior to an attempt, indicating the need to provide the right help when it is sought (Luoma, Martin, & Pearson, 2002). Taken together, these studies suggest that pervasive suicidal thoughts are linked to adverse self-harming behaviours. Therefore, it may be beneficial to improve prediction of trends in suicidal thoughts while patients are still in inpatient care to provide them with the necessary skills to cope with stressors in an adaptive manner, rather than engage in self-injury. Research should look to build on these findings and determine whether the assessment of interpersonal factors enhances the prediction of trajectories of change in suicide risk.

Summary

The majority of suicide research has been devoted to determining which factors may be associated with heightened risk of suicide through cross-sectional and longitudinal
research, but few have assessed which factors are the driving forces behind dangerous short-term developments in suicidal thoughts. This limits our understanding of why suicidal thoughts develop, and how they can be targeted during interventions. In addition, the lack of dynamic research may limit prediction of adverse outcomes within a clinical setting, and development of novel methods is required. Within the current dissertation, an adverse outcome refers to non-suicidal self-injury and/or those with severe suicidal thoughts resistant to psychotherapy, who may be at a heightened risk of suicide attempts. Thus, the current dissertation looks to track suicidal ideation and interpersonal risk factors continuously over time to enhance understanding and prediction of adverse outcomes.
Chapter 2

Study 1 & 2 Dynamic Changes in a Desire to Escape from Interpersonal Adversity: A Fluid Experimental Assessment of the Interpersonal Theory of Suicide

Abstract

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

Keywords: interpersonal theory of suicide, belongingness, perceived burdensomeness, experimental psychopathology
Dynamic Changes in a Desire to Escape from Interpersonal Adversity: A Fluid Experimental Assessment of the Interpersonal Theory of Suicide

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

The current study looks to implement an experimental design to assess how changes in risk factors can influence a desire to escape from adversity.

Recent developments in experimental research designs have provided important steps in assessing the causal effects of changes in risk factors. Collins, Best, Stritzke, and Page (2016) developed a laboratory-based paradigm capable of manipulating interpersonal circumstances, and assessing effects on the desire to escape from the task. This design is grounded in theories of suicide which suggest that suicide is a mechanism to escape from intolerable life circumstances and painful self-awareness (Baumeister, 1990; O’Connor, 2011). Building on this position, the Interpersonal-Psychological Theory of Suicidal Behaviour (IPTS; Joiner, 2005) suggests that an increase in interpersonal adversity generates significant psychological pain and distress, and as a result increases the risk of attempting suicide. Two interpersonal factors are believed to be important in the developments of
suicidal thoughts: thwarted belongingness, when an individual’s innate desire to feel socially connected is not met; and perceived burdensomeness, when an individual feels they are a burden on those around them. In addition, they are believed to partly influence suicide through affective pathways, encompassing factors such as shame, self-esteem, and a depressed mood (Van Orden et al., 2010). In early studies using this experimental paradigm, the task has found higher levels of manipulated thwarted belongingness and perceived burdensomeness to be associated with a higher desire to escape from adversity (Collins et al., 2016; 2017; Hartley et al., 2018). Thus, the task is able to test the causal predictions of a prominent theory of suicide through the direct manipulation of interpersonal circumstances and assessing a desire to escape.

**The Dynamic Nature of Interpersonal Risk Factors**

The interpersonal psychological theory of suicidal behaviour defines thwarted belongingness and perceived burdensomeness as dynamic constructs which are prone to change over time. However, few ecological studies have routinely tracked how interpersonal factors change, and their association with a desire to escape through the use of suicide. For instance, Kleiman et al. (2017) tracked psychiatric inpatients’ suicidal ideation, hopelessness, thwarted belongingness and perceived burdensomeness every few hours for several weeks. Ideation was found to vary frequently over a matter of hours for many patients, which was correlated with changes in risk factors. Likewise, Kyron et al. (2018) found perceived burdensomeness and thwarted belongingness were strongly associated with day-to-day changes in suicidal ideation in a psychiatric inpatient sample. Consistent with prominent theories of suicide, these studies suggest that as interpersonal adversity increases, there may be associated increases in a desire to suicide as a means to escape from intolerable life circumstances through suicide.
Using the lens of the interpersonal psychological theory of suicidal behaviour, both non-suicidal self-injury (i.e., self-harm without an intent to die) and suicide attempts are methods of self-harm used to escape or diminish feelings of distress caused by interpersonal adversity (Joiner, Ribeiro, & Silva, 2012). Consistent with this stance, Turner, Cobb, Gratz, and Chapman (2016) tracked individuals with a history of non-suicidal self-injury (NSSI) on a daily basis, finding self-injury was more common on days in which interpersonal difficulties were experienced. In addition, Bagge, Glenn, and Lee (2013) asked psychiatric patients who had recently attempted suicide to recall any negative events that had occurred in the 48 hours prior. Negative life events were commonly reported in the hours prior to an attempt, and were predominantly interpersonal in nature. In a study using a similar retrospective recall design over the same time period, Bagge, Littlefield, and Glenn (2017) found dramatic increases in fear, guilt, sadness, and hostility occurred in the hours prior to a suicide attempt. Taken together, these studies suggest that as an individual’s interpersonal adversity and associated distress increases, the more likely they are to use self-harming behaviours to escape from intolerable life circumstances (i.e., suicidal thoughts and self-injury).

**Rationale of the current research**

While ecological research has noted that a propensity to escape from life is heightened when experiencing increases in interpersonal adversity, there are still important limitations. Firstly, it is unclear whether interpersonal factors are causally related to changes in a desire to escape due to an absence of experimental research. Secondly, research to date has largely focused on which factors are involved in heightening risk, rather than resolving episodes. That is, experiencing negative interpersonal relationships for a period may heighten a desire to escape from adversity, while a positive change could effectively diminish these desires. Likewise, a negative change may override prior positive interpersonal experiences.
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

Such findings reflect key predictions of the fluid vulnerability theory (Rudd, 2006), which suggests increases in risk factors, including those interpersonal in nature, are sufficient in causing brief but intensive periods of suicidality, and a removal of these factors can resolve a high-risk episode. However, this notion has not been assessed empirically.

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

**Study 1**

**Method**

**Participants.**

Seventy-two introductory psychology students ($M_{age} = 20.06, SD = 4.44$, 57% female) participated in the study in exchange for course credits. Of the available 538 participants in
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

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

Measures.

Interpersonal factors. The Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012) is a 15-item measure with two subscales assessing perceived burdensomeness and thwarted belongingness. It has excellent psychometric properties (Van Orden et al., 2008). Participants rate their agreement with statements such as “The people in my life would be better off if I were gone” (perceived burdensomeness) and “I rarely interact with people who care about me” (thwarted belongingness) on a 7-point Likert scale ranging from 0 (not at all true for me) to 6 (very true for me), with higher scores indicating greater perceived burdensomeness and thwarted belongingness. Internal consistency in the current sample was high for both burdensomeness (α=.95) and belongingness (α=.93) scales.

Experimental Task and Procedure.

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

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

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

**Manipulating Burdensomeness.** Perceived burdensomeness was induced using performance related feedback delivered each round. As discussed, the situation presented to the participant was for the team to beat a target score to ‘win’ the game. Therefore, a poor individual score affected whether the team was successful in task. The success a participant had in each condition, and the performance of the team more generally was pre-determined, and therefore their actual performance was not reflected in the score. In the high PB-TB
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

condition, the participant had a much lower chance of success, while in the low PB-TB condition they had a much higher chance of success. For instance, in the high PB-TB condition, odds were that a participant scored correctly four out of ten times regardless of how they were performing. This aimed to ensure that participants in the high PB-TB condition always performed worse than their teammates, and the team were unable to meet their target. On the other hand, in the low PB-TB condition the participant performed equal to or better than their teammates, with the team always beating the target score. Thus, participants in the high PB-TB condition were encouraged to perceive that they were not effectively contributing to their team and burdening the team’s success in the task.

**Manipulating Belongingness.** Thwarted belongingness was manipulated through the use of interpersonal feedback statements from teammates. At the end of each round the participants were given the opportunity to provide and receive feedback to and from their teammates. Unbeknownst to the participant, teammates were computer-controlled and the comments sent to the participant predetermined. This allowed for uniform interpersonal experiences for each participant. To reduce suspicions of the computer-generated nature of teammates, other participants were tested at the same time in adjacent computer booths and presented as being part of the same team. As such, participants could see, but not communicate with each other. The participants in the high PB-TB condition consistently did worse than their teammates, and the team failed to reach the target. Thus, the participants’ teammates provided negative and critical feedback that they were letting down the team. Participants in the high PB-TB condition received comments such as “u sure ur hitting the right keys?” and “If you aren’t playing your best why play at all :(". In the low PB-TB condition the participants performed better than their teammates, and the team performed well overall. To compliment their performance, participants received positive feedback, such as “well done, keep it up!” and “good job, keep going like that”.
**Experimental Design.** The current study was interested in whether a single interpersonal change was sufficient in affecting a desire to quit or escape from the task. Participants were randomly assigned to begin the experiment in either a high or low PB-TB condition (i.e., Starting Condition). Half way through the experiment, participants either continued in the same PB-TB condition (i.e., Stable) or they changed to the other PB-TB condition (i.e., Switch). Therefore, the study used a 2 (Starting Condition: Low or High PB-TB) x 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds Per Phase) Mixed-Design. In total, there were four experimental conditions: two stable control groups, who had a uniform experience for the duration (Low-Low or High-High PB-TB) and two switch groups who experienced changes in interpersonal adversity from high PB-TB to low PB-TB, or from low PB-TB to high PB-TB (High-Low or Low-High PB-TB, respectively). This allowed for an assessment of changes in interpersonal circumstances, and a comparison to stable conditions.

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

Suspicion Check.

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

Assessing the Manipulation.

Perceived Burdensomeness. To assess the effects of a switch in PB-TB condition on feelings of burdensomeness, a 2 (Starting Condition: Low or High PB-TB) x 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds per Phase) Mixed-Design ANOVA, was performed (Figure 1: Panel A). The efficacy of the manipulation on burdensomeness was indicated by a significant three-way interaction between starting condition and whether conditions changed over the two experimental phases (i.e., Phase 1: Rounds 1-3 and Phase 2: Rounds 4-6), $F(1, 68) = 33.02, p < .01, \eta^2_{\text{partial}} = .36$.

Follow up contrasts revealed that for participants who remained in either high or low PB-TB conditions for the duration of the experiment, feelings of burden did not significantly change from phase 1 to phase 2, $F(1, 44) = 3.85, p > .05, \eta^2_{\text{partial}} = .08$. In contrast, for the participants who switched from low to high PB-TB (or vice versa) half way through the experiment, there was a significant interaction, $F(1, 24) = 23.93, p < .001, \eta^2_{\text{partial}} = .53$. That
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

is, when there was a negative change in interpersonal conditions halfway through the task, there was a corresponding increase in burdensomeness. Further, when there was a positive change, there was a decrease in burdensomeness. Therefore, the task was successful in manipulating burdensomeness as intended.

**Thwarted Belongingness.** In addition to changes in burdensomeness, a successful manipulation required a similar pattern of changes in belongingness (Figure 1: Panel B). A 2 (Starting Condition: Low or High PB-TB) x 2 (Stable or Switch: whether PB-TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds per Phase) Mixed-Design ANOVA was run, with thwarted belongingness as the dependent variable. There was a significant three-way interaction, indicating that the groups who changed PB-TB condition across the two phases of the experiment had different patterns of belongingness, $F(1, 68) = 58.75, p < .001, \eta^2_{\text{partial}} = .46$. That is, feelings of belongingness did not change over the two experimental phases (i.e., rounds 1-3 versus 4-6), for participants who remained in either high or low PB-TB conditions for the duration of the experiment, $F(1, 44) = .15, p > .05, \eta^2_{\text{partial}} = .00$. For switch conditions, a positive change in interpersonal feedback caused decreases in thwarted belongingness, while a negative change caused an increase in thwarted belongingness, $F(1, 24) = 70.28, p < .001, \eta^2_{\text{partial}} = .75$. Therefore, the manipulation was successful in changing belongingness as desired.
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

Figure 1: Self-reported ratings across Phase 1 (Rounds 1-3) to Phase 2 (Rounds 4-6) for all four groups. Panel A shows changes in perceived burdensomeness, while Panel B shows changes in thwarted belongingness. Error bars represent standard error.

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

Our main interest was whether a short-term change in burdensomeness and belongingness would change the desire to quit or escape the task. Results indicated a
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

significant three-way interaction between starting condition and whether or not a change in conditions occurred throughout the task, from phase 1 to phase 2, \( F(1, 68) = 24.89, p < .01, \eta^2_{\text{partial}} = .27 \) (see Figure 2). Follow-up contrasts revealed that participants who were exposed to the same high or low levels of burdensomeness and belongingness for the duration of the experiment did not report a significantly different desire to quit, \( F(1, 44) = 1.42, p > .05, \eta^2_{\text{partial}} = .03 \). Importantly, desire to quit immediately changed from Phase 1 to Phase 2 for those who switched conditions midway through the task, \( F(1, 24) = 25.47, p < .001, \eta^2_{\text{partial}} = .52 \). Therefore, significant changes in the desire to quit or escape from the task occurred in response to changes in interpersonal circumstances.

Figure 2: Self-reported desire to quit scores over both phases (Phase 1 = Rounds 1-3, Phase 2 = Rounds 4-6) for the four groups. Error bars represent standard error.

While the results indicate a change in a desire to quit occurred through a change in interpersonal feedback, it was not clear whether this occurred for both change conditions. Follow-up tests showed that for participants who switched from the low PB-TB condition in Phase 1 (\( M = 1.41, SD = 1.69 \)) to the high PB-TB condition in Phase 2 (\( M = 2.88, SD = 2.00 \)), there was a significant increase in desire to quit, \( t(13) = -4.11, p < 0.001, \text{Cohen's } d = 0.79 \).
In the high-low PB-TB condition there was also a significant drop in desire to quit from Phase 1 ($M = 2.71$, $SD = 1.27$) to Phase 2 ($M = 1.95$, $SD = 1.38$), $t(13) = 2.90$, $p < 0.01$, Cohen’s $d = 0.57$. These two results taken together suggest that changes in interpersonal circumstances, in either direction, result in significant changes in a desire to quit or escape from the task.

We also wanted to determine whether changes in burdensomeness or belongingness had the strongest association with changes in a desire to quit for switch conditions. To do so, a linear regression was performed, with differences in thwarted belongingness and perceived burdensomeness regressed on changes in a desire to escape (Table 1). Differences were assessed from Round 3 to Round 6, to capture the full effects of the interpersonal manipulation at the end of each phase. While the model accounted for 59% of variance in changes in a desire to escape, $F(2, 23) = 21.03$, $p = .001$, only perceived burdensomeness was a significant predictor. This suggests that perceived burdensomeness may have been a stronger driver of change in a desire to escape than thwarted belongingness.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>$\beta$</th>
<th>$t$</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Burdensomeness</td>
<td>.41</td>
<td>.15</td>
<td>.55</td>
<td>2.76</td>
<td>.01</td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>.23</td>
<td>.16</td>
<td>.28</td>
<td>1.41</td>
<td>.17</td>
</tr>
</tbody>
</table>

*Note.* $B =$ Beta, $SE =$ Standard Error, $\beta =$ Standardized Beta.

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

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

**Study 2**

Having demonstrated that changes in a desire to escape from interpersonal adversity was a function of the levels of perceived burdensomeness and thwarted belongingness, Study 2 aimed to assess the influence of interpersonal factors when varied independently. While cross-sectional assessments indicate the combined presence of perceived burdensomeness and thwarted belongingness has a greater effect on suicide risk than either factor alone, the transition between these states has not been explored (Van Orden et al., 2008). Therefore, the manner in which suicide risk varies due to a change in only one interpersonal variable is unclear. Knowing whether a single interpersonal factor can offset the pernicious effects of another provides an indication of how it could enhance an individual's persistence through adverse life situations.
Similar to the previous study, two groups experienced stable positive or negative interpersonal feedback, while other groups experienced a change halfway through the task. However, Study 2 focused on changes in only belongingness, rather than both factors. This method was used due to difficulties in plausibly manipulating burdensomeness while keeping high thwarted belongingness stable. That is, as a participant begins to do better, it is unlikely that teammates would keep providing negative interpersonal comments. Thus, in Study 2, performance feedback (i.e., perceived burdensomeness) would be manipulated to remain poor for all individuals, and interpersonal comments (i.e., thwarted belongingness) would change. Participants in all conditions would always score worse than their teammates, and the team would fail to score above the target as a result. With perceptions of burdensomeness remaining high, the study can investigate the degree to which thwarted belongingness can independently affect a desire to quit in the face of interpersonal adversity.

Method

Participants.

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

Materials.

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

Procedure.

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

Results and Discussion

Suspicion and Stable Burdensomeness Check.

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

Assessing the Manipulation.

Thwarted Belongingness. For the manipulation to be successful, a significant change in belongingness was required for groups experiencing a change in TB condition, but not for stable groups. A 2 (Starting Condition: Low or High TB) x 2 (Stable or Switch: whether TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups, with thwarted belongingness as the dependent variable (Figure 2: Panel A). Participants that remained in the same TB condition for the duration of the experiment did not report a change in
Changes in interpersonal adversity and a desire to escape, Study 1 & 2

belongingness, $F(1, 27) = 2.97, p > .05$, $\eta^2_{\text{partial}} = .10$. Participants that experienced a positive change in comments from teammates mid-way through the task reported a decrease in thwarted belongingness, while those who experienced a negative change in comments indicated an increase in thwarted belongingness, $F(1, 19) = 28.19, p < .001$, $\eta^2_{\text{partial}} = .61$. Therefore, the manipulation was successful in changing thwarted belongingness in the switch conditions, and keeping belongingness consistent in the stable conditions.

**Perceived Burdensomeness.** As the study was interested in the comparison between stable levels of burdensomeness, analysis was required to identify whether burdensomeness remained relatively stable for four conditions. A 2 (Starting Condition: Low or High TB) x 2 (Stable or Switch: whether TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups (Figure 2: Panel B). Feelings of burdensomeness did not significantly change over time for participants who remained in either a Low or High TB condition for the duration of the experiment, $F(1, 27) = 3.46, p > .05$, $\eta^2_{\text{partial}} = .11$. In addition, feelings of burden did not significantly change over time for participants who experienced a change in conditions over the experiment, $F(1, 19) = 3.75, p > 0.05$, $\eta^2_{\text{partial}} = .17$. Therefore, the study was successful in manipulating changes in belongingness over the experiment, while keeping perceived burdensomeness stable.
Evaluating Effects of a Change in Thwarted Belongingness on a Desire to Quit

Similar to Study 1, we were interested as to whether the experimental condition in Phase 1 (i.e., Starting Condition) would interact with whether a change in conditions occurred in Phase 2. Only switch groups would experience a change in thwarted belongingness, and a significant change in desire to quit for these groups was expected. A 2 (Starting Condition: Low-Low TB, Low-High TB, High-Low TB, High-High TB) x 2 (Phase: Phase 1, Phase 2) ANOVA was conducted to evaluate this interaction. The results revealed a significant interaction effect, indicating that the change in thwarted belongingness had a differential impact on the desire to quit depending on the starting condition. Further analyses showed that participants in the High-Low TB group had a significantly higher desire to quit compared to those in the Low-Low TB group after the change in conditions.

Figure 3: Self-reported ratings across Phase 1 (Rounds 1-3) to Phase 2 (Rounds 4-6) for all four groups. Panel A shows changes in belongingness, while Panel B shows changes in perceived burdensomeness. Error bars represent standard error.
Low or High TB) x 2 (Stable or Switch: whether TB condition changed halfway through the task) x 2 (Phase: Phase 1 and Phase 2) x 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups (Figure 2; Panel C). Participants who remained in the same TB condition for the duration of the experiment did not report a change in desire to quit over time, $F(1, 27) = .05, p > .05, \eta^2_{\text{partial}} = .00)$. As expected, participants in the High TB condition for the duration reported a greater desire to quit than those in the Low TB condition, $F(1, 27) = 4.82, p < .05, \eta^2_{\text{partial}} = .15$, indicating consistent support from teammates reduced desire to quit even in the presence of heightened feelings of burden. Participants who experienced a change in interpersonal conditions reported a change in desire to quit the task, $F(1, 19) = 14.44, p < .001, \eta^2_{\text{partial}} = .45$. Therefore, a change in only thwarted belongingness was still sufficient in causing changes in participants’ desire to quit.

Figure 4: Self-reported desire to quit scores over Phase 1 (Rounds 1-3) and Phase 2 (Rounds 4-6) for the four groups. Error bars represent standard error.

Similar to Study 1, a linear regression was performed to determine whether changes in burdensomeness or belongingness had the strongest association with changes in a desire to escape from Round 3 to Round 6 for participants in switch conditions ($N = 19$). Changes in both thwarted belongingness and perceived burdensomeness accounted for roughly 37% of
variance in the dependent variable, $F(2, 17) = 3.57, p = .04$. Changes in thwarted belongingness ($\beta = .74, p = .01$), but not perceived burdensomeness ($\beta = -.25, p = .34$), was a significant predictor of changes in a desire to escape. This is expected, given only thwarted belongingness was manipulated in the current task, and points to the effectiveness of changes in a single interpersonal variable in affecting a desire to quit over time.

**Table 2**

Linear regression with changes in interpersonal factors from round 3 to round 6 predicting changes in a desire to quit for switch conditions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE(B)</th>
<th>$\beta$</th>
<th>t</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Burdensomeness</td>
<td>-.25</td>
<td>.25</td>
<td>-.25</td>
<td>-.99</td>
<td>.34</td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>.56</td>
<td>.19</td>
<td>.74</td>
<td>2.88</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Note. B = Beta, SE = Standard Error, $\beta$ = Standardized Beta.*

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

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

**General Discussion**

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

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

Clinical and Theoretical Implications

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

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

**Limitations and Directions for Future Studies**

There are notable limitations of the manipulation utilized in both studies. Firstly, the change in interpersonal circumstances was quite sudden. Although this may emulate the vulnerability of interpersonal environments to abrupt changes, it also may have heightened suspicion of the computerized nature of the participants’ teammates. Some participants noted that they were surprised and confused by the sudden change in the supportiveness of their teammates. Despite its sudden nature, most participants reported being convinced and affected by the change in interpersonal feedback. Future studies could aim to use more subtle
manipulations of interpersonal circumstances. These changes may also replicate the gradual
decline in interpersonal relationships that may occur over time, and increase ecological
validity of findings. Secondly, the use of a healthy university sample may limit how findings
can be generalized to other populations, particularly clinical adult populations. Such
individuals may interpret interpersonal events in a different manner, and this should be
explored in future research.

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

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

In conclusion, the current study is the first to assess the dynamic nature of interpersonal risk factors experimentally. Results suggested rapid changes in a desire to escape as a result of a single change in interpersonal circumstances. More adverse interpersonal conditions resulted in a significantly greater desire to escape. The malleability of both interpersonal factors and the associated changes in a desire to escape suggest they may be appropriate areas for clinical intervention. The dynamic nature of a desire to escape in the current studies suggests the need for continuous clinical assessment to monitor the effects of adverse changes in interpersonal circumstances. Dynamic measurement of suicide and interpersonal risk factors is in its early stages, and future research in this domain would assist in increasing our understanding of this complex phenomenon.
Foreword to Chapter 3

Study 1 and 2 identified that as interpersonal adversity increased or decreased there were associated increases or decrease in a desire to escape from adversity in an experimental setting, respectively. Study 2 also suggested that changes in only thwarted belongingness, in the presence of heightened perceived burdensomeness, are sufficient in altering a desire to escape. Given ecological studies are effective in determining which factors are correlated with changes in suicidal thoughts and behaviours, experimental studies are particularly important in manipulating risk factors in an isolated manner to determine causality. These help to support key predictions from the interpersonal psychological theory of suicidal behaviour that interpersonal factors are dynamic and responsible for driving escape-related behaviours. While Study 1 and 2 provide causal evidence as to the effects of changes in interpersonal circumstances, it is important to identify whether similar patterns are evident with regard to suicidal thoughts and behaviours in an ecological setting. That is, interpersonal adversity was associated with a desire to escape from the task, whether it results in a desire to escape from life is unclear. Ensuring similar patterns are evident in an ecological setting is an important step in falsifying theories of suicide.

Preliminary research into how interpersonal factors are associated with suicidal ideation over time is limited. Perhaps the strongest evidence within an ecological setting comes from Kleiman et al. (2017), which found changes in suicidal ideation over a matter of hours were correlated with changes in interpersonal factors. However, there a several limitations in prior ecological research that provides the basis for Study 3. Firstly, it is important to build on Kleiman et al. (2017) to determine the effects of an interaction between interpersonal variables. Based on key premises of the interpersonal theory of suicide, it is expected that concurrent experiences of thwarted belongingness and perceived burdensomeness would be associated with heightened levels of suicidal ideation than either
factor alone. Second, the relationship between interpersonal factors in isolation was not assessed; rather they were compared for their clinical utility in predicting ideation hours later through multiple regression techniques. As indicated by Study 2, it may be beneficial to assess the effects of changes in thwarted belongingness and perceived burdensomeness in isolation. Study 3 therefore looked to assess how interpersonal factors, both in isolation and together, were associated with suicidal ideation over various points in time on a daily basis.

A consistent finding from prior research is that non-suicidal self-injury is a maladaptive method to escape or minimize experiences of distress amongst clinical and non-clinical samples (Joiner, Ribeiro, & Silva, 2012; Klonsky, 2007). If interpersonal adversity causes sufficient distress to heighten a desire to escape through suicide, it would be expected that it would also heighten to risk of non-suicidal self-injury. In line with this position, research has found interpersonal conflict to be more common on days when non-suicidal self-injury occurs, indicating it may be an important driving factor (Turner, Cobb, Gratz, & Chapman, 2016). However, such research has not occurred continuously in the lead up to self-injurious behaviours, thus understanding of the patterns of change in risk factors over time and how prediction can be enhanced is limited. Study 3 therefore looks to explore how changes in interpersonal adversity occur in the lead up to NSSI. Further, it looks to explore whether suicidal ideation increases prior to NSSI, under the assumption that those who rely on maladaptive strategies to minimize distress, such as through desiring suicide, will be more likely to engage in NSSI to minimize distress.
Interpersonal factors, suicidal ideation and NSSI, Study 3

Daily Assessment of Interpersonal Factors to Predict Suicidal Ideation and Non-Suicidal Self-Injury in Psychiatric Inpatients

Published 12th March 2018 as journal article in Journal of Consulting and Clinical Psychology (please see Appendix 1 for article in journal format)

Abstract

**Objective:** The study assessed suicidal ideation and interpersonal variables to explore the extent to which: (i) changes in interpersonal factors predicted future suicidal ideation, and (ii) changes in either predicted non-suicidal self-injury.

**Method:** In total, 1044 patients (72.3% Female; mean age = 41.95) at a psychiatric inpatient facility were assessed daily for suicidal thoughts. If patients indicated suicidal thinking (N = 417), their feelings of perceived burdensomeness and thwarted belongingness were assessed.

**Results:** There was a reciprocal relationship between suicidal ideation and interpersonal factors, with both predicting each other on the next day. Changes in suicidal ideation, but not interpersonal factors, over two days were a significant predictor of 22.6% of non-suicidal self-injury cases (N = 67).

**Conclusions:** The findings reinforce the need for more intensive assessment of suicidal ideation (i.e. days, hours) to determine complex relationships with risk factors. This acts to enhance prediction and prevention of suicidal ideation and non-suicidal self-injury.
Daily Assessment of Interpersonal Factors to Predict Suicidal Ideation and Non-Suicidal Self-Injury in Psychiatric Inpatients

Suicide is a leading cause of death worldwide, with approximately 800,000 people taking their own lives each year (World Health Organization, 2017). Yet deaths by suicide are often unexpected among the general population and even among psychiatric in-patients (Morgan & Priest, 1991). Due to the difficulties inherent in the assessment of suicide risk, heightened periods of suicide risk often go unpredicted. This problem is compounded by the fluctuations in suicidal thinking occurring over relatively short periods of time (Kleiman, Turner, Fedor, Beale, Huffman, & Nock, 2017). Hence, it is important to understand the dynamic relationships over time shared by suicide risk and its predictors. Thus, the main aim of the current study is to assess changes in suicidal ideation over a short-term period and identify the extent to which notable risk factors of suicide relate to suicidal ideation and self-injurious behaviours.

Although there are many predictors of increased suicidal risk, the Interpersonal Theory of Suicide (Joiner, 2005) organized these factors by suggesting that significant interpersonal deficits enable the development of suicidal desire. The theory defines two interpersonal states: (i) perceived burdensomeness, when an individual feels they are a liability on friends, family and society, and fundamentally flawed to the point of self-hatred; and (ii) thwarted belongingness, when an individual’s innate desire to feel socially connected is not met due to excessive loneliness and a lack of perceived support (Van Orden, Witte, Cukrowicz, Braithwaite, Selby, & Joiner, 2010). Experiencing both thwarted belongingness and perceived burdensomeness simultaneously is theorized to increase the risk of developing suicidal ideation. Perhaps most importantly, these components are suggested to be dynamic and proximal causes of increases in suicide risk, occurring close in time to the onset of suicidal thoughts. Cross-sectional assessments of the theory have largely been supportive,
indicating heightened levels of both thwarted belongingness and perceived burdensomeness are associated with a desire to suicide (Christensen, Batterham, Soubelet, & Mackinnon, 2013; Hagan, Podlogar, Chu, & Joiner, 2015; Joiner et al., 2009; Monteith, Menefee, Pettit, Leopoulou, & Vincent, 2013; Van Orden, Witte, Gordon, Bender, & Joiner, 2008).

However, such cross-sectional research does not speak to the dynamic relationships across time between these variables. To date, one study (Kleiman et al., 2017) has provided a short-term intensive assessment of suicide risk. This study observed that suicidal ideation varied within short periods of time, but the interpersonal risk factors of suicide (burdensomeness and loneliness) were not significant predictors of future changes in suicidal ideation. However, the authors note that the small sample size may have limited the ability to determine interactions between risk factors. Further, to adequately falsify the interpersonal psychological theory of suicidal behaviour and assess its predictive power, future assessments may benefit from repeatedly assessing all the above-mentioned aspects of thwarted belongingness (i.e., loneliness, perceived support) and perceived burdensomeness (i.e., self-hate, liability).

Previous assessments have largely been unidirectional, that is, they have only assessed the extent to which risk factors of suicide predict whether an individual has suicidal thoughts. However, Joiner (2005) speculates that components of the Interpersonal Theory of Suicide may act in a cyclical manner. That is, there are multiple entry points by which risk factors (i.e., perceived burdensomeness and thwarted belongingness) may become escalated. For instance, an individual may be viewed unfavourably and as a burden for engaging in self-harm, causing heightened thwarted belongingness and perceived burdensomeness. To date, there has not been an empirical assessment of a reciprocal relationship between interpersonal factors and suicidal thoughts and behaviours.
While Joiner does not speculate as to a potential bidirectional relationship between suicidal thinking and interpersonal factors, an assessment of testimonials indicates this may be the case (2005; See page 138). That is, interpersonal factors may influence the development of suicidal thoughts, and suicidal thoughts may in turn influence interpersonal circumstances. On a cognitive level, thoughts of suicide appear to generate negative perceptions regarding interpersonal circumstances. For instance, loneliness may be heightened if the individual contemplating suicide believes their presence will not be missed (“No one will care if I kill myself”) and self-hate may be perpetuated for considering what they perceive to be a shameful behaviour (“I am selfish and pathetic for considering suicide”). In addition, a heightened emotional state during suicidal periods may cause cognitive biases toward future interpersonal events, subsequently heightening interpersonal deficits (Krantz & Hammen, 1979). On a behavioural level, individuals contemplating suicide sometimes report engaging in self-destructive behaviours, which may perpetuate interpersonal difficulties. For example, disconnecting from friends and family will create a lonely environment devoid of reciprocal care. Thus, while interpersonal factors may be implicated in the development of suicidal thoughts, heightened suicidality may have subsequent effects on interpersonal circumstances. A bidirectional relationship between variables potentially creates a feedback loop between factors, efficiently increasing suicidal ideation and interpersonal deficits over time. Identifying reciprocal relationships may therefore be beneficial for clinical assessments and interventions to reduce suicide.

Recent research suggests that the impact of interpersonal factors varies dependent on the level of suicidal ideation (Rogers & Joiner, 2017). In particular, the effects of perceived burdensomeness and thwarted belongingness were significant at high levels of suicidal ideation, while an interaction between factors was only significant at low-moderate levels of suicidal ideation. That is, more severe suicidal thoughts are driven by the individual effects of
interpersonal factors, while an interaction drives less severe thoughts. However, the authors note the cross-sectional nature of the study, and the need to assess this relationship over time. As such, when assessing reciprocal relationships over time, research may benefit from determining differing effects at varied levels of suicidal ideation.

Persistent thoughts of suicide are particularly pernicious due to their relation to subsequent suicide attempts. However, Joiner (2005) suggests that an ability to overcome a fear of pain or death mediates this relationship, diminishing an individual’s ability to attempt suicide. An ability to suicide can be acquired through exposure to repeated dangerous and painful situations. The literature has not explored whether intensive suicidal thoughts and interpersonal deficits are associated with an elevated risk of engaging in self-induced painful experiences. Self-injury encapsulates a number of harmful behaviours, including a clear intention to end one’s own life, referred to as suicidal behaviours, or the destruction of one’s own bodily tissues with no intention to die, referred to as non-suicidal self-injury (NSSI; Nock, 2009). While some research has attempted to explore the relationship between interpersonal factors and suicide attempts (Van Orden et al., 2008; Joiner et al., 2009; Anestis & Joiner, 2011), there has been limited focus on NSSI. The same processes involved in the development of suicidal desire (i.e., perceived burdensomeness and thwarted belongingness) may drive the need to engage in NSSI (Joiner, Ribeiro, & Silva, 2012). Indeed, early research suggests that perceived family support, a key aspect in belonging, is important in the cessation or maintenance of NSSI (Tatnell, Kelada, Hasking, & Martin, 2013; Muehlenkamp, Brausch, Quigley, & Whitlock, 2013). As previously noted, Joiner (2005) suggests self-harming behaviours may in-turn exacerbate interpersonal deficits, indicating a reciprocal relationship between variables. Recent research by Turner et al. (2016) support this position, with interpersonal deficits remaining heightened following NSSI, increasing the possibility of
further self-injurious behaviours. However, these issues require further empirical attention, indicating the relation between variables and the ability to predict NSSI incidents.

The current study examined how suicidal ideation and interpersonal factors change over time using a larger sample than previous studies. The ability to identify any reciprocal relationships between variables may be particularly advantageous when assessing suicide and its risk factors. In addition, the extent to which suicidal ideation and interpersonal factors drive and can predict NSSI events can be assessed. The current study used a cross-lagged panel design to determine causal relationships between suicide and interpersonal risk factors over the short-term (i.e., days). Based on the above, there are several hypotheses to be drawn:

- Interpersonal factors to be highly correlated with suicidal ideation cross-sectionally.
- Interpersonal factors are expected to be predictive of changes in suicidal ideation.
- Interpersonal factors are expected to drive changes in suicidal ideation on the next day, and suicidal ideation to affect subsequent changes in interpersonal factors.
- The relationship between interpersonal factors and suicidal ideation over time is expected to be different for low and high levels of suicidal ideation.
- Feelings of perceived burdensomeness and thwarted belongingness are expected to remain heightened on the day following a NSSI event.
- NSSI incidents will be predicted by changes in suicidal ideation and interpersonal factors in the days prior.

**Method**

**Participants and Procedure**

Patients at an inpatient psychiatric facility were invited daily to answer a series of items about their symptoms and wellbeing. From these scales, data from a single question regarding their suicidal ideation were examined. Questionnaires were computer-delivered, via
electronic tablet devices, and if a patient indicated suicidal thoughts from the past day, then they were provided with four additional questions to answer on that day and for the next two days (a score above 0 on the suicidal ideation questionnaire item indicated suicidal thinking). The additional questions assessed feelings of burdensomeness and belongingness. Of the total 1044 separate inpatient admissions, 417 patients indicated low to high levels of suicidal thinking, with the remaining patients indicating no desire to suicide. All questionnaires were available throughout each day for patients to complete no more than once per day, as the questionnaires aimed to capture psychological states from the previous 24 hours. Generally, questionnaires were completed in the morning and took only a few minutes to complete. Self-harm incidents were logged independently with administration by nursing staff on the date in which self-harm occurred (as part of routine government reporting requirements on hospitals), with 70 patients self-harming (NSSI=67, Suicide Attempts=3). Incidents were either witnessed by nursing staff or informed of their occurrence by patients. As such, an explicit intention to die through self-harming was determined through subsequent questioning by nursing staff or through witnessing near-fatal behaviours (e.g., attempting to electrocute one’s self). Patients that attempted suicide during their stay were not included in the assessment of NSSI, as this included an intention to die. In addition, multiple self-harming events for the same person were not included in analyses to avoid violating non-independence assumptions. Data was collected as part of an ongoing program of evaluation at the facility and written informed consent was obtained upon admission to the hospital.

All self-harm events were logged by day and most also recorded the time when they occurred. For the self-harm events where the time they occurred was recorded, the time always proceeded the completion of the questionnaire.
**Demographic Information**

The majority of patients were identified as being high in socio-economic status (71.2%). The sample was 72.3% female, with a mean age of 41.95 years ($SD = 16.1$). The mean length of stay was 14.2 days ($SD = 12.7$). The sample consisted of patients with the principal diagnosis of affective disorders (50.5%), neurotic disorders (20.4%), substance use disorders (13.1%), personality disorders (6.6%), and other disorders including schizophrenia (9.3%).

**Measures**

Two questions were created to measure perceived burdensomeness, “In the past 24 hours, I have felt that I am worthless” and “In the past 24 hours, I have felt like my death would be a relief to people”. Both items represent constructs that according to the Interpersonal Theory of Suicide combine to create a global state of burdensomeness (i.e. self-hate and perceived liability, respectively). As a result, a total burdensomeness variable was created through the summation of standardized scores on both items. The items showed acceptable internal consistency ($ \alpha = 0.76$).

Two questions measured perceptions of belonging, “In the past 24 hours, I have felt that people care for me” and “In the past 24 hours, I have felt close to others”. For scores to represent feelings of thwarted belongingness, responses were reverse scored. In so doing, higher scores indicated less belongingness. As per burdensomeness, belongingness items represented differing sub-constructs of wider feelings of belongingness (i.e. perceived support and loneliness, respectively). Both items were subsequently combined and standardized to create a total thwarted belongingness score. Both belongingness items were shown to have acceptable internal consistency ($ \alpha = 0.76$).
Suicidal ideation was measured through a single question “In the past 24 hours, I have thought about suicide”. Both suicide ideation and worthlessness were measured on a 6-point Likert scale (0 = At no time, 5 = All the time). Perceived support, perceived liability and loneliness questionnaire items were measured on a 7-point Likert scale (1 = Not true for me at all, 7 = Very True for me). These were adapted from the Interpersonal Needs Questionnaire to largely retain the same wording but include temporal elements unique to their use in the current study (i.e. “In the past 24 hours…”) (INQ; Joiner, Van Orden, Witte, & Rudd, 2009). As previously discussed, items were selected on a conceptual basis to represent aspects of thwarted belongingness and perceived burdensomeness defined by Joiner (2005). Further, they selected due to strong loadings on either perceived burdensomeness or thwarted belongingness through factor analysis (Van Orden et al., 2012). There was a moderate correlation between perceived burdensomeness and thwarted belongingness, \( r(446) = 0.41, p < .001 \), which is consistent with previous studies that have identified the constructs as being related, yet unique (Van Orden et al., 2008).

**Analytical Approach**

Is there a reciprocal relationship between interpersonal factors and suicidal ideation? Cross-Lagged Panel Assessment was used to permit causal inferences between factors in longitudinal studies. An autoregressive cross-lagged panel approach, with MPlus (Version 7; Muthen & Muthen 1998-2016), was used to address reciprocal associations between suicide and interpersonal factors. As the Interpersonal Theory of Suicide points to the roles of thwarted belongingness and perceived burdensomeness separately and combined, analyses first examined each variable alone. Next an interaction term between interpersonal variables was created, through the product of their standardized scores. In each analysis, the role of the predictor for days one through three was entered along with the corresponding suicidal ideation scores. Analyses were based on responses from the three consecutive days
of data collection for each participant, where the initial time point was the first day the suicidal ideation item was endorsed. As interpersonal items were no longer available for a fourth time point unless suicidal ideation was endorsed again, three time points were seen as optimal to maximise the sample size.

To accommodate for any relationships between risk factors that may occur over time dependent on severity of suicidal ideation, the same analyses would be run for low and high suicidal ideation. A median split was utilized to maximise the sample size available for both groups. The low suicidal ideation groups would consist of the lower 50% of responses to the suicidal ideation question (1 = Some of the time, 2 = Less than half of the time). The high suicidal ideation groups would consist of the upper 50% of responses to the suicidal ideation question (3 = More than half of the time, 5 = All of the time).

**What is the relationship between suicidal ideation, interpersonal factors and NSSI?** To determine differences between patients who engaged in NSSI and those who did not, suicidal ideation, perceived burdensomeness and thwarted belongingness were compared from two days prior to an incident to the day of an incident. Several within-subjects ANOVAs were run for suicidal ideation, perceived burdensomeness and thwarted belongingness across all three days for both NSSI groups. Essentially, this would indicate whether notable differences in these factors were evident in the lead up to NSSI.

To assess whether suicidal ideation and interpersonal deficits increased following NSSI, several t-tests were run to determine whether both factors were significantly different from the day in which NSSI occurred to the day after. If suicidal ideation and interpersonal factors did not significantly increase, the extent to which they remained heightened when compared with two days prior to NSSI was also assessed. This would allow us to identify whether suicide risk factors appeared to increase, maintain or decrease following NSSI.
A hierarchical logistic regression was used to determine the extent to which continuous variables (i.e., changes in suicidal ideation, burdensomeness and belongingness) could predict a categorical NSSI outcome (i.e., NSSI incident vs. no NSSI incident). To assess the effects of changes in variables over time, a separate term was created from the differences between suicidal ideation, thwarted belongingness and perceived burden on the day of an incident and two days prior. These analyses were performed utilizing IBM SPSS (Version 23) software.

**Results and Discussion**

**Is There a Reciprocal Relationship Between Interpersonal Factors and Suicidal Ideation?**

**Perceived burdensomeness.** Results indicate that for suicidal ideation and burdensomeness, the auto-regressive effects were all strong (Figure 5). Essentially, if someone felt they were a burden on one day, there was a strong chance they would feel like a burden on the next day. Likewise, if an individual thought about suicide, results indicated a strong chance they would think about suicide again the next day.

Cross-sectional assessments indicated medium and significant correlations between suicidal ideation and interpersonal factors. Therefore, patients who reported higher levels of perceived burdensomeness reported greater suicidal ideation. Results also indicated significant cross-lagged correlations between perceived burdensomeness and next day suicidal ideation. Therefore, feelings of burdensomeness predicted subsequent thoughts of suicidal ideation. In addition, suicidal ideation on Day 2 predicted feelings of burdensomeness on Day 3, indicating that thoughts of suicide may increase feelings of burden and a reciprocal relationship exists between the two factors.
Thwarted belongingness. A total of responses to the belongingness items was created and compared with suicidal ideation over three days of responses (Figure 6). The auto-regressive effects were all significant and moderate to strong. Cross-sectional assessments indicated significant correlations between suicidal ideation and thwarted belongingness. Patients who reported higher levels of thwarted belongingness were more likely to report more frequent suicidal ideation.

There was some evidence of cross-lagged effects, with suicidal ideation significantly, but weakly correlated with next day thwarted belongingness. Thwarted belongingness was only correlated with next day ideation from day 1 to day 2. Thus, there was evidence of a reciprocal relationship between suicidal ideation and thwarted belongingness.
Figure 6. Cross-Lagged Panel Analysis of suicidal ideation and thwarted belongingness on day 1 (IDEATION 1, BELONG 1), day 2 (IDEATION 2, BELONG 2) and day 3 (IDEATION 3, BELONG 3). All correlations are shown, with significant results asterisked and boldfaced (*p < .05, **p < .001).

Interaction between factors. Like the previous analyses, the auto-regressive pathways were medium to strong and significant across all time points (Figure 7). Cross-sectional assessments indicated medium strength correlations between suicidal ideation and interpersonal factors, suggesting both variables tended to vary together on the same day. The cross-lagged pathways were weak, but significant, in both directions. Therefore, both suicidal ideation and interpersonal factors acted to predict each other over both assessment periods.
Figure 7. Cross-Lagged Panel Analysis of suicidal ideation and the interaction between perceived burdensomeness and thwarted belongingness on day 1 (IDEATION 1, INTERACTION 1), day 2 (IDEATION 2, INTERACTION 2) and day 3 (IDEATION 3, INTERACTION 3). All correlations are shown, with significant results asterisked and boldfaced (*p < .05, **p < .001).

Comparing Relationships over Time between Low and High Suicidal Ideation Groups

**Perceived Burdensomeness.** The same cross-lagged panel analyses were run for low and high suicidal ideation groups. There were significant autoregressive and cross-sectional relationships between suicidal ideation and perceived burdensomeness at all time points. For low ideation groups, burdensomeness on day 1 was weakly and significantly correlated with suicidal ideation on day 2 (Figure 8: Panel A). From day 2 to day 3 suicidal ideation predicted feelings of burdensomeness. Therefore, there was a reciprocal relationship over time, with burdensomeness driving initial changes in suicidal ideation. For high ideation groups, there was a weak cross-lagged correlation between perceived burdensomeness and suicidal ideation on the next day, with suicidal ideation predicting burdensomeness from day 2 to day 3 (Figure 8: Panel B).
Figure 8. Cross-Lagged Panel Analysis of suicidal ideation and burdensomeness on day 1 (IDEATION 1, BURDEN 1), day 2 (IDEATION 2, BURDEN 2) and day 3 (IDEATION 3, BURDEN 3). Panel A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*p < .05, **p < .001).

Thwarted Belongingness. Results suggested significant autoregressive effects for both low and high groups. In addition, there were significant weak to moderate cross-sectional correlations between ideation and belongingness at all but one time point. Low
ideation groups exhibited no cross-lagged relationships between ideation and belonging (Figure 9: Panel A). On the other hand, the high ideation group reported a reciprocal relationship from day 1 to day 2 (Figure 9: Panel B). That is, suicidal ideation and thwarted belongingness only predicted each other when suicidal ideation was high.

Figure 9. Cross-Lagged Panel Analysis of suicidal ideation and thwarted belongingness on day 1 (IDEATION 1, BELONG 1), day 2 (IDEATION 2, BELONG 2) and day 3 (IDEATION 3, BELONG 3). Panel A and B represent results for low and high ideation.
groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*$p < .05$, **$p < .001$).

**Interaction between factors.** For both low and high ideation groups there were significant auto-regressive correlations on the next day and cross-sectional correlations. For the low ideation group, an interaction between burdensomeness and belongingness on day 1 significantly predicted suicidal ideation on day 2 (Figure 10: Panel A). In addition, suicidal ideation on day 2 predicted an interaction between interpersonal variables on day 3, indicating a reciprocal relationship. For the high ideation group, suicidal ideation and an interaction between interpersonal factors significantly predicted each other from day 1 to day 2 (Figure 10: Panel B). Only an interaction between interpersonal factors significantly predicted suicidal ideation from day 2 to day 3. Therefore, there was a reciprocal relationship between variables over time for both low and high suicidal ideation groups.
Figure 10. Cross-Lagged Panel Analysis of suicidal ideation and the interaction between perceived burdensomeness and thwarted belongingness on day 1 (IDEATION 1, INTERACTION 1), day 2 (IDEATION 2, INTERACTION 2) and day 3 (IDEATION 3, INTERACTION 3). Panel A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*p < .05, **p < .001).
What is the Relationship between Suicidal Ideation, Interpersonal Factors and NSSI?

Several analyses were conducted to assess the relationship between suicidal ideation, interpersonal factors and incidents of NSSI. Assessment of mean scores over time indicated that individuals who engaged in NSSI reported significant increases in suicidal ideation,

\[ F(1.48, 56.08) = 14.78, p = .00, \eta = 0.37, \]

thwarted belongingness, \[ F(2, 58) = 7.14, p = .002, \eta = 0.20, \]

perceived burdensomeness, \[ F(2.47, 42.13) = 8.80, p = .002, \eta = 0.23, \]

and an interaction between interpersonal variables, \[ F(1.45, 42.10) = 10.69, p = .00, \eta = 0.27, \]

in the lead up to an event (See Figure 11). Thus, while all interpersonal factors and suicidal ideation remained stable over the assessment period for individuals who did not engage in NSSI, there was a notable rise in interpersonal factors and suicidal ideation prior to a NSSI incident.

We also hypothesized that engaging in NSSI may act to maintain interpersonal deficits and suicidal ideation. Follow-up t-tests indicated there were no significant change in suicidal ideation, \[ t(23) = 1.37, p = .83, \]

perceived burden, \[ t(23) = -0.73, p = .47, \]

thwarted belongingness, \[ t(23) = -1.18, p = .25 \]

and an interaction, \[ t(23) = -1.77, p = .09, \]

on the day following NSSI. However, only suicidal ideation, \[ t(23) = 3.29, p = .001, \]

and perceived burdensomeness, \[ t(23) = 3.27, p = .004 \]

remained significantly higher than the two days prior to a NSSI incident. As a result, risk of subsequent NSSI may not diminish following the initial NSSI incident. Of the 67 individuals who engaged in NSSI, 13 had further incidents within the next four days. In sum, there was a significant increase in all interpersonal factors and suicidal ideation in the lead up to initial NSSI, with evidence of distress remaining heightened and a risk of subsequent self-injurious behaviours in the days following.
Figure 11. Standardized self-reported mean scores between patients who did and did not engage in NSSI in self-reported suicidal ideation (Panel A), perceived burdensomeness (Panel B), thwarted belongingness (Panel C) and an interaction between interpersonal variables (Panel D) over time (T0 = date of incident, T - 1 = 1 day prior, T - 2 = 2 days prior, T + 1 = 1 day after an incident). Error bars represent standard error.

To assess the ability of changes in suicidal ideation, thwarted belongingness, and perceived burdensomeness to predict NSSI (over the two days prior to a NSSI event), a hierarchical binomial regression was run, with results reported in Table 3. At Step 1, burdensomeness and belongingness were entered, with only burdensomeness being a significant predictor of NSSI. However, the model accurately predicted only 3% of NSSI incidents. At Step 2, an interaction between burdensomeness and belongingness was added, but did not significantly contribute in predicting NSSI. At Step 3, only a change in suicidal ideation over two days was a significant predictor of NSSI, with the model accurately
Interpersonal factors, suicidal ideation and NSSI, Study 3

predicting 22.6% of NSSI incidents (Sensitivity = 22.6%, Specificity = 98.7%). Therefore, when controlling for suicidal ideation, interpersonal factors were not a significant predictor of NSSI. While suicidal ideation and interpersonal factors appeared to drive each other, ideation seems to be a better predictor of NSSI.

Table 3

Results of a hierarchical binomial regression assessing the association between changes in suicidal ideation, thwarted belongingness, perceived burdensomeness and an interaction between interpersonal variables over two days in predicting NSSI incidents.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>W</th>
<th>OR</th>
<th>CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.28</td>
<td>0.23</td>
<td>98.68</td>
<td>0.10***</td>
<td></td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>0.12</td>
<td>0.14</td>
<td>0.70</td>
<td>1.12</td>
<td>0.86–1.48</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>0.97</td>
<td>0.33</td>
<td>8.68</td>
<td>2.64**</td>
<td>1.39–5.05</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.28</td>
<td>0.23</td>
<td>98.63</td>
<td>0.10***</td>
<td></td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>0.07</td>
<td>0.67</td>
<td>0.01</td>
<td>1.07</td>
<td>0.29–3.94</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>0.89</td>
<td>1.15</td>
<td>0.60</td>
<td>2.43</td>
<td>0.26–22.94</td>
</tr>
<tr>
<td>Interaction (TB x PB)</td>
<td>0.15</td>
<td>1.98</td>
<td>0.01</td>
<td>1.16</td>
<td>0.02–56.39</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.42</td>
<td>0.27</td>
<td>81.25</td>
<td>0.09***</td>
<td></td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>0.46</td>
<td>0.76</td>
<td>0.37</td>
<td>1.58</td>
<td>0.36–6.97</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>1.25</td>
<td>1.33</td>
<td>0.88</td>
<td>3.48</td>
<td>0.26–47.12</td>
</tr>
<tr>
<td>Interaction (TB x PB)</td>
<td>-1.29</td>
<td>2.21</td>
<td>0.34</td>
<td>0.27</td>
<td>0.00–21.02</td>
</tr>
<tr>
<td>Suicidal Ideation</td>
<td>1.57</td>
<td>0.34</td>
<td>20.76</td>
<td>4.79***</td>
<td>2.44–9.40</td>
</tr>
</tbody>
</table>

*Note. W = Wald statistic; OR = odds ratio; CI = confidence interval; TB = Thwarted Belongingness; PB = Perceived Burdensomeness. ** p < .01. *** p < .001.*
**General Discussion**

The current study assessed suicidal ideation, interpersonal factors and NSSI on a daily basis during inpatients’ stay at a psychiatric facility. The first aim of the study was to examine the extent that interpersonal factors at one time point drive short-term changes in suicidal ideation at a subsequent time point and vice versa. Results suggested that both thwarted belongingness, perceived burdensomeness and an interaction between factors predicted subsequent suicidal ideation over and above that explained by prior suicidal ideation. In each cross-panel design results identified a reciprocal relationship between factors, indicating that thinking about suicide heightens perceptions of both thwarted belongingness and perceived burdensomeness. Consistent with Rogers and Joiner (2017), there appeared to be a differing relationship between interpersonal factors at varied levels of suicidal ideation. In particular, the relationship between interpersonal factors and suicidal ideation was stronger over time when suicidal ideation was high. However, it is important to note that the current study assessed the significance of relationships at different levels of suicidal ideation, rather than effect sizes, and future studies should therefore be conducted to support findings from the current study.

The findings from the current study are consistent with Van Orden et al. (2008), which found burdensomeness to be a stronger predictor of suicidal ideation than belongingness. The findings that interpersonal factors accounted for a significant amount of variance contrast with findings from Kleiman et al. (2017), which suggested that neither thwarted belongingness nor perceived burdensomeness are significant predictors of suicidal ideation. However, Kleiman and colleagues did speculate that their small sample may have been a factor in their failure to detect a difference and therefore, the larger sample size in the present study could explain the apparent discrepancy.
Likewise, the current studies contrast with findings from Lasgaard et al. (2011), who identified loneliness (i.e., a component of belongingness) as a predictor for future suicidal ideation. However, their study used only two time points over a year apart. The differences in the designs point to a possible difference in the predictive role of belongingness. It could be that thwarted belongingness functions as a proximal predictor of suicidal ideation (as found in the current study), but that it plays less of a role as a distal predictor (as Lasgaard et al. found). Future research is needed to explore this intriguing possibility.

Prior studies have not explored the influence of suicidal thinking on interpersonal factors. The current study shows a reciprocal relationship between variables, whereby they both influence each other at future time points. We have discussed potential reasons why a reciprocal relationship may occur, such as the stigma associated with suicide, a desire for isolation during suicidal periods and feelings of worthlessness for considering suicide. However, qualitative assessments of how suicidal thinking affects other cognitions of patients may provide weight to these positions.

The second aim of the current study was to assess the relationship between suicidal ideation, interpersonal factors, and NSSI. Analyses indicated that all factors increased across the two days prior to the day of a NSSI event. Patients who engaged in NSSI during their stay reported significantly greater elevations in interpersonal adversity and suicidal ideation than patients who did not. While suicidal ideation and interpersonal adversity did not significantly increase further following NSSI, both ideation and perceived burdensomeness remained heightened following an attempt. Therefore, high-risk periods develop within a day, and the elevated risk may be sustained following NSSI.

The current study also assessed the ability of suicidal ideation and interpersonal factors to predict NSSI. While changes in perceived burdensomeness over two days were a
significant predictor of NSSI, the inclusion of suicidal ideation accounted for a significant portion of this variance. Thus, NSSI behaviours may only arise when distress from interpersonal deficits is also sufficient to generate suicidal ideation. The findings are consistent with Joiner et al. (2012) which advocated a rise in suicidal ideation to be associated with an increase in the severity of NSSI. As previously discussed, this may be due to a mediating role of emotional regulation that may underlie both suicidal ideation and NSSI, regarded as mechanisms to reduce emotional distress (Nock & Prinstein, 2004; Weinberg & Klonsky, 2009). Indeed, notes from nursing staff regarding self-harm events indicate some incidences were preceded by emotionally distressing events (e.g., arguments with spouses and clinical staff). This is consistent with Turner et al. (2016), which found heightened interpersonal conflict on days NSSI occurred. Further, also consistent was the finding that conflict did not significantly decrease on the day following NSSI, increasing the potential for a second incident. Alternatively, engaging in NSSI may also act as a method of practicing for a future suicide attempt in an absence of a capability to suicide (Joiner, 2005). Future studies should look to further explore the underlying mechanisms behind this relationship.

**Clinical and Theoretical Implications**

The Interpersonal Theory of Suicide (Joiner, 2005) suggests that heightened perceived burdensomeness and thwarted belongingness is associated with thoughts of suicide. This position is supported in the current study, with evidence of both factors predicting suicidal ideation on the next day. In addition, an interaction between interpersonal factors appeared to have a consistent reciprocal relationship with suicidal ideation. The theory, however, does not specify the feedback relationship that thoughts of suicide may have upon interpersonal cognitions and thus Figure 12 depicts the possible reciprocal relationships. Moreover, the current study has shown the value of short-term measurement of interpersonal factors and
Interpersonal factors, suicidal ideation and NSSI, Study 3

Suicide risk. Doing so allows for an understanding of the proximal and dynamic relationships among the predictors of risk.

![Diagram](Image)

**Figure 12.** Illustration of a reciprocal relationship between interpersonal factors and suicidal thoughts.

In terms of clinical implications, the current study indicates a need for more intensive assessment to predict suicidal ideation and guide interventions. Changes in suicidal ideation and interpersonal factors may create a feedback loop, whereby both factors drive each other over time. This is particularly problematic when not detected early, and rumination of suicide and interpersonal adversity occurs for prolonged periods of time. Clinical intervention may therefore be important in disrupting this process by targeting perceptions of burden and a lack of belonging, and also be aware of recent changes through daily assessment. Findings also suggest that interpersonal factors are a significant predictor of suicidal ideation on the next day. While only weak effects were found, this still provides valuable information in the prediction of a complex phenomenon and improves the ability to detect imminent fluctuations in suicidal ideation. However, it is important to find a balance between the benefit derived
from additional questions in prediction and information to guide interventions, and the burden it may cause patients if assessed on a daily basis. Given findings from the current study, it may be more appropriate to assess interpersonal factors less frequently than suicidal ideation.

NSSI has been acknowledged to be associated with a lower fear of pain (Joiner, 2005). However, the limited ability to predict NSSI events means even within a well-monitored psychiatric facility an ability to overcome a fear of pain can gradually be acquired (Brackman, Morris, & Andover, 2016). The current study showed that in the lead up to a NSSI incident there is a growth in perceptions of interpersonal adversity and suicidal ideation. Predicting a NSSI event can be aided through consistent monitoring over time to identify when there is sufficient deterioration in a patient’s clinical progress. Enhanced monitoring of deteriorating patients can help prevent early NSSI events. As perceived burdensomeness and suicidal ideation remained high following NSSI, there is also a need to enhance supervision to ensure further events do not occur. In the longer term, clinical interventions may aim to improve a patient’s coping mechanisms when experiencing significant emotional distress to prevent incidences of suicidal ideation and NSSI.

**Directions for Future Studies and Limitations**

The use of a tailored questionnaire delivery system, such as the one used in the present study, permitted questions about burdensomeness and belongingness to be asked of patients, but conditional upon the presence of ideation. This required patients to report some level of suicidal ideation to answer questions regarding their interpersonal circumstances. This design decision means that the present study cannot speak to the possibility that burdensomeness and belongingness may serve a different role among people who have not reported any suicidal ideation and this limitation could be addressed in future research.
Otherwise, it provides information regarding a clinical sample that is at a heightened risk of desiring suicide and engaging in NSSI than the general population. It describes the mechanisms surrounding fluctuations in suicidal ideation, and provides clinically useful information to assist patients who are more likely to require assistance.

The current study opted to assess patients every 24 hours for suicidal ideation and interpersonal deficits. While this is not as frequent as Kleiman et al. (2017), it allowed for data to be gathered for a greater number of patients. As a result, important interactions could be assessed and several effects determined. However, more frequent assessments may prevent short-term fluctuations in suicide from being missed. In addition, it may also allow for assessments of interpersonal changes closer to the occurrence of a change in suicidal desire. Future studies should look to determine an optimal balance between the amount of detail, frequency of measurement, and sample size. Further, research should look to evaluate the extent to which retest effects may bias results for different periods of assessment.

The current study opted to assess only burdensomeness and belongingness due to limitation in the number of questionnaire items that could be implemented into daily assessment. Thus, there were elements of the interpersonal psychological theory of suicidal behavior that were not included. Specifically, the theory suggests that thwarted belongingness and perceived burdensomeness lead to passive ideation (i.e., “I want to die”), while additional feelings of hopelessness regarding these states leads to active ideation (i.e., “I want to kill myself”; Van Orden et al., 2010). However, few studies have assessed this relationship to date (Chu et al., 2017). Therefore, future studies could look to assess whether an interaction between perceived burdensomeness, thwarted belongingness and hopelessness is a significant driver of suicidal ideation. While recent studies have identified that changes in acquired capability can occur within short periods of time (Wadman et al., 2017), the extent to they interact with changes in interpersonal deficits to heighten risk of NSSI and suicide attempts is
Interpersonal factors, suicidal ideation and NSSI, Study 3

a task for future research. The effects of interpersonal events on suicidal thoughts may be
different based on a range of factors (i.e., personality, age or sex). However, this has seldom
been explored and warrants exploration in future research to enhance understanding and
prediction.

In conclusion, the current study provides one of the first assessments of the short-term
reciprocal relationships between the interpersonal factors of belongingness and
burdensomeness on the one hand and suicidal ideation on the other. Findings suggest a
reciprocal causal relationship between suicidal thoughts and interpersonal risk factors. In
addition, it was the first to assess the relationship between suicidal thinking, interpersonal
factors and NSSI. Results indicate that suicidal ideation was a significant predictor of a future
NSSI attempt. This sets the groundwork for future studies which can look to conduct more
proximal assessments of suicide risk. Doing so will allow for a greater understanding of how
other factors drive suicide risk. By attempting to understand why sudden short-term
fluctuations in suicidal thoughts occur, clinicians can be aided in predicting and preventing
suicide attempts.
Foreword to Chapter 4

Study 3 provided insights into how interpersonal factors are related to daily changes in suicidal ideation. Specifically, both thwarted belongingness and perceived burdensomeness were significantly related to suicidal ideation on the next day. This suggests that interpersonal factors may be a driving force behind the development of suicidal thoughts. The fact that this occurred beyond suicidal ideation, a strong predictor of future ideation in prior research, shows there is some clinical utility in assessing interpersonal factors to predict adverse outcomes and target them during interventions to minimize suicidal episodes. However, clinical resources are often limited, and therefore it is important that the right patients receive the right attention to minimize their suicidal thoughts. One potential way to ensure this occurs is through the use of sophisticated risk assessments at admission, allowing for high-risk patients to be provided with adequate coping skills before being discharged. To build on the insights from Study 3, Study 4 looks to enhance risk assessments at admission.

Few studies have examined which factors best predict suicidal ideation across inpatient visits, particular with the use of interpersonal factors. A recent example comes from Hains, Janackovski, Deane, and Rankin (2018), where perceived burdensomeness measured at admission was found to predict suicidal ideation at discharge for psychiatric inpatients, beyond thwarted belongingness, hopelessness and depression. However, the authors utilized a static approach, measuring suicide risk at admission and discharge only. If suicide risk is dynamic, then static assessments in suicide research may misrepresent an inpatient’s level of risk and the relationship with risk factors.

To further enhance risk assessment, suicide research may benefit from determining how suicide risk changes over time. For instance, Czyz and King (2015) found patients with high and pervasive suicidal thoughts in the months following discharge were at the highest risk of suicide attempts. In addition, feelings of hopelessness measured at discharge were
effective in differentiate ideation trajectories. Such an approach assists in overcoming the difficulties in predicting low prevalence suicide attempts. It may be more productive to identify those with pervasive and severe suicidal thoughts, who are at risk of suicide behaviours, and provide them with appropriate skills. That is, while few will go on to attempt suicide, it provides those most at risk with the resources to deal with adverse life circumstances in an adaptive manner. Study 4 looks to build on these findings by determining how suicide risk changes over the course of an inpatient stay to categorise patient trajectories, and whether they can be predicted at admission.

To date, no studies have determined the risk of developing suicidal thoughts throughout one’s stay during an inpatients setting. Specifically, which patients are more vulnerable to deterioration throughout an inpatient visit? Study 3 suggested that suicidal thoughts and interpersonal circumstances can become cyclical, with thinking about suicide heightening interpersonal adversity, and vice versa. It could prove beneficial to identify those at risk of developing suicide thoughts to prevent a rapid decline. Study 4 looks to assess the characteristics of patients who enter a clinical setting reporting no suicidal thoughts, and go on to report them later in their stay. Such patients may enter a clinic with poorer interpersonal circumstances, or higher levels of negative affect. This would further contribute to risk assessments at admission and guide therapeutic interventions for the right individuals.
Chapter 4

Study 4 Assessing Interpersonal and Mood Factors to Predict Trajectories of Suicidal Ideation within an Inpatient Setting

Abstract

Objective: The current study used daily assessment of suicidal ideation and risk factors during an inpatient psychiatric stay to refine prediction of suicide risk.

Method: In total, 1076 patients (73% Female; mean age = 39.21) at a psychiatric inpatient facility were assessed daily for suicidal thoughts, perceived burdensomeness, thwarted belongingness, hopelessness, depression, and anxiety.

Results: Thwarted belongingness at admission predicted the trajectory of suicidal ideation over the course of inpatient visits, while perceived burdensomeness predicted which patients would develop suicidal thoughts during their visit.

Conclusions: Change in suicidal ideation is associated with changes in a number of psychological risk factors. Only interpersonal factors at admission were predictive of suicidal ideation at discharge and the trajectory of ideation during inpatient visits. Thus, interpersonal factors can provide an early warning sign to clinical staff as to which at-risk individuals require greater attention and may be an effective target for interventions.
Assessing Interpersonal and Mood Factors to Predict Trajectories of Suicidal Ideation within an Inpatient Setting

Suicide is a particularly difficult problem to target due to complexities involved in its prediction (Ryan, Nielssen, Paton, & Large, 2010). Clinical assessments of suicide risk are often limited by isolated measurements that miss short-term fluctuations. In addition, prior research has largely occurred in a cross-sectional manner, preventing a clear understanding of how suicidal ideation and risk factors change over time (Bryan & Rudd, 2016). For instance, the Interpersonal Theory of Suicide (ITS; Joiner, 2005) has attracted a significant amount of attention since its inception, providing a testable framework outlining why suicidal thoughts may develop. In particular, it suggests two factors increase the risk of desiring suicide; thwarted belongingness, when an individual’s desire to feel socially connected is not met; and perceived burdensomeness, when an individual feels they are a burden on friends, family, and society. Despite being defined as cognitive, dynamic constructs, only 7% of research evaluating the theory has occurred in a longitudinal manner (Chu et al., 2017). Preliminary research suggests that suicide ideation and its risk factors (e.g., interpersonal and mood factors) are prone to change over short-periods (i.e., hours, days), and consistent assessment may assist in enhancing prediction (Kashyap, Hooke, Page, 2015; Kyron, Hooke, & Page, 2018; Restifo, Kashyap, Hooke, & Page, 2015). However, there is little understanding of how changes occur over longer periods of time, such as days or weeks. The current study looks to assess suicidal ideation and interpersonal and mood risk factors at each quarter of inpatient visits to a psychiatric facility in order to: (i) understand how changes tend to occur over the course of inpatient visits; and (ii) identify how clinicians can be assisted through early prediction of patients with suicidal ideation resistant to therapy.

Initial dynamic short-term assessments provide insight into how suicidal ideation and both cognitive and mood risk factors tend to change over time. Two studies by Kleiman et al.
(2017, 2018) used an intensive monitoring system, prompting hospitalized patients to indicate their desire to suicide four times a day, as well as a range of cognitive (e.g., loneliness, burdensomeness, hopelessness) and affective risk factors (e.g., sadness, anxiousness). Not only was suicidal ideation prone to change over short-term periods, they were correlated with changes in risk factors. Likewise, Coppersmith et al. (2018) found day-to-day fluctuations in social support to be correlated with changes in suicidal ideation. More recently, Kyron and colleagues (2018) and Rogers and Joiner (2019) dynamically assessed the ability of interpersonal factors to predict suicidal ideation over longer periods (i.e., days) in clinical and non-clinical samples, respectively. Both studies found a reciprocal relationship between variables, with interpersonal factors and ideation driving each other over time. Therefore, repeated assessment provides insights into the temporal relationships between ideation and its associated cognitive and affective risk factors, and how they may be effective targets to reduce suicide risk.

Preliminary research assessing suicidal ideation and risk factors over longer periods (i.e., weeks) provides further insight into how changes occur over time. For instance, Keilp et al. (2018) tracked suicidal ideation in conjunction with symptoms of depression and anxiety on a weekly basis in a sample of outpatients receiving pharmacological treatments, finding decreases in ideation were associated with decreases in affective symptoms. Other research suggests interpersonal factors may have a stronger relationship with changes in ideation. In a study of youth receiving short-term psychological treatment, Hains, Janackovski, Frank, and Rankin (2018) assessed changes in suicidal ideation, hopelessness, depression and interpersonal factors at admission and discharge, finding perceived burdensomeness mediated the effects of depression and hopelessness on ideation. These studies suggest that tracking long-term treatment outcomes assists in understanding temporal dynamics between suicidal ideation and associated risk factors, and which factors are associated with positive change.
Early use of repeated assessments in research also shows benefits in providing novel methods to predict adverse outcomes over long-term periods. For instance, Restifo et al., (2015) tracked inpatients’ suicidal ideation over the first week of their stay at a psychiatric facility, and grouped patients based on similar patterns of responses over time. They found groups of patients with trajectories or longitudinal patterns of pervasively high ideation had the highest risk of self-injury throughout their stay. Extending this concept, Czyz and King (2015) monitored suicidal ideation of patients with a history of suicide attempts in the 3, 6 and 12 months following discharge from hospital, also finding those with pervasively high suicidal thoughts were most at-risk of self-injury. Further, of a series of risk factors measured at discharge, hopelessness was found to best predict suicidal ideation trajectories. Therefore, determining trajectories or patterns of change in suicide risk through dynamic measurement indicates patients trending toward negative outcomes, and simultaneously assessing risk factors may provide early warning signs. Continuous assessment may also be important for therapists seeking to determine patients who are not on track for positive clinical outcomes and may benefit from a change in strategy (Lambert, Hansen, & Finch, 2001; Newnham & Page, 2010).

Predicting a low prevalence behaviour such as suicide attempts is difficult, and a more fruitful endeavour may be to identify those at-risk (i.e., with pervasive suicidal ideation) and provide them with adaptive coping mechanisms during inpatient visits. To our knowledge, no study has assessed the manner in which suicidal ideation and risk factors tend to change over the course of psychotherapy within an inpatient setting. Further, the extent to which interpersonal and mood related factors can predict adverse outcomes is unclear. The current study looks to repeatedly measure suicidal ideation, feelings of hopelessness, interpersonal factors (thwarted belongingness, perceived burdensomeness), and mood-related factors (depressed and anxious mood) on a daily basis to identify trajectories or distinct patterns of
change over time. Rather than conduct short-term assessments (i.e., day-to-day) of suicide risk to determine causality, the current study looks to examine trends and enhance prediction. Several groups of patients will be identified based on similar patterns of change in suicidal thoughts over their stays at a psychiatric facility as per Restifo et al. (2015), and the associated changes in risk factors will be assessed. We expect changes between suicidal ideation and risk factors to co-occur as per Kleiman et al. (2017). Specifically, we expect groups of patients with higher suicidal ideation to report higher levels of interpersonal adversity, depression, anxiety, and hopelessness, and changes in factors to covary over time. In addition, the current study looks to explore which risk factors effectively predict changes in ideation in several ways:

- Whether interpersonal factors and hopelessness are more effective predictors than mood related factors of current and future ideation;
- The extent to which trajectories of change in suicidal ideation can be predicted by risk factors at admission;
- Whether the development of suicidal thoughts during an inpatient stay can be predicted for patients who enter the hospital with no suicidal thoughts.

**Method**

**Participants and Procedure**

Patients at an Australian private inpatient psychiatric facility were invited daily to answer a series of questions regarding suicidal thoughts, interpersonal circumstances, anxious and depressed mood, and feelings of hopelessness ($N = 1076$). Questionnaires were computer-delivered, via electronic tablet devices provided by the hospital for use in each inpatient’s room throughout their stay. All questionnaires were available throughout each day for patients to complete once per day. They took only a few minutes to complete, with no set
time the questionnaires had to be completed during that day. Patients were not prompted to complete questionnaires, and rather completed them voluntarily at their own discretion. Daily response rates to questionnaires averaged 73%. Around half of patients who completed questionnaires did so before noon, with the majority completing them before 5pm. Further, most patients were fairly consistent with when they completed questionnaire each day, completing questionnaires on consecutive mornings or afternoons/evenings. All procedures were approved by the University’s Human Research Ethics Committee.

The majority of patients were female (73%), with the average age being 39.21 years ($SD = 16.89$, range: 13-93). In addition, the majority were married (33%) or not in a relationship (51%), and high in socio-economic status (76%). Patients were referred to the facility by a physician, and could receive a variety of treatments throughout their stay, including cognitive, dialectical, and interpersonal therapies. The average length of stay was 16 days ($SD = 11.85$). The sample consisted of patients with a principal diagnosis of affective disorders (51.4%), anxiety/stress disorders (23.1%), substance use disorders (14%), personality disorders (6.8%), and other disorders including schizophrenia (4.7%).

**Measures**

Questionnaire items were used to measure suicidal ideation, and also interpersonal, mood and hopelessness factors. Each item was adapted to include temporal elements relevant to their daily measurement (i.e., In the past 24 hours, I have…).

**Thwarted Belongingness.** Belongingness was measured by summing two items, “In the past 24 hours, I have felt that people care for me” and “In the past 24 hours, I have felt close to others”. Both items aimed to capture sub-constructs of belongingness (i.e., perceived support and loneliness, respectively). Responses were reverse scored so that higher scores indicated a greater sense of thwarted belongingness. Both items had high internal consistency
Predicting trajectories of suicidal ideation, Study 4

(α = 0.81). Items were adapted from the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner, 2012), and were measured on a 7-point Likert scale (1 = Not true for me at all, 7 = Very True for me). These items were selected based on their strong factor loadings in clinical samples (Van Orden et al., 2012).

**Perceived Burdensomeness.** Three items in total were used to measure perceived burdensomeness. Two of these items aimed to capture sub-constructs of burdensomeness advocated in the Interpersonal Theory of Suicide (i.e., self-hate and liability; Joiner, 2005). Worthlessness attempted to measure negative feelings about the self (i.e., self-hate), “In the past 24 hours, I have felt that I am worthless”. This item was taken from a psychometrically validated five-item daily index measuring the distress of inpatients (DI-5; Dyer, Hooke, & Page, 2015) and was measured on a 6-point Likert scale (0 = At no time, 5 = All the time). Liability was measured through a single-item, “In the past 24 hours, I have felt like my death would be a relief to people”. A third item was used to measure global feelings of burden, and enhance construct validity of other burden items, “In the past 24 hours, I have felt like a burden”. With the exception of worthlessness, these items were taken from INQ measure and were assessed on a 7-point Likert scale (1 = Not true for me at all, 7 = Very True for me). Items were selected based on their strong factor loadings in clinical samples presented in Van Orden et al. (2012).

A burdensomeness composite score was created by summing the standardized scores, with higher scores representing higher levels of perceived burden. All three factors had acceptable internal consistency in the present sample (α = 0.76). A principal components analysis was conducted on both perceived burdensomeness and thwarted belongingness items to ensure all interpersonal items loaded onto expected factors (i.e., thwarted belongingness
and perceived burdensomeness; Appendix 1). The results indicated clear loadings on the intended factor for each item.

**Depressed and Anxious Mood.** Single items were used to measure depressed mood (“In the past 24 hours, I have felt depressed”) and anxious mood (“In the past 24 hours, I have felt anxious”). These items were extracted from the DI-5 (Dyer et al., 2015) and were measured on a 6-point Likert scale (0 = At no time, 5 = All the time). Individual items were used to minimize responder burden, rather than assess a series of symptoms. Comparisons with more comprehensive measures indicate these items may perform sufficiently well to identify the presence of mental health issues. The depression and anxiety items as measured on the DI-5 were strongly correlated with respective depression ($r = 0.74, p < 0.001$) and anxiety ($r = 0.61, p < 0.001$) sub-scores on the psychometrically sound Depression Anxiety Stress Scale in the current sample (DASS-21; Lovibond and Lovibond, 1995b).

**Suicidal Ideation.** Ideation was measured through a single item, “In the past 24 hours, I have had thoughts about killing myself”. This item was also taken from the DI-5 measure (Dyer et al., 2015), and was measured on a 6-point Likert scale (0 = At no time, 5 = All the time). The wording of the item was in line with existing measures of suicidal ideation (Beck, Steer, & Carbin, 1988). In addition, Dyer et al. (2015) suggest the wording of the item was designed to be more sensitive to active suicidal ideation. That is, it attempted to capture specific and riskier thoughts of lethal self-harm (i.e., “I want to kill myself”), rather than passive suicidal ideation (i.e., “I wish I was dead”) (Nock and Kessler, 2006).

**Hopelessness.** The hopelessness item “In the past 24 hours, I have felt there is no way I can change many of the important things in my life” was derived from the Perceived Mastery Scale (Pearlin, Menaghan, Lieberman, & Mullan, 1981) and measured on a 7-point Likert Scale (1 = Not true for me at all, 7 = Very True for me).
Analysis

Assessing Progression of Suicidal Ideation and Risk Factors over the Course of Treatment. As all patients had varied lengths of stays at the hospital, a score on a particular day after admission had different meanings. Therefore, following Page, Cunningham, & Hooke (2016), we re-coded data available for the day of assessment according to the quartile of the admission that the data point was obtained from. That is, the first available response to any questionnaire items during the first, second, third, and fourth quarters of their stay were selected for analyses over time. For example, if a patient had a 12-day length of stay and completed questionnaires on days two and three, the score for the first quartile of their admission would be the patient’s day two score. Latent-Class Growth Analysis (LCGA) was performed using Mplus software to identify patterns in responses on the suicidal ideation item over six time periods; admission, four quartiles and discharge (Version 7; Muthen & Muthen 1998-2016). Latent class growth analysis determines unobserved heterogeneity of responses in a population, and attempts to group people similar in their responses (Nylund, Asparouhov, & Muthén, 2007). This analysis was performed for the 491 patients who had provided responses to the suicidal ideation questionnaire item at all six time points. Little’s (1988) test to determine randomness of missing data was performed on ideation and risk factors, and indicated data was missing completely at random.

Using Risk Factors at Admission to Predict Ideation at Discharge. As we aimed to assess the relationship between suicidal ideation and its concurrent risk factors, and also whether suicidal ideation at discharge could be predicted at admission, two hierarchical linear regressions were performed using IBM SPSS (Version 23). In the first regression, interpersonal factors, hopelessness, depression, and anxiety were used to predict suicidal ideation at admission, while the second attempted to predict ideation at discharge. This analysis was performed for the 491 patients included in the latent class analysis.
Predicting the Trajectory of Suicidal Ideation Using Risk Factors Measured at Admission. Once the patients had been grouped (based on the trajectories of their suicidal thoughts), a logistic regression was used to determine which risk factors, measured at admission, were capable of predicting this group membership.

Predicting the Development of Suicidal Thoughts during Treatment. Patients who reported no suicidal thoughts at admission were identified. They were then separated into two groups based on whether they developed suicidal thoughts throughout their stay, or reported no suicidal thoughts for the duration. A logistic regression was performed with risk factors at admission to predict group membership. Patients who failed to respond to questionnaire items on all days during their stay were excluded from the analysis. Thus, quartile analysis was used for previous analyses, while assessment of daily responses were used to identify the development of suicidal thoughts.

Results and Discussion
Analysis of Predictor Variables and Suicidal Ideation

There were strong correlations between perceived burdensomeness, hopelessness, and depressed mood (see Table 1). Consistent with Joiner et al. (2008), which found a moderate-strong correlation between both factors \( r = 0.58 \), there was a weak-moderate correlation between perceived burdensomeness and thwarted belongingness in the current study \( r = 0.47 \), indicating they are related, yet unique constructs. Skewness and kurtosis of each predictor variable at admission was within the guidelines outlined by George & Mallery (2010), indicating normality of the data was acceptable. All variance inflation coefficients were below 2.5, and tolerance was above 0.4, indicating levels of multicollinearity were acceptable compared to proposed guidelines (O’Brien, 2007).
Table 4

Pearson correlations between ideation and predictors at admission.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perceived Burdensomeness</td>
<td>.67**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Thwarted Belongingness</td>
<td>.38**</td>
<td>.47**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Hopelessness</td>
<td>.48**</td>
<td>.65**</td>
<td>.29**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Depression</td>
<td>.52**</td>
<td>.64**</td>
<td>.33**</td>
<td>.52**</td>
<td>-</td>
</tr>
<tr>
<td>5. Anxiety</td>
<td>.30**</td>
<td>.38**</td>
<td>.21**</td>
<td>.30**</td>
<td>.53**</td>
</tr>
</tbody>
</table>

Note. ** p < 0.001.

Assessing Progression of Suicidal Ideation and Risk Factors over the Course of Treatment

**Extraction of Latent Classes.** A series of LCGA were performed to identify the model that provided the best fit of the data. Beginning with a single latent class model, additional latent classes were added into the LCGA until the optimal number of classes was found. Using the Parametric Bootstrapped Likelihood Ratio Test, adding an extra group significantly improved the model until the fourth class (one class vs. two classes: \( p < 0.001 \); two classes vs. three classes: \( p < 0.001 \); three classes vs. four classes: \( p = 0.75 \)). The latent class model revealed three distinct suicidal ideation trajectories during inpatient visits: low (\( N = 344; 70\% \)) and high (\( N = 67; 14\% \)) suicidal thoughts for the duration, and an improvement group (\( N = 80; 16\% \)) which transitioned from high to low suicidal thoughts (Figure 1).

**Changes in risk factors for each group over treatment.** With groups defined based on their suicidal ideation trajectories, the associated movements in risk factors over inpatients’ stays were plotted (Figure 1). In total, there were six time points of interest;
admission, each quarter of patients’ stays, and discharge. There was a concurrent decrease in suicidal ideation and risk factors for the improvement condition. On the other hand, low or high suicidal ideation for the duration of treatment was associated with relatively stable interpersonal factors, although some changes were expected given the effects of treatment.
Figure 13. Changes over each quarter of patients’ stay at the clinic, from admission to discharge, in ideation (Panel A), thwarted belongingness (Panel B), perceived burdensomeness (Panel C), depression (Panel D), anxiety (Panel E), and hopelessness (Panel F). Each line represents the trajectories of suicidal thoughts of groups determined by LCGA.

Note: A = Admission, Q = Quartile, D = Discharge.
Associations between Risk Factors and Ideation at Admission

Of the 491 patients routinely completing suicidal ideation questionnaire items, 118 (24%) did not answer interpersonal, mood or hopelessness items at admission and were excluded from subsequent analyses. To assess the association between variables, a hierarchical linear regression performed with mood related factors entered at Step 1 and interpersonal factors entered at Step 2 (Table 2). At Step 1, depression, but not anxiety, was significantly associated with suicidal ideation at admission, with the model accounting for 29.3% of variance in the dependent variable, $F(2, 370) = 78.03, p < 0.001$. At Step 2, interpersonal factors were found to account for an additional 22.4% of variance in suicidal ideation, $F(5, 367) = 79.77, p < 0.001$, with depression, thwarted belongingness and perceived burdensomeness being significant predictors. Therefore, both interpersonal and mood factors were associated with current ideation.

Predicting Ideation at Discharge

The same two-step hierarchical regression was run to predict suicidal ideation at discharge, with mood and interpersonal factors at admission as predictors (Table 2). At Step 1, depression and anxiety were significant predictors of ideation at discharge, with the model accounting for 7.8% of variance, $F(2, 370) = 15.57, p < 0.001$. At Step 2, the inclusion of interpersonal factors accounted for an additional 11% of variance in the dependent variable, $F(5, 367) = 17.18, p < 0.001$, with only thwarted belongingness and perceived burdensomeness being significant predictors. Therefore, interpersonal factors appeared to have a stronger relationship with future levels of ideation than mood related factors.
Table 5

Hierarchical linear regressions predicting suicidal ideation at admission (left) and discharge (right) reported by patients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE (B)</th>
<th>(\beta)</th>
<th>t</th>
<th>Sig. (p)</th>
<th>B</th>
<th>SE (B)</th>
<th>(\beta)</th>
<th>t</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideation (Admission)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed Mood</td>
<td>.99</td>
<td>.10</td>
<td>.53</td>
<td>10.2</td>
<td>.00</td>
<td>.26</td>
<td>.08</td>
<td>.19</td>
<td>3.24</td>
<td>.00</td>
</tr>
<tr>
<td>Anxious Mood</td>
<td>.04</td>
<td>.10</td>
<td>.02</td>
<td>.41</td>
<td>.68</td>
<td>.16</td>
<td>.08</td>
<td>.12</td>
<td>2.06</td>
<td>.04</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed Mood</td>
<td>.37</td>
<td>.10</td>
<td>.20</td>
<td>3.88</td>
<td>.00</td>
<td>-.02</td>
<td>.09</td>
<td>-.02</td>
<td>.24</td>
<td>.81</td>
</tr>
<tr>
<td>Anxious Mood</td>
<td>-.08</td>
<td>.08</td>
<td>-.04</td>
<td>-.97</td>
<td>.33</td>
<td>.10</td>
<td>.07</td>
<td>.08</td>
<td>1.38</td>
<td>.17</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>.02</td>
<td>.09</td>
<td>.01</td>
<td>.17</td>
<td>.86</td>
<td>-.02</td>
<td>.08</td>
<td>-.02</td>
<td>.28</td>
<td>.78</td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>.16</td>
<td>.07</td>
<td>.09</td>
<td>2.15</td>
<td>.03</td>
<td>.22</td>
<td>.07</td>
<td>.17</td>
<td>3.17</td>
<td>.00</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>1.01</td>
<td>.10</td>
<td>.55</td>
<td>9.80</td>
<td>.00</td>
<td>.41</td>
<td>.07</td>
<td>.31</td>
<td>4.30</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note. B = Beta, SE = Standard Error, \(\beta\) = Standardized Beta. Significant predictors are boldfaced.

Predicting the Trajectory of Suicidal Ideation at Admission

Given patients experiencing stable and intensive suicidal thoughts are of particular concern to clinicians when trying to manage suicidal patients, a logistic regression was run to determine whether the trajectories of the stable high ideation group could be differentiated from the improvement group at admission (Tables 3 & 4). A model with mood related factors (i.e., anxious and depressed mood) and interpersonal factors at admission was shown to have acceptable fit [Hosmer and Lemeshow test; \(\chi^2 (8) = 12.27; p = .14\)], with 12.9% of variation in the dependant variable explained. Thwarted belongingness was a significant predictor of suicide trajectory; with a one unit increase associated with a 13% increased chance of experiencing stable high suicidal thoughts for the duration of visits to the facility. Thus, while the model generally performed well with the inclusion of mood related factors, interpersonal factors appeared to be stronger predictors.
Table 6

Results of a binomial regression assessing the degree to which thwarted belongingness, perceived burdensomeness, hopelessness, depressed mood, and/or anxious mood predicted stable high or improvement suicidal ideation trajectories defined by LCGA.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>W</th>
<th>OR</th>
<th>CI (95%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>-.37</td>
<td>.30</td>
<td>1.55</td>
<td>.69</td>
<td>.38-1.24</td>
<td>.21</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.17</td>
<td>.18</td>
<td>.92</td>
<td>1.19</td>
<td>.08-1.70</td>
<td>.34</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>-.14</td>
<td>.18</td>
<td>.57</td>
<td>.87</td>
<td>.62-1.24</td>
<td>.45</td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>.12</td>
<td>.06</td>
<td>4.06</td>
<td>1.13</td>
<td>1.00-1.27</td>
<td>.04</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>.17</td>
<td>.10</td>
<td>3.03</td>
<td>1.18</td>
<td>.98-1.42</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note. B = Beta; SE = Standard Error; W = Wald statistic; OR = odds ratio; CI = confidence interval.

Table 7

Classification result of improvement and stable high groups using mood related factors, hopelessness and interpersonal factors as predictors.

<table>
<thead>
<tr>
<th>Predicted Groups</th>
<th>Improvement</th>
<th>Stable High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement</td>
<td>47 (73.4%)</td>
<td>17 (26.6%)</td>
</tr>
<tr>
<td>Stable High</td>
<td>21 (38.9%)</td>
<td>33 (61.1%)</td>
</tr>
</tbody>
</table>

Note: Percentage of cases accurately predicted = 67.8%.

Predicting the Development of Suicidal Thoughts during Inpatient Visits

Of the patients who entered the clinic with no suicidal thoughts, there was evidence of clinical deterioration during their stay at the facility. That is, some patients developed suicidal thoughts (N = 88), while others continued to report no suicidal thoughts throughout their stay.
Such patients, despite some indication of developing suicidal thoughts, would still be identified as having pervasively low suicidal thoughts in latent growth analysis. To determine whether risk factors at admission could predict the development of suicidal thoughts, a logistic regression was performed ($N = 81$). Model fit was acceptable [Hosmer and Lemeshow test; $\chi^2 (8) = 2.98; p = .94$], with the model accounting for 17.6% of variation in the dependant variable. Results indicated feelings of burdensomeness at the beginning of therapy were a significant predictor, with the model predicting 64% of patients with suicidal thoughts at admission (see Table 5 and 6). Specifically, a one unit increase in burdensomeness was associated with an 18% increased chance of developing suicidal thoughts. Therefore, burden at admission indicated a propensity for developing suicidal thoughts during inpatient visits.

**Table 8**

*Logistic regression predicting the development of suicidal thoughts during inpatients’ stay.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>$W$</th>
<th>OR</th>
<th>CI (95%)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>-.06</td>
<td>.15</td>
<td>.15</td>
<td>.79</td>
<td>0.70–1.27</td>
<td>.16</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-.23</td>
<td>.17</td>
<td>1.99</td>
<td>.40</td>
<td>0.57–1.10</td>
<td>.33</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>.16</td>
<td>.10</td>
<td>2.58</td>
<td>1.17</td>
<td>.97-1.43</td>
<td>.11</td>
</tr>
<tr>
<td>Thwarted Belongingness</td>
<td>.02</td>
<td>.06</td>
<td>.16</td>
<td>1.02</td>
<td>.91-1.15</td>
<td>.69</td>
</tr>
<tr>
<td>Perceived Burdensomeness</td>
<td>.16</td>
<td>.05</td>
<td>9.48</td>
<td>1.18</td>
<td>1.07-1.34</td>
<td><strong>.00</strong></td>
</tr>
</tbody>
</table>

*Note.* B = Beta; SE = Standard Error; $W$ = Wald statistic; OR = Odds Ratio; CI = Confidence Interval.
Table 9

Classification results of ideation and no ideation groups using mood related factors, hopelessness and interpersonal factors as predictors.

<table>
<thead>
<tr>
<th>Predicted Groups</th>
<th>No Ideation</th>
<th>Developing Ideation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Ideation</td>
<td>62 (70.5%)</td>
<td>26 (29.5%)</td>
</tr>
<tr>
<td>Developing Ideation</td>
<td>34 (42.0%)</td>
<td>47 (58.0%)</td>
</tr>
</tbody>
</table>

Note: Percentage of cases accurately predicted = 64.2%.

General Discussion

The current study looked to track changes in suicidal ideation over the course of inpatients’ psychiatric admissions. Results support a growing amount of research finding suicidal ideation to be prone to change over relatively short time periods. In addition to Kleiman et al. (2017), who found suicidal ideation and a number of risk factors to vary of very short periods of time (i.e., hours), the current study extends this research by showing how suicidal ideation changes daily over the course of inpatient visits. Specifically, patients either had relatively stable high or low suicidal thoughts for the duration of their visit or showed a marked improvement over its course. Not only is this consistent with the notion that there are therapeutic interventions that occur during a psychiatric hospitalization that can minimize suicide risk factors, it supports the need to track progress during inpatient visits to assist identification of patients in need of assistance.

Suicidal ideation trajectories were accompanied by comparable changes in cognitive (i.e., thwarted belongingness, perceived burdensomeness, and hopelessness) and affective (i.e., depressive and anxious mood) risk factors of suicide. Specifically, the group of patients
who showed the greatest improvements in ideation over their stay exhibited the largest improvement in all risk factors. This is consistent with Keilp et al. (2018), who identified depression to change concurrently with suicidal ideation over the course of therapy. While such findings do not look to determine causality of risk factors, they rather describe the manner in which positive outcomes develop within an inpatient setting. A concurrent change in suicidal ideation and interpersonal factors is consistent with recent research identifying interpersonal factors to be a driving factor behind daily changes in suicidal ideation (Kyron et al., 2018). As such, they may be an effective target for clinical interventions concerned with suicidal thoughts. Future research should further look to explore which risk factors have the strongest association with short-term changes in suicidal ideation.

To determine their clinical utility, the effectiveness of cognitive and affective risk factors to predict suicidal ideation was compared. At admission, perceived burdensomeness, and thwarted belongingness were significant predictors of current suicidal ideation. In addition, both were also significant predictors of suicidal ideation at discharge. Therefore, individuals who reported higher levels of interpersonal adversity were more likely to indicate current and future ideation, supporting findings from prior research (Joiner et al., 2009; Christensen et al. 2013; Monteith, Menefee, Pettit, Leopoulos, & Vincent, 2013; Barzilay et al., 2015). Thus, interpersonal factors may assist with prediction of suicidal ideation, and also be effective targets for therapeutic interventions.

Mood related factors had a different relationship with suicidal ideation. A depressed mood was associated with current feelings of ideation, even when taking into account hopelessness and interpersonal factors. The finding that it was predictive above hopelessness supports findings from Reinecke et al. (2001) and Nock and Kazdin (2002), while contrasting with findings from Beck et al. (1993). Anxious mood was not significantly predictive of suicidal ideation, indicating it may not be as strongly associated with suicidal thoughts as
identified in prior research (Apter et al., 1993; Reineck et al., 2001). The finding that depressed mood was not predictive of suicidal thoughts at discharge may indicate it is more strongly associated with current suicidal thoughts than a driving force behind its development over time. Suicide risk assessments attempting to identify early warning signs for higher risk patients may benefit from assessment of interpersonal, rather than only mood-related factors.

Another aspect of the current study was to determine which cognitive or affective factors differentiated the trajectories of suicidal ideation over the course of therapy. Results suggested that thwarted belongingness at admission was the only variable that predicted the different patterns of changes in suicidal thoughts during treatment. While several studies have identified perceived support (Reifman & Windle, 1995; Mazza & Reynolds, 1998) and loneliness (King & Merchant, 2008) as indicators for future ideation, to our knowledge the current study is the first to indicate that interpersonal circumstances at the beginning of treatment may drive change. On top of enhancing the prediction of at-risk patients, it suggests positive changes in suicidal ideation should occur within the context of a supportive interpersonal environment. Future research could build on the current findings and determine the extent to which feelings of belonging and burden mediate therapeutic improvement.

The final aim of the current study was to assess whether the prediction of the development of suicidal thoughts could be enhanced by measuring risk factors at admission. Results suggest perceived burdensomeness was a significant predictor above mood related factors, thwarted belongingness and hopelessness. Therefore, patients who entered the clinic reporting no suicidal thoughts, but higher perceived burdensomeness, were more likely to develop suicidal thoughts throughout their stay. This may point to the effects of a fragile interpersonal environment, in which a patient has a greater inclination to perceive themselves as letting down those in their lives. That perceived burdensomeness has been shown in the current study to be variable indicates it may be an effective therapeutic target to minimize the
risk of developing suicidal thoughts throughout treatment. Thus, patients otherwise identified as being at a similar risk of suicide when assessed only at admission may be at different risks throughout their stay, which speaks to the benefits of consistent measurement and identification of interpersonal difficulties.

**Theoretical and Clinical Implications**

The interpersonal theory of suicide argues that perceptions of burdensomeness and thwarted belongingness are driving forces behind the development of suicidal thoughts. The present study supports this position, with thwarted belongingness and perceived burdensomeness predicting suicidal ideation cross-sectionally and longitudinally. Importantly, interpersonal factors were related to suicidal ideation beyond depression and anxiety, which indicates that cognitive, as well as emotional factors are implicated in the development of suicidal thoughts. That is, the effects of interpersonal factors on suicide cannot simply be explained by their effects on mood (Joiner et al., 2009). Further, the interpersonal theory defines thwarted belongingness and perceived burdensomeness as related, yet unique constructs. As such, they have the propensity to influence each other over time. Correlational analysis in the current study supported this position by identifying a medium correlation between variables. The extent to which these factors drive each other over time should be examined in future research to prioritize which is targeted during therapeutic interventions.

Measuring perceived burdensomeness and thwarted belongingness provides clinicians with information regarding specific cognitive mechanisms which can be addressed directly, and therefore be more efficient clinical targets. Conversely, it may be more difficult to determine underlying causes only receiving information regarding feelings of depression and anxiety, although symptoms may be related to interpersonal circumstances. While this may help clinicians narrow their focus when addressing patients’ suicidal thoughts, perceived
burdensomeness and thwarted belongingness still remain multi-faceted constructs, and further research is needed to examine which aspects are more malleable during therapy. Several psychotherapies may effectively target interpersonal deficits, such as cognitive behaviour therapy (Beck, 1979), dialectic behaviour therapy (Linehan, 1993) and interpersonal psychotherapy (Klerman, Weissman, Rounsaville, & Chevron, 1984). Techniques which aim to restructure cognitions related to perceived burdensomeness and thwarted belongingness may effectively reduce suicidal ideation, as well as assisting patients with overcoming interpersonal difficulties (see Joiner, Van Orden, Witte, & Rudd, 2009). Therefore, the overall efficiency of therapeutic interventions for suicide may be enhanced by addressing interpersonal factors.

Another clinical implication is that suicidal ideation at discharge is in part influenced by interpersonal circumstances when entering the clinic. Thus, measuring interpersonal factors may assist in differentiating which patients are prone to pervasive suicidal thoughts during inpatient visits, or may develop them during their stay, and prioritize the suicide related treatment of such patients. Further, a supportive therapeutic environment, as well as familial support from the beginning to the end of therapy, may be important for facilitating improvement in suicidal thoughts and other risk. It is important to note that prediction in the current study was imperfect, and it still remains imperative to assess suicidal ideation and risk factors over the course of therapy, which can fluctuate significantly within hours and days (Kleiman et al., 2017; Kyron et al., 2018). Although the optimal temporal resolution of measurement remains to be demonstrated, measuring interpersonal factors early on during therapy may assist in providing early warning signs of adverse outcomes within an inpatient setting.

Limitations and Directions for Future Studies
A limitation of the current study was the larger amount of individuals diagnosed with mood related disorders (i.e., anxiety, depression) than personality or substance use disorders. However, these proportions undoubtedly reflect the higher proportion of such disorders in inpatient settings and also the general population. Nonetheless, future studies could look to determine whether particular diagnoses are associated with different trajectories of suicidal ideation over time, and how prediction may differ. Future research should also look to determine the effectiveness of particular treatments in reducing interpersonal factors and suicidal ideation (i.e. interpersonal therapy and cognitive behavioural therapy).

Another limitation is the use of single items to measure interpersonal and mood related factors. Given the complexity involved in the development of suicidal thoughts, variance may have been unaccounted for by not using more comprehensive measures. However, single items allowed a wide variety of factors to be assessed daily. Therefore, more information could be gathered over time, rather than at isolated points throughout treatment. Further, the items included in the current study were effective predictors of clinical improvement or deterioration in suicidal ideation, and are consistent with the need to use sharp and refined risk assessment tools in a clinical setting. Future studies could look to implement more comprehensive measures to assess interpersonal factors and its sub-constructs (i.e., perceived support, self-hate), and assess whether prediction is enhanced.

The use of short-term recall in each questionnaire item in the current study (i.e., in the past 24 hours) may limit specify of measurement of suicide risk at the time of measurement. Arguably, measuring current suicide levels of suicidal ideation (i.e., “How intense is your desire to kill yourself right now?”, as per Kleiman et al., 2017) may understate suicide risk if assessed on a daily, rather than hourly basis. As such, asking patients to recall whether they have thought about suicide and the frequency of its occurrence over the past 24 hours helps classify suicide risk without burdening patients with obtrusive and incessant assessment.
Future research should identify whether a short-term recall method used in the current study is biased toward over or under representation of suicide risk when compared with more frequent measurement used in Kleiman et al. (2017).

Another potential limitation for the current study is the exclusion of patients that completed insufficient questionnaires over their stay. However, Myrtveit, Stensrud, and Olsson (2001) suggest this may be the most appropriate method to deal with missing data within a large dataset, and also when data is missing at random. Further, with evidence suggesting suicidal ideation and risk factors are prone to changes over short periods of time, an imputed score for a time point may be inaccurate. This could result in incorrect identification of suicide risk over time and affect prediction. Future research should look to replicate findings from the current study using different samples.

The current study provides preliminary evidence that interpersonal factors predict adverse outcomes within inpatient psychiatric settings. However, it is unclear as to whether this is the case with other non-clinical populations, which limits the ability to generalize the current findings. To date, no study has assessed this in a manner consistent with the current study, and is an important endeavour for future research.

Suicidal ideation is a particularly complex phenomenon, whereby multiple risk factors can influence a desire to suicide. While the current study aimed to compare how a number of proximal risk factors change over time and their effectiveness in predicting suicidal ideation, prior research has indicated a multitude of other risk factors. For instance, research emphasizes the balance between a wish to live and die in the development of suicidal thoughts (Kovacs & Beck, 1977; Brown, Steer, Henriches, & Beck, 2005), with a recent study by Bryan, Rudd, Peterson, Young-McCaughan, and Wertenberger (2016) determining these states are fluid and prone to change over time. In addition, the recognition of distal risk factors may also aid in the prediction of outcomes, such as previous suicide ideation and
attempts (Brown, Beck, Steer, & Grisham, 2000), as well as personality variables linked to suicidal behaviours (e.g. neuroticism; Brezo, Paris, & Turecki, 2006). As such, there are various additional factors which affect suicidal ideation, and future research should look to assess their effects in a dynamic manner.

Conclusion

The current study tracked suicidal ideation and a number of risk factors over the course of inpatients’ stay at a psychiatric facility. In general, changes in suicidal ideation were associated with concurrent changes in most risk factors. Interpersonal factors at admission proved most useful in predicting suicidal ideation at discharge, the trajectory of ideation across the course of therapy and development of suicidal thoughts. This speaks to the strong relationship between interpersonal factors and suicidal ideation, and indicates they are an effective target for therapeutic intervention. While some have noted that suicide cannot be predicted, the current research provides evidence as to the benefits of dynamically researching suicidal ideation and risk factors to enhance prediction and allow for early intervention of high-risk patients. Future research should aim to expand on the current trend toward short-term repeated measurement of suicide to determine complex relationships between suicidal ideation and associated risk factors.
Appendix 1

*Pattern matrix from a principal components analysis of items representing burdensomeness and belongingness using a direct oblimin rotation.*

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Burdensomeness)</td>
<td>(Belongingness)</td>
</tr>
<tr>
<td>“I have felt close to others”</td>
<td>-0.05</td>
<td><strong>0.88</strong></td>
</tr>
<tr>
<td>“I have felt supported by others”</td>
<td>0.02</td>
<td><strong>0.93</strong></td>
</tr>
<tr>
<td>“I have felt that I am worthless”</td>
<td><strong>0.84</strong></td>
<td>-0.06</td>
</tr>
<tr>
<td>“I have felt like a burden”</td>
<td><strong>0.95</strong></td>
<td>0.14</td>
</tr>
<tr>
<td>“I have felt like my death would be a relief to people”</td>
<td><strong>0.74</strong></td>
<td>-0.18</td>
</tr>
</tbody>
</table>

Eigenvalue

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Variance Explained</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.87</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>57.47</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.54</td>
</tr>
</tbody>
</table>
To further understanding of suicide, research needs to identify how changes in suicide risk occur over short periods of time and which factors may drive change. The current dissertation looked to overcome the shortage of studies assessing dynamic factors by determining how interpersonal adversity may affect suicide risk. In addition, it looked to determine how assessments of interpersonal factors can be used to predict adverse clinical outcomes, such as persistent suicidal thoughts and non-suicidal self-injury. Studies were first conducted in an experimental setting to allow for a controlled assessment of interpersonal changes. Subsequent studies were conducted in a naturalistic setting to determine whether similar changes in interpersonal factors affected suicidal thoughts and self-injury.

**A Controlled Dynamic Assessment of the Interpersonal Theory of Suicide**

Although interpersonal factors are consistently associated with suicidal ideation in field studies, determining causality is difficult due to a shortage of experimental research. This is largely due to the inherent limitations in assessing a fatal behaviour such as suicide. However, Collins et al. (2016) proposed that focusing on early volitional stages of suicide, such as a withdrawing or escaping in the face of adversity, may allow for informative experimental assessments of suicide theories. In their study assessing the interpersonal psychological theory of suicidal behaviour, the authors manipulated high or low thwarted belongingness and perceived burdensomeness by providing varied interpersonal feedback. Higher interpersonal adversity resulted in a greater desire to quit or escape from the task, thus indirectly supporting key aspects of the interpersonal psychological theory of suicidal behaviour (Joiner, 2005; Van Orden et al., 2010).
Study 1 and Study 2 built on Collins et al. (2016) by manipulating changes in interpersonal feedback, with increases in interpersonal adversity resulting in a greater desire to escape. That is, not only does negative feedback result in a greater desire to escape, a positive change can be effective in reducing the desire to escape. In addition, Study 2 found that manipulating improvements in only belonging was sufficient in counteracting the effects of negative performance on the task (i.e., aspects of perceived burdensomeness). These findings support the fluid vulnerability theory of suicide which suggests that an increase in risk factors may trigger episodes of heightened suicidality, while a removal of these factors acts to reduce risk. In addition, it supports the interpersonal psychological theory of suicidal behaviour which suggests that current suicidal desire is relative to levels of perceived burdensomeness and thwarted belongingness. Despite the promising findings of this study, it is important to ensure they reflect findings in naturalistic setting assessing suicidal thoughts and behaviours.

The Fluid Nature of Suicidal Ideation and Interpersonal Factors in a Clinical Population

Although short-term intensive studies of suicidal ideation and risk factors provide important information about which factors are proximally related to changes over time, few studies have been conducted in such a manner. In a high-risk clinical population of adults who have a history of suicide, Kleiman et al. (2017) measured levels of suicidal ideation, hopelessness, loneliness and burdensomeness in a prospective manner, finding they varied over a matter of hours. Thus, even amongst high-risk clinical populations, there were significant fluctuations in levels of suicidality. In addition, changes in hopelessness, thwarted belongingness and perceived burdensomeness were correlated with changes in suicidal ideation, which suggests clinical utility in predicting short-term variations in suicide risk. Monitoring patients continuously over short-periods of time may provide a more complete
picture of factors that may drive short-term high risk periods of suicide, and aid in prediction over time.

Building on Kleiman et al. (2017), Study 3 looked to identify the variability of inpatients’ suicidal ideation and interpersonal risk factors on a day-to-day basis within a psychiatric facility, Perth Clinic. Consistent with their findings, suicidal ideation and interpersonal factors were prone to changes on each day. These changes were evident for patients who were identified as having high or low risk at the initial assessment, indicating there tends to be both positive and negative changes in suicide risk from day-to-day. Isolated measurement may therefore inaccurately identify a patient’s suicide risk in many instances. This points to the benefit of continuous assessments in accurately identifying patients’ current suicide risk, and helps in the allocation of often scant clinical resources to patients showing marked deterioration. In addition, Study 3 also found perceived burdensomeness and thwarted belongingness to be associated with suicidal ideation on the next day. This association occurred when controlling for prior suicidal ideation, which is frequently cited as a strong predictor of future ideation. These findings suggest consistently monitoring interpersonal factors may provide warnings signs for short-term changes in suicide risk. In addition, findings support both the interpersonal theory and fluid vulnerability theory of suicide, by suggesting an increase in interpersonal adversity is associated with an increase in suicide risk.

While theories of suicide suggest how risk factors are associated with and may cause suicidal ideation, no studies have assessed how thinking about suicide may inversely affect risk factors. The findings from Study 3 found there to be a reciprocal relationship between both perceived burdensomeness and thwarted belongingness, and suicidal thoughts. This is a novel concept which suggests that over time thinking about suicide may exacerbate interpersonal difficulties and cause a cyclical relationship. This downward spiral may cause
marked deterioration within short periods of time. The reason for this reciprocal relationship is currently not clear, however, it may indicate that an individual begins to isolate themselves from others when they begin thinking about suicide. Alternatively, thoughts of suicide may be interpersonal in nature (e.g., “people in my life would be better off if I was gone”). This rumination of interpersonal difficulties may act to exacerbate and reinforce perceptions of adversity. A cyclical relationship further points to why rapid fluctuations in suicide risk may occur, and the benefit of using continuous assessment to identify changes in interpersonal factors and suicidal ideation.

**The Benefit of Determining Trajectories of Suicidal Ideation**

Determining typical patterns of change in suicidal ideation and associated risk factors over time may be useful in discriminating patients at-risk of adverse outcomes. For instance, Czyz and King (2015) tracked the suicidal thoughts in the 3, 6, and 12 months following discharge from a hospital setting for patients that had a history of suicide attempts. Results suggested distinct patterns of change in suicidal thoughts over time which represented different risks of engaging in suicidal behaviours. Suicide risk for two groups in particular were similar at discharge, yet in the months following one group showed marked improvement, while the other was chronically elevated. The latter was associated with an increased risk of self-injury, and tended to report higher levels of risk factors at discharge. Of use for risk assessment, hopelessness was found to significantly predict group membership and thus risk of attempting suicide. It is important to note, however, that prediction was not perfect, with some individuals reporting low levels of suicidal ideation in the months following discharge going on to attempt suicide. This suggests that a combination of both risk assessment and continuous monitoring may be particularly beneficial.
Within an inpatient setting, it is important for clinicians to be aware of who may be at an increased risk of poor outcomes early during their stay. Such patients may require additional clinical resources and interventions tailored toward reducing suicide risk. Restifo et al. (2015) looked to track suicidal ideation over the first week of inpatient visits at a psychiatric facility, and determine particular trajectories over time. Similar to Czyz and King (2015), they found pervasive and high suicidal ideation was associated with the highest likelihood of engaging in non-suicidal self-injury. Thus, despite the variability noted by Kleiman et al., (2017) and Study 3, patients may also show identifiable patterns of change which provides a more complete picture of their risk over time.

Study 4 built on these findings by determining trajectories of suicidal ideation, interpersonal risk factors and mood factors over the course of inpatient visits at Perth Clinic. Most patients with high suicidal thoughts at admission either showed marked improvement or had pervasive issues. In addition, these changes in ideation were accompanied by comparative changes in risk factors. Individuals with pervasive and high suicidal ideation may therefore be resistant to therapeutic strategies. Through isolated measurements, the course of an individual’s suicidal thoughts would be difficult to determine. This is important for two reasons: first, this limits the ability to determine patients at-risk of self-injury (i.e., as per Restifo et al., 2015); and second, understanding which patients may be at-risk of poor outcomes throughout the treatment process helps direct therapeutic strategies (Shimokawa, Lambert, & Smart, 2010). Addressing issues prior to discharge is important considering the months following discharge are a particular high-risk period for suicidal behaviours (Prinstein et al., 2008).

Identifying which factors have strong relationships with the development of suicidal thoughts may also facilitate risk assessments at the beginning of inpatient visits. In Study 4, both perceived burdensomeness and thwarted belongingness at the beginning of therapy were
significant predictors of suicidal ideation at discharge. In addition, only levels of thwarted belongingness at admission significantly differentiated which patients would have a trajectory of high and pervasive suicidal thoughts, and those that would show marked improvements. Patients who enter the clinic with negative interpersonal circumstances may be more resistant to therapeutic interventions, and suggests the importance of a supportive clinical environment and developing interpersonal skills in facilitating improvements. Alternatively, it may represent patients who enter the clinic with more pervasive mental health issues who tend to perceive their interpersonal environments as more threatening. Future research is needed to replicate these findings to determine whether a positive interpersonal environment lends itself to improvements in suicidal thoughts.

**A Novel Method to Predict Non-Suicidal Self-Injury**

Engaging in non-suicidal self-injury may heighten suicide risk by reducing a fear of painful situations associated with suicide attempts. However, non-suicidal self-injury is difficult to predict over long periods over time, given many who experience high levels of distress do not engage in self-injury. This is partly due to the fact that few studies have used routine and short-term assessments to predict non-suicidal self-injury, despite it being seen by some as an impulsive act (Dougherty et al., 2009). As previously discussed, Restifo et al. (2015) tracked suicidal ideation over the first week of inpatient visits at a psychiatric clinic, and identified specific temporal patterns under the assumption that particular patterns would be associated with NSSI. Patients who self-injured were more likely to report high and pervasive levels of suicidal ideation, indicating consistent experiences of distress are associated with increased risk of self-injury. Daily routine measurement of suicidal ideation could be used to improve prediction of NSSI, although the relatively low prediction rate suggests more research is needed to explore factors associated with adverse outcomes and the optimal period of assessment (i.e., changes over hours or days).
Other research has focused on how affect changes in the lead up to self-injurious behaviours. Using a timeline follow-back methodology, Bagge et al. (2017) tracked levels of fear, hostility, sadness, and guilt every hour, for the 48 hours prior to inpatient suicide attempts. The purpose was to see whether in the lead up to a suicide attempt there was a significant change in levels of negative affect, providing an indication of why the attempt may have occurred (Bagge et al., 2017). In the hours prior to attempts there tended to be significant increases in risk factors for most patients, suggesting heightened distress may drive self-injurious behaviours. Bagge et al., (2013) conducted a similar retrospective 48-hour study with inpatients that had attempted suicide, focusing on whether negative life occurred in the hours prior and also the nature of these events. Individuals were at an increased risk of attempting suicide after a negative life event, particular if events were interpersonal in nature. Taken together, these two studies suggest that continuously monitoring risk factors in the lead up to self-injury, particularly those interpersonal in nature, may enhance understanding and prediction. However, a retrospective approach to monitor distress in both studies may have under or overestimated negative affect, with patients having to estimate their distress in the hours prior to a suicide attempt. A prospective approach may allow for a more accurate identification of how risk factors change prior to self-injury.

Study 3 built on these findings by tracking suicidal ideation and interpersonal risk factors on a daily basis to determine how they change in the lead up to non-suicidal self-injury. Over the two days prior to an incident of non-suicidal self-injury, there were significant increases in suicidal ideation and interpersonal factors. All factors together predicted a notable amount of incidents, although only suicidal ideation was a significant predictor. This could be due to the fact that both suicidal thoughts and self-injury may be methods to alleviate distress. An increase in suicidal ideation may indicate a patient’s difficulty in regulating emotions, and suggests clinical attention is required to address issues
causing distress. On the other hand, not everyone who experiences interpersonal adversity considers suicide or engages in non-suicidal self-injury, which limits predictive capabilities. To further understand this temporal relationship, and potentially enhance prediction, future research could assess associations between factors over shorter periods of time (i.e., as per Kleiman et al., 2017).

**Broader Implications**

The findings from the current dissertation are largely compatible with key theories of suicide. Specifically, the fluid vulnerability theory of suicide suggests that an increase in risk factors can trigger brief episodes of heightened suicidality. Likewise, the interpersonal psychological theory of suicidal behaviour suggests higher levels of thwarted belongingness and perceived burdensomeness are particular important in driving a higher desire to die by suicide. Consistent with both theories, increases in interpersonal adversity were associated with a desire to escape within an experimental setting, and also a desire to suicide within a clinical setting. These changes were capable of occurring over short-periods of time, further supporting theoretical positions that risk factors and suicidal ideation are dynamic constructs. However, an important finding is that interpersonal factors in isolation were associated with increases in suicidal ideation. Therefore, concurrently experiencing both factors may not be essential in developing suicidal thoughts, as is suggested by the theory. A new contribution to theory is the identification of reciprocal relationships between interpersonal factors and suicidal thoughts in Study 3. Joiner (2005) notes that the risk factors for suicide in the interpersonal theory may act to feed each other over time. For instance, acquiring the capability to suicide through self-injury may exacerbate thwarted belongingness by ostracising one’s self from others. Our findings take the theory one step forward, and suggest thinking about suicide may affect interpersonal factors. This further speaks to the fragility of the suicidal mind and their interpersonal environments. To further enhance our theoretical
understanding of an interpersonal model, it would prove beneficial to understand how factors act to influence each other over time and where clinicians can intervene to minimize suicide risk.

Suicide attempts are difficult to predict given their low frequency. While many risk factors of suicide attempts have been identified, they are poor predictors. Adversity happens to a high proportion of individuals and not everyone who experiences negative events attempts suicide (May & Klonsky, 2016). Perhaps a more fruitful endeavour is to focus on adequate treatment of those at-risk of suicide, and providing them with the appropriate skills to deal with adversity. It is estimated that the majority of individuals seek some form of psychiatric care before suicide attempts (Luoma, Martin, & Pearson, 2002). Therefore, within a clinical setting it is important to enhance assessments and understanding of suicide to make sure the right patients receive the right interventions. This in part involves moving away from static measurements used in clinical and research settings. Rather, attempts should be made to capture the dynamic nature of suicide. In this regard, Perth Clinic is innovative and these practices should be a goal for clinical assessments more generally. Providing patients with easy to interpret interfaces on electronic devices allows patients to provide feedback regarding their own mental health at their discretion, and increases the amount of responses that can be gathered. These devices are available in the rooms of patients and also in therapy rooms, allowing for a large deal of freedom in responses. By completing self-report measures regularly, it assists a patient-centred approach to therapy where treatment can be adapted to the needs of that particular patient.

The findings from the current dissertation point to the benefits of tracking progress on a day-to-day basis, but also general trends over time, in enhancing prediction. Progress can be tracked over the course of therapy, and information fed back to clinicians and patients. This approach has been shown to result in improved treatment outcomes, particularly for patients
who are trending toward negative outcomes (De Jong et al., 2014; Shimokawa et al., 2010). The findings from Study 4 suggest particular patients with high and pervasive suicidal thoughts for the duration of treatment may benefit from feedback. Thus, a step-wise approach to risk assessment may improve outcomes: improving risk assessments upon admission, routinely monitoring progress, and determining whether they may be on or off track by determining their trajectories. More research is needed to determine whether routine feedback to clinicians and patients improves outcomes in terms of reduced suicidal thoughts and self-harm, rather than symptom severity. In addition, whether enhanced longer term prediction of adverse outcome is sufficient in improving outcomes warrants exploration in future research.

Despite the fact that non-suicidal self-injury is often seen as an impulsive behaviour to alleviate distress, nurse’s reports of self-harm incidents in Study 3 suggested some patients extensively planned their self-harming behaviours, such as sneaking sharp tools into the clinic. It is possible that patients who showed increases in suicidal ideation in the lead up to self-injury in Study 3 were more likely to engage in impulsive behaviours (i.e., wall punching), while those with more stable thoughts were more likely to engage in planned self-injury (i.e., seeking tools to self-cut). In a study consistent with this stance, Rizk et al. (2018) identified two sub-types of patients with suicidal thoughts with markedly different stress reactions. Those with brief suicidal ideation were more likely to have more emotional reactivity and less cognitive control, than individuals with more stable thoughts. The authors hypothesize that this puts them at risk of impulsive self-injury, while those with stable thoughts are more likely to engage in planned and lethal attempts. This may in part explain why not all patients who self-injure have persistently high levels of suicidal ideation (Czyz and King, 2015; Restifo et al., 2015). Identifying different sub groups of self-injurers is a positive step forward and moves away from a limiting one-size-fits-all approach which often fails to encapsulate a range of human experiences. Those with volatile ideation may not be
easily identifiable when determining trajectories over time, and clinical assessments would benefit greatly from continuous assessment to identify any short-term fluctuations in efforts to minimize NSSI.

**Guiding treatment of suicidal patients**

The majority of the dissertation has been devoted to understanding how interpersonal factors may drive suicidal thoughts and how prediction of suicidal individuals can be enhanced. That is, which factors can be targeted during treatments, and to whom should the treatment be delivered to. The findings can also inform interventions to help reduce suicide risk. If interpersonal factors drive short-term fluctuations in suicidal ideation, it could be beneficial to assign individuals who have experienced a sharp increase in suicidal desire to a treatment group which specifically targets feelings of perceived burdensomeness or thwarted belongingness. If this is not feasible, then nursing staff may be able to conduct a brief interpersonal intervention for suicide using techniques from various therapies, such as dialectical behaviour therapy (DBT; Linehan, Armstrong, Suarez, Allmon, Heard, 1991), cognitive behaviour therapy (CBT; Beck, 1979) and interpersonal psychotherapy (Klerman & Weissman, 1994). Perhaps most important is preventing a cycle of decline noted in Study 3, with a reciprocal relationship between interpersonal factors and suicidal desire. Interpersonal factors may trigger suicidal thoughts, and suicidal thoughts may go on to exacerbate interpersonal difficulties. Breaking this cycle by directly addressing suicidal thoughts or reducing interpersonal difficulties could be important in minimizing periods of heightened suicide risk. The following section identifies particular mechanisms which may be effective in addressing both aspects.
Restructuring cognitions

Suicidal thoughts may develop due to incorrect or maladaptive beliefs regarding interpersonal circumstances. Clients should therefore be taught to recognise thoughts that arise during suicidal episodes, and connect them to a particular cognitive distortion (Burns & Beck, 1999). For example, a patient may identify thoughts relating to thwarted belongingness (e.g., “what’s the point in living if nobody loves me?”), and identify how it relates to a particular cognitive distortion, in this case all-or-nothing thinking. From here the patient could examine the validity of their thoughts, which in this instance would involve helping the patient identify some supportive individuals in their life who they may have overlooked and working to restructure their cognitions in accordance with this evidence. In a brief intervention, completely restructuring a thought process would be difficult. However, challenging perceptions may at least protect an individual against desiring suicide by seeing some positive aspects of their interpersonal relationships (Joiner, Van Orden, Witte, & Rudd, 2009). A final stage involves acting on their newly held thoughts, which may involve something as simple as a phone conversation with a friend.

Building on this notion, a technique from DBT may be effective in easing the transition in cognitions. Part of DBT involves finding a kernel of truth, or acknowledging two conflicting cognitions an individual may hold simultaneously (Linehan, 1993). This helps to unravel negative perceptions over time, identifying positive aspects within negative thoughts. Further, validating negative thoughts signals to the patient that the therapist understands why these thoughts may exist, thus improving perceptions of support and closeness with the therapist. For instance, the therapist can acknowledge the patient feels like a burden on those around them, and help them reach the realisation that they contribute more than they initially thought. While completely restructuring maladaptive cognitions is optimal, within short-term
treatments it may be more effective to sway cognitions to diminish episodes of heightened suicide risk.

**Assisting patients with interpersonal conflicts**

Interpersonal life events may be a trigger for suicidal episodes and self-injury. Elements from interpersonal psychotherapy in particular address facets of interpersonal relationships which may drive mental health issues. The therapist can determine if the patient is dealing with grief after the loss of a loved one, experiencing conflict in significant relationships, having difficulty adapting to a new role and/or difficulties with social isolation (Klerman & Weissman, 1994). For instance, a patient may view their spouse as not contributing enough to their relationship, causing significant hostility. This fracture in their relationship may cause the patient to perceive a lack of closeness, heightening feelings of thwarted belongingness. The therapist can look to work through these problems with the patient, and provide a more adaptive solution. Another example is a patient grieving the loss of their spouse who is having difficulties adjusting to a sudden loss of support and closeness, resulting in feelings of thwarted belongingness. Nursing staff and other clinicians could work together with the patient to come to terms with the loss, focus on other significant interpersonal relationships within the individual’s life, and help them connect with friends and family. Clinicians can also work together with the patient to enhance their social skills to minimize chances of developing interpersonal conflicts and experiencing isolation in the future (Lipsitz & Markowitz, 2013).

**Guiding more extensive treatments through assessment.**

Targeting interpersonal factors may effectively minimize suicide risk temporarily; however, there may be underlying issues which predispose a patient to subsequent episodes (See Figure 14). If therapeutic interventions aim to tackle suicidal thoughts and behaviours, it
is important that appropriate strategies are used for a particular patient. As discussed prior, Rizk (2018) identified two sub-types of suicidal patients with suicidal thoughts (i.e., brief and continuous), which may have different underlying issues. Following Figure 14, it may be important to tailor treatments of suicide over the course of inpatient visits to patients who have more pervasive issues or those who have volatile, brief episodes of suicidality. The figure below is based around the notion that individuals with brief periods of suicidal ideation may be better equipped to deal with long term solutions, but may have impulsive acts of anger. However, it is possible that other combinations may exist, such as patients with brief periods of suicidal ideation having problem solving deficits or those with continuous ideation having low distress tolerance. For the sake of the simplicity, the following section will discuss potential approaches to treatment for brief periods of suicidal ideation and then continuous ideation based on the definitions in Figure 14.

![Figure 14. An interpersonal model of suicide for patients with brief or continuous suicidal thoughts.](image-url)
**Treating Patients with Brief Suicidal Thoughts.**

Patients with brief suicidal thoughts may become noticeable through significant variability in daily assessments of suicidal thoughts. However, it may be more beneficial to determine potentially volatile patients by including measures of distress tolerance in risk assessments at admission. This may provide early indications as to which patients may be more likely have dynamic periods of suicidality, and be at-risk of impulsive self-injury. Such patients may benefit from interventions over the course of therapy to increase distress tolerance and emotional regulation.

Distress tolerance can be targeted through techniques from mindfulness-based cognitive therapy (MBCT) which were developed to reduce impulsive coping by introducing a new way to relate to thought and emotions using mindfulness (Teasdale et al., 2000). Patients are trained not to treat distressing thoughts as facts and recognise that emotions are transient states that need not be acted on. Through the lens of suicide, the justification for this approach is that severe suicidal episodes can be triggered through related thoughts, feelings and situations. In particular, a mindfulness approach could act to diminish the effects of thoughts relating to perceived burdensomeness and thwarted belongingness (see Collins et al., 2016). This approach has been shown to be particularly effective in reducing the risk of relapse in depressive patients (Teasdale et al., 2000).

If negative affect still arises, it is important that patients engage in adaptive behaviours. One method is to enhance emotional regulation skills by teaching patients to act opposite to their urges (Linehan et al., 1991). For instance, an individual may seek to withdraw socially in the face of distress and adversity, which would result in feelings of thwarted belongingness. In such a situation, a patient could be taught to engage in the opposite action, such as seeking out friends. This may act to reduce the chances of
A related DBT technique involves the therapist working with the patient to identify events that triggered a recent suicidal episode, and chain together thoughts, feelings and behaviours leading up the event. This may help the patient identify and understand their behaviours. By realising they are under their control, it assists the patient in choosing more adaptive ways to deal with emotional pain. According to Joiner et al. (2009), this approach helps inhibit impulsive self-injury that may be used as a method to escape from emotional pain. By minimizing the chances of self-injury, it helps prevent an individual acquiring the capability to suicide, thus preventing more serious instances of self-harm in the future.

**Treating Patients with Continuous Suicidal Thoughts.**

Patients with continuous suicidal thoughts may have stable and pervasive mental health issues which put them at risk of self-injury and suicide attempts. The clinician could work together with the patient to devise a plan for how they would deal with adverse life events in an adaptive way. Likewise, if a patient had a recent suicide attempt, significant problems they were facing prior could be identified and a plan developed based around that event. It could be important to focus on negative life events associated with thwarted belongingness (e.g., fractured relationships) and perceived burdensomeness (e.g., unemployment) and devise adaptive strategies surrounding them (Joiner et al., 2009). Guided imagery could also be used to recreate a recent event, and imagine using their newly founded skills to resolve the issue. Joiner et al. (2009) propose that this approach could be particularly effective in combating acquired capability by strengthening adaptive behaviours. Thus, this provides patients with strategies to cope with pervasive mental health issues and act to minimize risk of engaging in self-injurious behaviours following discharge.
Problem solving approaches have been shown to reduce rates of repeated suicide attempts (Salkovskis et al., 1999). Those who attempt suicide may have skills deficits which increase a reliance on maladaptive behaviours to escape from adversity. Working with patients to develop a structured approach to problem solving, the belief is that it acts to minimize these behaviours. Patients are taught six graded steps to address problems they may encounter: (1) Define the problem; (2) Identify the goal; (3) Generate alternatives; (4) Evaluate the alternatives; (5) Implement one; (6) Evaluate your initial efforts and modify your approach (Nezu, Nezu, & Perri, 1989). Borrowing from problem solving therapies for suicide, there can also be an emphasis on behavioural rehearsal, role playing, modelling and actual implementation of alternatives to solidify skills (Rudd et al., 1996). By enhancing problem solving skills, patients may be better equipped to deal with interpersonal adversity they experience following discharge and potentially minimize suicidal thoughts and behaviours.

Beyond Inpatients

Although many of those who attempt suicide receive some form of psychiatric care, a notable proportion may not, particularly close in time to their suicide attempt. For instance, Luoma, Martin, and Pearson (2002) found 80% of individuals did not receive mental health services in the month before their suicide. Many others receive care over longer periods, building into the core idea of the current dissertation that the right patients need to receive the right care when they do seek help. This may help provide them with adaptive coping mechanisms to deal with psychological distress, and increases the probability of future help seeking if prior experiences were positive. This suggests the need to improve the reach of interventions and ease of access.
Another important initiative may be increase the use of social programs that specifically tackle aspects of the interpersonal psychological theory. For instance, Ramey et al., (2009) assessed how a number of aspects of community engagement were associated with suicide, finding adolescents who engaged in enjoyable sporting activities and socializing had higher self-esteem and lower depressive symptoms, which in turn was associated with lower suicidality. The Houston Parent-Child Development Project provides another example of interventions that may tackle thwarted belongingness (Johnson, 1988). Part of the project involved having educators conduct home visits to promote mother-child interactions in low socio-economic areas. By increasing parental involvement, thwarted belonging may be reduced. More research is needed to evaluate the advocacy of social programs and ensure their reach is extended to those in need.

**Limitations and Directions for Future Research**

There are several limitations of the current research. Firstly, clinical assessments of suicidal ideation and interpersonal factors occurred on a daily basis. Given that Kleiman et al. (2017) identified changes in suicidal ideation can occur within as little as six hours, this may have resulted in important changes in factors being missed. However, the approach we implemented attempted to provide a practical, non-invasive method to suicide risk assessment. While measuring suicide risk over hours in Kleiman et al. (2017) offers more precision in assessment, maintaining such consistent measurement over the course of therapy can be disruptive to inpatient visits. Future research may look to compare whether prediction is enhanced over hours when compared with daily assessment, although a combination of both approaches are likely to complement each other. Another related problem is that suicidal ideation and associated risk factors were measured through self-report in Study 3 and 4. However, some patients may be hesitant to disclose their suicidal thoughts due to shame or stigma, and potentially begin to answer honestly when they begin to trust clinical staff. This
may affect assessment of relationships between variables and could partly account for a loss in sensitivity and specificity of prediction in the current dissertation. Further, research should look to evaluate the extent to which retest effects due to self-report may bias results when assessed on a daily basis.

Suicide is suggested to occur due to an interaction between longer-term distal factors (e.g., personality, childhood trauma) and factors exerting their influence more proximally to the event (e.g., interpersonal factors) (Mościcki, 2001). That is, distal factors establish vulnerability for suicide attempts by heightening the effects of proximal factors (Rudd, 2006). To adequately understand who is most likely to think about suicide or engage in self-injury, it may be important to include distal factors in risk assessments. However, the current dissertation looked to focus solely on the effects of proximal factors (i.e., perceived burdensomeness and thwarted belongingness) to further an understanding of the relationship between variables. It will be beneficial in future research to determine how distal factors, such as a neurotic personality, heighten the effects of interpersonal adversity on suicide risk. Risk assessments at admission may be improved by determining particular personality characteristics of patients and their interpersonal circumstances when entering the clinic.

**Conclusion**

Prevention of suicide is aided by an understanding of who is at-risk of adverse outcomes and which factors should be targeted during interventions. The current dissertation helps to improve outcomes within a clinical setting, by suggesting interpersonal factors could be effective targets for clinical interventions. However, for a multitude of reasons, those in need of care sometimes do not seek psychiatric help. It is therefore important that access to psychiatric sources is available to as many individuals as possible and social engagement is promoted to increase belongingness at a wider level. Both approaches combined may help to
overcome the difficulties in predicting extreme events like suicide by engaging in longer term preventative strategies.


References


Duberstein, P. R., Conwell, Y., Conner, K. R., Eberly, S., & Caine, E. D. (2004). Suicide at 50 years of age and older: perceived physical illness, family discord and financial strain. *Psychological Medicine, 34*(1), 137-146. [https://doi.org/10.1017/S0033291703008584](https://doi.org/10.1017/S0033291703008584)


References

Results From Two Ecological Momentary Assessment Studies. *Journal of Abnormal Psychology, 126*(6), 726-738. [http://dx.doi.org/10.1037/abn0000273](http://dx.doi.org/10.1037/abn0000273)


References


https://doi.org/10.1111/sltb.12027


psychotherapy quality assurance system. *Journal of consulting and clinical psychology*, 78(3), 298. [http://dx.doi.org/10.1037/a0019247](http://dx.doi.org/10.1037/a0019247)


APPENDIX 1

Study 2 in published format:


Please see next page.
Dynamic Changes in a Desire to Escape from Interpersonal Adversity: A Fluid Experimental Assessment of the Interpersonal Theory of Suicide

Michael J. Kyron · Anna C. Badcock · Elliot Baker-Young · Werner G. K. Stritzke · Andrew C. Page

© Springer Science+Business Media, LLC, part of Springer Nature 2019

Abstract

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

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

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

Recent developments in experimental research designs have provided important steps in assessing the causal effects of changes in risk factors. Collins et al. (2016) developed a laboratory-based paradigm capable of manipulating interpersonal circumstances, and assessing effects on the desire to escape from the task. This design is grounded in theories of suicide which suggest that suicide is a mechanism to escape from intolerable life circumstances and painful self-awareness (Baumeister 1990; O’Connor 2011). Building on this position, the Interpersonal Theory of Suicide (ITS; Joiner 2005) suggests that an increase in interpersonal adversity generates significant psychological pain and distress, and as a result increases the risk of attempting suicide. Two interpersonal factors are believed to be important in the developments of suicidal thoughts: thwarted belongingness, when an individual’s innate desire to feel socially connected is not met; and perceived burdensomeness, when an individual feels they are a burden on those around them. In addition, they are believed to partly influence suicide through affective pathways, encompassing factors such as shame, self-esteem, and a depressed mood (Van Orden et al. 2010). In early studies using this experimental paradigm, the task has found higher levels of manipulated thwarted belongingness and
perceived burdensomeness to be associated with a higher desire to escape from adversity (Collins et al. 2016, 2017; George et al. 2017; Hartley et al. 2018). Thus, the task is able to test the causal predictions of a prominent theory of suicide through the direct manipulation of interpersonal circumstances and assessing a desire to escape.

The Dynamic Nature of Interpersonal Risk Factors

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

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

Rationale of the Current Research

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

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

Study 1

Method

Participants

Seventy-four introductory psychology students ($M_{age} = 20.06, SD = 4.44, 57\%$ female) participated in the study in exchange for course credit points. Of the available 538
participants in the cohort, those that had burdensomeness and belongingness scores in the middle two quartiles of the distribution of all students on the Interpersonal Needs Questionnaire were invited to participate ($N = 271$). This was done in an attempt to recruit participants with relatively comparable interpersonal circumstances prior to commencing the task. Participants were randomly allocated to a high or low perceived burdensomeness and thwarted belongingness (PB-TB) condition. All participants completed the task in its entirety. All procedures were approved by the University’s Human Research Ethics Committee.

**Measures**

**Interpersonal Factors**

The Interpersonal Needs Questionnaire (INQ; Van Orden et al. 2012) is a 15-item measure with two subscales assessing perceived burdensomeness and thwarted belongingness. It has excellent psychometric properties (Van Orden et al. 2008). Participants rate their agreement with statements such as “The people in my life would be better off if I were gone” (perceived burdensomeness) and “I rarely interact with people who care about me” (thwarted belongingness) on a 7-point Likert scale ranging from 0 (not at all true for me) to 6 (very true for me), with higher scores indicating greater perceived burdensomeness and thwarted belongingness. Internal consistency in the current sample was high for both burdensomeness ($\alpha = 0.95$) and belongingness ($\alpha = 0.93$) scales.

**Experimental Task and Procedure**

The interpersonal persistence task is a three player team-based task, whereby participants score points by correctly and quickly indicating whether two stimuli (i.e., Ŷ and Ū), displayed on a computer screen, were the same or different. Participants were informed that one point is awarded for a rapid and correct response, with a point deducted for a slow or incorrect response. The aim for each team member was to score as many points as possible, with individual scores contributing to a total team score. The goal of the task was for the team to beat a target score to ‘win’ the game. Therefore, a poor individual score affected whether the team was successful in task. The success a participant had in each condition, and the performance of the team more generally was pre-determined, and therefore their actual performance was not reflected in the score. In the high PB-TB condition, the participant had a much lower chance of success, while in the low PB-TB condition they had a much higher chance of success. For instance, in the high PB-TB condition, odds were that a participant scored correctly four out of 10 times regardless of how they were performing. This aimed to ensure that participants in the high PB-TB condition always performed worse than their teammates, and the team were unable to meet their target. On the other hand, in the low PB-TB condition the participant performed equal to or better than their teammates, with the team always beating the target score. Thus, participants in the high PB-TB condition were encouraged to perceive that they were not effectively contributing to their team and burdening the team’s success in the task.

**Manipulating Belongingness**

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

**Experimental Design**

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

**Measuring Burdensomeness, Belongingness and a Desire to Quit**

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

**Results and Discussion**

**Suspicion Check**

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

**Assessing the Manipulation**

**Perceived Burdensomeness**

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

Follow up contrasts revealed that for participants who remained in either high or low PB-TB conditions for the duration of the experiment, feelings of burden did not significantly change from phase 1 to phase 2, $F(1, 44) = 3.85, p > .05, \eta^2_{\text{partial}} = 0.08$. In contrast, for the participants who switched from low to high PB-TB (or vice versa) half way
through the experiment, there was a significant interaction, $F(1, 24) = 23.93$, $p < .001$, $\eta^2_{\text{partial}} = 0.53$. That is, when there was a negative change in interpersonal conditions halfway through the task, there was a corresponding increase in perceived burdensomeness. Further, when there was a positive change, there was a decrease in perceived burdensomeness. Therefore, the task was successful in manipulating perceived burdensomeness as intended.

**Thwarted Belongingness**

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

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

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

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

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

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

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

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

### Study 2

Having demonstrated that changes in a desire to escape from interpersonal adversity was a function of the levels of perceived burdensomeness and thwarted belongingness, Study 2 aimed to assess the influence of interpersonal factors when varied independently. While cross-sectional assessments indicate the combined presence of perceived burdensomeness and thwarted belongingness has a greater effect on suicide risk than either factor alone, the transition between these states has not been explored (Van Orden et al. 2008). Therefore, the manner in which suicide risk varies due to a change in only one interpersonal variable is unclear. Knowing whether a single interpersonal factor can offset the pernicious effects of another provides an indication of how it could enhance an individual’s persistence through adverse life situations.
Similar to the previous study, two groups experienced stable positive or negative interpersonal feedback, while other groups experienced a change halfway through the task. However, Study 2 focused on changes in only belongingness, rather than both factors. This method was used due to difficulties in plausibly manipulating burdensomeness while keeping high thwarted belongingness stable. That is, as a participant begins to do better, it is unlikely that teammates would keep providing negative interpersonal comments. Thus, in Study 2, performance feedback (i.e., perceived burdensomeness) would be manipulated to remain poor for all individuals, and interpersonal comments (i.e., thwarted belongingness) would change. Participants in all conditions would always score worse than their teammates, and the team would fail to score above the target as a result. With perceptions of burdensomeness remaining high, the study can investigate the degree to which thwarted belongingness can independently affect a desire to quit in the face of interpersonal adversity.

**Method**

**Participants**

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

**Materials**

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

**Procedure**

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

**Results and Discussion**

**Suspicion and Stable Burdensomeness Check**

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

**Assessing the Manipulation**

**Thwarted Belongingness**

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

**Perceived Burdensomeness**

As the study was interested in the comparison between stable levels of burdensomeness, analysis was required to identify whether burdensomeness remained relatively stable for four conditions. A 2 (Starting Condition: Low or High TB) × 2 (Stable or Switch: whether TB condition changed halfway through the task) × 2 (Phase: Phase 1 and Phase 2) × 3 (Rounds per Phase) Mixed-Design ANOVA was run for both stable and switch groups (Fig. 2b). Feelings of burdensomeness did not significantly change over time.
for participants who remained in either a Low or High TB condition for the duration of the experiment, \( F(1, 27) = 3.46, p > .05, \eta^2_{\text{partial}} = 0.11 \). In addition, feelings of burdensomeness did not significantly change over time for participants who experienced a change in conditions over the experiment, \( F(1, 19) = 3.75, p > .05, \eta^2_{\text{partial}} = 0.17 \). Therefore, the study was successful in manipulating changes in thwarted belongingness over the experiment, while keeping perceived burdensomeness stable.

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

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

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

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

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

### General Discussion

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

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

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

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

Limitations and Directions for Future Studies

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

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

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

In conclusion, the current study is the first to assess the dynamic nature of interpersonal risk factors experimentally. Results suggested rapid changes in a desire to escape as a result of a single change in interpersonal circumstances. More adverse interpersonal conditions resulted in a significantly greater desire to escape. The malleability of both interpersonal factors and the associated changes in a desire
to escape suggest they may be appropriate areas for clinical intervention. The dynamic nature of a desire to escape in the current studies suggests the need for continuous clinical assessment to monitor the effects of adverse changes in interpersonal circumstances. Dynamic measurement of suicide and interpersonal risk factors is in its early stages, and future research in this domain would assist in increasing our understanding of this complex phenomenon.

**Funding** This research was supported in part by an ARC Linkage Grant (LP150100503) and an Australian Government Research Training Program Scholarship.

**Compliance with Ethical Standards**

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

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

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

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

**References**


**Publisher’s Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.
APPENDIX 2

Study 3 in published format:


*Journal of consulting and clinical psychology, 86*(6), 556.

[http://dx.doi.org/10.1037/ccp0000305](http://dx.doi.org/10.1037/ccp0000305)

Please see next page.
Daily Assessment of Interpersonal Factors to Predict Suicidal Ideation and Non-Suicidal Self-Injury in Psychiatric Inpatients

Michael J. Kyron
University of Western Australia

Geoff R. Hooke
University of Western Australia and Perth Clinic, West Perth, WA, Australia

Andrew C. Page
University of Western Australia

Objective: The study assessed suicidal ideation and interpersonal variables to explore the extent to which (a) changes in interpersonal factors predicted future suicidal ideation and (b) changes in either predicted nonsuicidal self-injury. Method: In total, 1,044 patients (72.3% Female; mean age = 41.95) at a psychiatric inpatient facility were assessed daily for suicidal thoughts. If patients indicated suicidal thinking (n = 417), their feelings of perceived burdensomeness and thwarted belongingness were assessed. Results: There was a reciprocal relationship between suicidal ideation and interpersonal factors, with both predicting each other on the next day. Changes in suicidal ideation, but not interpersonal factors, over two days were a significant predictor of 22.6% of nonsuicidal self-injury cases (n = 67). Conclusions: The findings reinforce the need for more intensive assessment of suicidal ideation (i.e., days, hours) to determine complex relationships with risk factors. This acts to enhance prediction and prevention of suicidal ideation and nonsuicidal self-injury.

What is the public health significance of this article? The timely clinical intervention targeting interpersonal factors may be pivotal in minimizing periods of heightened suicidal ideation and indirectly minimize incidences of nonsuicidal self-injury. Daily assessments of interpersonal factors and suicidal ideation may assist in the prediction of heightened suicidal episodes.

Keywords: suicidal ideation, non-suicidal self-injury, interpersonal psychological theory, belongingness, perceived burdensomeness

Suicide is a leading cause of death worldwide, with approximately 800,000 people taking their own lives each year (World Health Organization, 2017). Yet deaths by suicide are often unexpected among the general population and even among psychiatric in-patients (Morgan & Priest, 1991). Because of the difficulties inherent in the assessment of suicide risk, heightened periods of suicide risk often go unpredicted. This problem is compounded by the fluctuations in suicidal thinking occurring over relatively short periods of time (Kleiman et al., 2017). Hence, it is important to understand the dynamic relationships over time shared by suicide risk and its predictors. Thus, the main aim of the current study is to assess changes in suicidal ideation over a short-term period and identify the extent to which notable risk factors of suicide relate to suicidal ideation and self-injurious behaviors.

Although there are many predictors of increased suicidal risk, the interpersonal theory of suicide (Joiner, 2005) organized these factors by suggesting that significant interpersonal deficits enable the development of suicidal desire. The theory defines two interpersonal states: (a) perceived burdensomeness, when an individual feels they are a liability on friends, family and society, and fundamentally flawed to the point of self-hatred; and (b) thwarted belongingness, when an individual’s innate desire to feel socially connected is not met due to excessive loneliness and a lack of perceived support (Van Orden et al., 2010). Experiencing both thwarted belongingness and perceived burdensomeness simultaneously is theorized to increase the risk of developing suicidal ideation. Perhaps most importantly, these components are suggested to be dynamic and proximal causes of increases in suicide risk, occurring close in time to the onset of suicidal thoughts.
Cross-sectional assessments of the theory have largely been supportive, indicating heightened levels of both thwarted belongingness and perceived burdensomeness are associated with a desire to suicide (Christensen, Batterham, Soubelet, & Mackinnon, 2013; Joiner et al., 2009; Van Orden, Witte, Gordon, Bender, & Joiner, 2008).

However, such cross-sectional research does not speak to the dynamic relationships across time between these variables. To date, one study (Kleiman et al., 2017) has provided a short-term intensive assessment of suicide risk. This study observed that suicidal ideation varied within short periods of time, but the interpersonal risk factors of suicide (burdensomeness and loneliness) were not significant predictors of future changes in suicidal ideation. However, the authors note that the small sample size may have limited the ability to determine interactions between risk factors. Further, to adequately falsify the interpersonal theory of suicide and assess its predictive power, future assessments may benefit from repeatedly assessing all the above-mentioned aspects of thwarted belongingness (i.e., loneliness, perceived support) and perceived burdensomeness (i.e., self-hate, liability).

Previous assessments have largely been unidirectional, that is, they have only assessed the extent to which risk factors of suicide predict whether an individual has suicidal thoughts. However, Joiner (2005) speculated that components of the interpersonal theory of suicide may act in a cyclical manner. That is, there are multiple entry points by which risk factors (i.e., perceived burdensomeness and thwarted belongingness) may become escalated. For instance, an individual may be viewed unfavorably and as a burden for engaging in self-harm, causing heightened thwarted belongingness and perceived burdensomeness. To date, there has not been an empirical assessment of a reciprocal relationship between interpersonal factors and suicidal thoughts and behaviors.

Although Joiner (2005) did not speculate as to the relationship between suicidal thinking and interpersonal factors, an assessment of testimonials indicates a potential bidirectional relationship between variables (see p. 138). That is, interpersonal factors may influence the development of suicidal thoughts, and suicidal thoughts may in turn influence interpersonal circumstances. On a cognitive level, thoughts of suicide appear to generate negative perceptions regarding interpersonal circumstances. For instance, loneliness may be heightened if an individual contemplating suicide believes their presence will not be missed (“No one will care if I kill myself”) and self-hate may be perpetuated for considering what they perceive to be a shameful behavior (“I am selfish and pathetic for considering suicide”). In addition, a heightened emotional state during suicidal periods may cause cognitive biases toward future interpersonal events, subsequently heightening interpersonal deficits (Krantz & Hammen, 1979). On a behavioral level, individuals contemplating suicide sometimes report engaging in self-destructive behaviors, which may perpetuate interpersonal difficulties. For example, disconnecting from friends and family will create a lonely environment devoid of reciprocal care. Thus, although interpersonal factors may be implicated in the development of suicidal thoughts, heightened suicidality may have subsequent effects on interpersonal circumstances. A bidirectional relationship between variables potentially creates a feedback loop between factors, efficiently increasing suicidal ideation and interpersonal deficits over time. Identifying reciprocal relationships may therefore be beneficial for clinical assessments and interventions to reduce suicide.

Recent research suggests that the impact of interpersonal factors varies dependent on the level of suicidal ideation (Rogers & Joiner, 2017). In particular, the effects of perceived burdensomeness and thwarted belongingness were significant at high levels of suicidal ideation, although an interaction between factors was only significant at low-moderate levels of suicidal ideation. However, the authors note the cross-sectional nature of the study, and the need to assess this relationship over time. As such, when assessing reciprocal relationships over time, research may benefit from determining differing effects at varied levels of suicidal ideation.

Persistent thoughts of suicide are particularly pernicious due to their relation to subsequent suicide attempts. However, Joiner (2005) suggested that an ability to overcome a fear of pain or death mediates this relationship, diminishing an individual’s ability to attempt suicide. An ability to suicide can be acquired through exposure to repeated dangerous and painful situations. The literature has not extensively explored whether intensive suicidal thoughts and interpersonal deficits are associated with an elevated risk of engaging in self-injurious behaviors. Self-injury encapsulates a number of harmful behaviors, including a clear intention to end one’s own life, referred to as suicidal behaviors, or the destruction of one’s own bodily tissues with no intention to die, referred to as nonsuicidal self-injury (NSSI; Nock, 2009). Although some research has attempted to explore the relationship between interpersonal factors and suicide attempts (Anestis & Joiner, 2011; Joiner et al., 2009; Van Orden et al., 2008), there has been limited focus on NSSI. The same processes involved in the development of suicidal desire (i.e., perceived burdensomeness and thwarted belongingness) may drive the need to engage in NSSI (Joiner, Ribeiro, & Silva, 2012). Indeed, early research suggests that perceived family support, a key aspect in belonging, is important in the cessation or maintenance of NSSI (Muehlenkamp, Brausch, Quigley, & Whitlock, 2013; Tattnell, Kelada, Hasking, & Martin, 2014). As previously noted, Joiner (2005) suggested self-harming behaviors may in-turn exacerbate interpersonal deficits. Recent research by Turner, Cobb, Gratz, and Chapman (2016) supported this position, with interpersonal deficits remaining heightened following NSSI, increasing the possibility of further self-injurious behaviors. However, these issues require further empirical attention, indicating the relation between variables and the ability to predict NSSI incidents.

The current study examined how suicidal ideation and interpersonal factors change over time using a larger sample than previous studies. The ability to identify any reciprocal relationships between variables may be particularly advantageous when assessing suicide and its risk factors. In addition, the extent to which suicidal ideation and interpersonal factors drive and can predict NSSI events can be assessed. The current study used a cross-lagged panel design to determine causal relationships between suicide and interpersonal risk factors over the short-term (i.e., days). Based on the above, there are several hypotheses to be drawn:

- Interpersonal factors to be highly correlated with suicidal ideation cross-sectionally.
- Interpersonal factors are expected to drive changes in suicidal ideation on the next day, and suicidal ideation to affect subsequent changes in interpersonal factors.
• The relationship between interpersonal factors and suicidal ideation over time is expected to be different between low and high levels of suicidal ideation.
• Feelings of perceived burdensomeness and thwarted belongingness are expected to remain heightened on the day following a NSSI event.
• NSSI incidents will be predicted by changes in suicidal ideation and interpersonal factors in the days prior.

Method

Participants and Procedure

Patients at an inpatient psychiatric facility were invited daily to answer a series of items about their symptoms and wellbeing. From these scales, data from a single question regarding their suicidal ideation were examined. Questionnaires were computer-delivered, via electronic tablet devices, and if a patient indicated suicidal thoughts from the past day, then they were provided with four additional questions to answer on that day and for the next two days (a score above 0 on the suicidal ideation questionnaire item indicated suicidal thinking).

The additional questions assessed feelings of burdensomeness and belongingness. Of the total 1,044 separate inpatient admissions, 417 patients indicated low to high levels of suicidal thinking, with the remaining patients indicating no desire to suicide. All questionnaires were available throughout each day for patients to complete no more than once per day, as the questionnaires aimed to capture psychological states from the previous 24 hr. Generally, questionnaires were completed in the morning and took only a few minutes to complete. Self-harm incidents were logged independently with administration by nursing staff on the date in which self-harm occurred (as part of routine government reporting requirements on hospitals), with 70 separate self-harm incidents reported (NSSI = 67, suicide attempts = 3). Incidents were either witnessed by nursing staff or informed of their occurrence by patients. As such, an explicit intention to die through self-harming was determined through subsequent questioning by nursing staff or through witnessing near-fatal behaviors (e.g., attempting to electrocute one’s self). Patients that attempted suicide during their stay were not included in the assessment of NSSI, as it involved an intention to die, and, as a result, three participants were excluded from analysis. The remaining self-harm incidents consisted of intentional superficial or deep cuts to the skin with various objects (e.g., broken glass, scissors, and razors), burning of skin, and forceful hitting of body parts against hard surfaces. Data was collected as part of an ongoing program of evaluation at the facility and written informed consent was obtained upon admission to the hospital.

Demographic Information

The majority of patients were identified as being high in socioeconomic status (71.2%). The sample was 72.3% female, with a mean age of 41.95 years (SD = 16.1). The mean length of stay was 14.2 days (SD = 12.7). The sample consisted of patients with the principal diagnosis of affective disorders (50.5%), neurotic disorders (20.4%), substance use disorders (13.1%), personality disorders (6.6%), and other disorders including schizophrenia (9.3%).

Measures

Two questions were created to measure perceived burdensomeness, “In the past 24 hours, I have felt that I am worthless” and “In the past 24 hours, I have felt like my death would be a relief to people.” Both items represent constructs that according to the interpersonal theory of suicide combine to create a global state of burdensomeness (i.e., self-hate and perceived liability, respectively). As a result, a total burdensomeness variable was created through the summation of standardized scores on both items. The items showed acceptable internal consistency (α = .76).

Suicidal ideation was measured through a single question “In the past 24 hours, I have thought about suicide.” Both suicide ideation and worthlessness were measured on a 6-point Likert scale ranging from 0 (at no time) to 5 (all the time). Perceived support, perceived liability and loneliness questionnaire items were measured on a 7-point Likert scale ranging from 1 (not true for me at all) to 7 (very true for me). These were adapted from the Interpersonal Needs Questionnaire to largely retain the same wording but include temporal elements unique to their use in the current study (i.e., “In the past 24 hours...” ; Joiner, Van Orden, Witte, & Rudd, 2009). As previously discussed, items were selected on a conceptual basis to represent aspects of thwarted belongingness and perceived burdensomeness defined by Joiner (2005). Further, they selected due to strong loadings on either perceived burdensomeness or thwarted belongingness through factor analysis (Van Orden, Cukrowicz, Witte, & Joiner, 2012). There was a moderate correlation between perceived burdensomeness and thwarted belongingness, r(446) = 0.41, p = .00, which is consistent with previous studies that have identified the constructs as being related, yet unique (Van Orden et al., 2008).

Analytical Approach

Is there a reciprocal relationship between interpersonal factors and suicidal ideation? Cross-lagged panel analysis was used to permit causal inferences between factors in longitudinal studies. An autoregressive cross-lagged panel approach, with MPlus (Version 7; Muthén & Muthén, 1998–2016), was used to address reciprocal associations between suicide and interpersonal factors. As the interpersonal theory of suicide points to the roles of thwarted belongingness and perceived burdensomeness separately and combined, analyses first examined each variable alone. Next an interaction term between interpersonal variables was created.

---

1 All self-harm events were logged by day and most also recorded the time when they occurred. For the self-harm events where the time they occurred was recorded, the time always proceeded the completion of the questionnaire.
through the product of their standardized scores. In each analysis, the role of the predictor for days one through three was entered along with the corresponding suicidal ideation scores. Analyses were based on responses from the three consecutive days of data collection for each participant, where the initial time point was the first day the suicidal ideation item was endorsed. As interpersonal items were no longer available for a fourth time point unless suicidal ideation was endorsed again, three time points were seen as optimal to maximize the sample size.

To accommodate for any relationships between risk factors that may occur over time dependent on severity of suicidal ideation, the same analyses would be run for low and high suicidal ideation. A median split was utilized to maximize the sample size available for both groups. The low suicidal ideation groups would consist of the lower 55% of responses to the suicidal ideation question (1 = some of the time, 2 = less than half of the time). The high suicidal ideation groups would consist of the upper 45% of responses (3 = more than half of the time, 5 = all of the time).

What is the relationship between suicidal ideation, interpersonal factors and NSSI? To determine differences between patients who engaged in NSSI and those who did not, suicidal ideation, perceived burdensomeness and thwarted belongingness were compared from two days prior to an incident to the day of an incident. Several within-subjects analyses of variance were run for suicidal ideation, perceived burdensomeness and thwarted belongingness across all three days for both NSSI groups. Essentially, this would indicate whether notable differences in these factors were evident in the lead up to NSSI.

To assess whether suicidal ideation and interpersonal deficits increased following NSSI, several t tests were run to determine whether both factors were significantly different from the day in which NSSI occurred to the day after. If suicidal ideation and interpersonal factors did not significantly increase, the extent to which they remained heightened when compared with two days prior to NSSI was also assessed. This would allow us to identify whether suicide risk factors appeared to increase, maintain or decrease following NSSI.

A hierarchical logistic regression was used to determine the extent to which continuous variables (i.e., changes in suicidal ideation, burdensomeness and belongingness) could predict a categorical NSSI outcome (i.e., NSSI incident vs. no NSSI incident). To assess the effects of changes in variables over time, a separate term was created from the differences between suicidal ideation, thwarted belongingness and perceived burden on the day of an incident and two days prior. These analyses were performed utilizing IBM SPSS (Version 23) software.

Results and Discussion

Is There a Reciprocal Relationship Between Interpersonal Factors and Suicidal Ideation?

Perceived burdensomeness. Results indicate that for suicidal ideation and burdensomeness, the auto-regressive effects were all strong. Essentially, if someone felt they were a burden on one day, there was a strong chance they would feel like a burden on the next day. Likewise, if an individual thought about suicide, results indicated a strong chance they would think about suicide again the next day.

Cross-sectional assessments indicated medium and significant correlations between suicidal ideation and interpersonal factors. Therefore, patients who reported higher levels of perceived burdensomeness reported greater suicidal ideation. Results also indicated significant cross-lagged correlations between perceived burdensomeness and next day suicidal ideation. Therefore, feelings of burdensomeness predicted subsequent thoughts of suicidal ideation. In addition, suicidal ideation on Day 2 predicted feelings of burdensomeness on Day 3, indicating that thoughts of suicide may increase feelings of burden and a reciprocal relationship exists between the two factors. (See Figure 1.)

Thwarted belongingness. A total of responses to the belongingness items was created and compared with suicidal ideation over three days of responses. The auto-regressive effects were all significant and moderate to strong. Cross-sectional assessments

Figure 1. Cross-lagged panel analysis of suicidal ideation and burdensomeness on Day 1 (IDEATION 1, BURDEN 1), Day 2 (IDEATION 2, BURDEN 2), and Day 3 (IDEATION 3, BURDEN 3). All correlations are shown, with significant results asterisked and boldfaced ("p < .05. **p < .001). See the online article for the color version of this figure.
indicated significant correlations between suicidal ideation and thwarted belongingness. Patients who reported higher levels of thwarted belongingness were more likely to report more frequent suicidal ideation.

There was some evidence of cross-lagged effects, with suicidal ideation significantly, but weakly correlated with next day thwarted belongingness. Thwarted belongingness was only correlated with next day ideation from Day 1 to Day 2. Thus, there was evidence of a reciprocal relationship between suicidal ideation and thwarted belongingness. (See Figure 2.)

**Interaction between factors.** Like the previous analyses, the auto-regressive pathways were medium to strong and significant across all time points. Cross-sectional assessments indicated medium strength correlations between suicidal ideation and interpersonal factors, suggesting both variables tended to vary together on the same day. The cross-lagged pathways were weak, but significant, in both directions. Therefore, both suicidal ideation and interpersonal factors acted to predict each other over both assessment periods. (See Figure 3.)

**Comparing Relationships Over Time Between Low and High Suicidal Ideation Groups**

**Perceived burdensomeness.** The same cross-lagged panel analyses were run for low and high suicidal ideation groups. There were significant autoregressive and cross-sectional relationships between suicidal ideation and perceived burdensomeness at all time points. For low ideation groups, burdensomeness on Day 1 was weakly and significantly correlated with suicidal ideation on Day 2. From Day 2 to Day 3 suicidal ideation predicted feelings of burdensomeness. For high ideation groups, there was a weak cross-lagged correlation between perceived burdensomeness and suicidal ideation from Day 1 to Day 2, with suicidal ideation and burdensomeness predicting each other from Day 2 to Day 3. Therefore, both low and high ideation groups exhibited cross-sectional relationships between variables over time, with burdensomeness driving initial changes in suicidal ideation (See Figure 4.)

**Thwarted belongingness.** Results suggested significant autoregressive effects for both low and high groups. In addition, there were significant weak to moderate cross-sectional correlations between ideation and belongingness at all but one time point. Low ideation groups exhibited no cross-lagged relationships between ideation and belonging. On the other hand, the high ideation group reported a reciprocal relationship from Day 1 to Day 2. That is, suicidal ideation and thwarted belongingness only predicted each other when suicidal ideation was high. (See Figure 5.)

**Interaction between factors.** For both low and high ideation groups there were significant auto-regressive correlations on the next day and cross-sectional correlations. For the low ideation group, an interaction between burdensomeness and belongingness on Day 1 significantly predicted suicidal ideation on Day 2. In addition, suicidal ideation on Day 2 predicted an interaction between interpersonal variables on Day 3, indicating a reciprocal relationship. For the high ideation group, suicidal ideation and an interaction between interpersonal factors significantly predicted each other from Day 1 to Day 2. Only an interaction between interpersonal factors significantly predicted suicidal ideation from Day 2 to Day 3. Therefore, there was a reciprocal relationship between variables over time for both low and high suicidal ideation groups. (See Figure 6.)

**What Is the Relationship Between Suicidal Ideation, Interpersonal Factors, and NSSI?**

Several analyses were conducted to assess the relationship between suicidal ideation, interpersonal factors and incidents of NSSI. Assessment of mean scores over time indicated that individuals who engaged in NSSI reported significant increases in suicidal ideation, $F(1.48, 56.08) = 14.78, p = .00, \eta = 0.37$, thwarted belongingness, $F(2, 58) = 7.14, p = .002, \eta = 0.20$, perceived burdensomeness, $F(2.47, 42.13) = 8.80, p = .002, \eta = 0.23$, and an interaction between interpersonal variables, $F(1.45, 42.10) = 10.69, p = .00, \eta = 0.27$, in the lead up to an event (see Figure 7). Thus, although all interper-

---

**Figure 2.** Cross-lagged panel analysis of suicidal ideation and thwarted belongingness on Day 1 (IDEATION 1, BELONG 1), Day 2 (IDEATION 2, BELONG 2), and Day 3 (IDEATION 3, BELONG 3). All correlations are shown, with significant results asterisked and boldfaced ($^* p < .05, ^{**} p < .001$). See the online article for the color version of this figure.
In sum, there was a notable rise in interpersonal factors and suicidal ideation over the assessment period for individuals who did not engage in NSSI. Whereas personal factors and suicidal ideation remained stable over the assessment period for individuals who did not engage in NSSI, there was a notable rise in interpersonal factors and suicidal ideation prior to a NSSI incident.

We also hypothesized that engaging in NSSI may act to maintain interpersonal deficits and suicidal ideation. Follow-up t-tests indicated there were no significant change in suicidal ideation, $t(23) = 1.37, p = .25$, perceived burden, $t(23) = -0.73, p = .47$, thwarted belongingness, $t(23) = -1.18, p = .25$ and an interaction, $t(23) = -1.77, p = .09$, on the day following NSSI. However, only suicidal ideation, $t(23) = 3.29, p = .001$, and perceived burdensomeness, $t(23) = 3.27, p = .004$, remained significantly higher than the 2 days prior to a NSSI incident. As a result, risk of subsequent NSSI may not diminish following the initial NSSI incident. Of the 67 individuals who engaged in NSSI, 13 had further incidents within the next four days. In sum, there was a significant increase in all interpersonal factors and suicidal ideation in the lead up to initial NSSI, with evidence of distress remaining heightened and a risk of subsequent self-injurious behaviors in the days following.

To assess the ability of changes in suicidal ideation, thwarted belongingness, and perceived burdensomeness to predict NSSI (over the two days prior to a NSSI event), a hierarchical binomial regression was run, with results reported in Table 1. At Step 1, burdensomeness and belongingness were entered, with only burdensomeness being a significant predictor of NSSI. However, the model accurately predicted only 3% of NSSI incidents. At Step 2, an interaction between burdensomeness and belongingness was added, but did not significantly contribute in predicting NSSI. At Step 3, only a change in suicidal ideation over two days was a significant predictor of NSSI, with the model accurately predicting 22.6% of NSSI incidents. Therefore, when controlling for suicidal ideation, interpersonal factors were not a significant predictor of NSSI. Although suicidal ideation and interpersonal factors appeared to drive each other, ideation seems to be a better predictor of NSSI.

### General Discussion

The current study assessed suicidal ideation, interpersonal factors and NSSI on a daily basis during inpatients’ stay at a psychiatric facility. The first aim of the study was to examine the extent that interpersonal factors at one time point drive short-term changes in suicidal ideation at a subsequent time point and vice versa. Results suggested that both thwarted belongingness, perceived burdensomeness and an interaction between factors predicted subsequent suicidal ideation over and above that explained by prior suicidal ideation. In each cross-panel design results identified a reciprocal relationship between factors, indicating that thinking about suicide heightens perceptions of both thwarted belongingness and perceived burdensomeness.

Consistent with Rogers and Joiner (2017), there appeared to be a differing relationship between interpersonal factors at varied levels of suicidal ideation. In particular, the relationship between interpersonal factors and suicidal ideation was stronger over time when suicidal ideation was high. This may in part reflect a restricted range by which changes in suicidal thoughts could occur for the low ideation group, limiting the ability to determine relationships over time between variables. Clinical deterioration was rare within the current sample, and therefore there was a limited range for positive changes given low levels of initial suicidal ideation. Another possible explanation is that interpersonal factors may rather exert their influence at higher levels of suicidal ideation. That is, an individual who experiences heightened interpersonal adversity is more likely to have a severe, rather than moderate, desire to suicide. However, this may be due to the use of a median split when determining low and high ideation groups, rather than assessing a linear relationship between variables. Therefore, future studies should look to ascertain whether severity of suicidal ideation increases in a linear fashion over time with interpersonal adversity, or whether there is a tipping point where interpersonal factors begin to drive higher levels of suicidal ideation.
The findings from the current study are consistent with Van Orden et al. (2008), which found burdensomeness to be a stronger predictor of suicidal ideation than belongingness. The findings that interpersonal factors accounted for a significant amount of variance contrast with findings from Kleiman et al. (2017), which suggested that neither thwarted belongingness nor perceived burdensomeness are significant predictors of suicidal ideation. However, Kleiman and colleagues did speculate that their small sample may have been a factor in their failure to detect a difference and, therefore, the larger sample size in the present study could explain the apparent discrepancy.

Likewise, the current studies contrast with findings from Lasgaard, Goossens, and Elklit (2011), which identified loneliness (i.e., a component of belongingness) as a predictor for future suicidal ideation. However, their study used only two time points over a year apart. The differences in the designs point to a possible difference in the predictive role of belongingness. It could be that thwarted belongingness functions as a proximal predictor of suicidal ideation (as found in the current study), but that it plays less of a role as a distal predictor (as Lasgaard et al. found). Future research is needed to explore this intriguing possibility.

Prior studies have not explored the influence of suicidal thinking on interpersonal factors. The current study shows a reciprocal relationship between variables, whereby they both influence each other at future time points. We have discussed potential reasons why a reciprocal relationship may occur, such as the stigma associated with suicide, a desire for isolation during suicidal periods and feelings of worthlessness for considering suicide. However, qualitative assessments of how suicidal thinking affects other cognitions of patients may provide weight to these positions.

The second aim of the current study was to assess the relationship between suicidal ideation, interpersonal factors, and NSSI.

Figure 4. Cross-lagged panel analysis of suicidal ideation and burdensomeness on Day 1 (IDEATION 1, BURDEN 1), Day 2 (IDEATION 2, BURDEN 2), and Day 3 (IDEATION 3, BURDEN 3). Panels A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (\(^* p < .05\), \(** p < .001\)). See the online article for the color version of this figure.
Analyses indicated that all factors increased across the two days prior to the day of a NSSI event. Patients who engaged in NSSI during their stay reported significantly greater elevations in interpersonal adversity and suicidal ideation than patients who did not. Although suicidal ideation and interpersonal adversity did not significantly increase further following NSSI, both ideation and perceived burdensomeness remained heightened following an attempt. Therefore, high-risk periods develop within a day, and the elevated risk may be sustained following NSSI.

The current study also assessed the ability of suicidal ideation and interpersonal factors to predict NSSI. Although changes in perceived burdensomeness over 2 days were a significant predictor of NSSI, the inclusion of suicidal ideation accounted for a significant portion of this variance. Thus, NSSI behaviors may only arise when distress from interpersonal deficits is also sufficient to generate suicidal ideation. The findings are consistent with Joiner et al. (2012), who advocated a rise in suicidal ideation to be associated with an increase in the severity of NSSI. As previously discussed, this may be due to a mediating role of emotional regulation that may underlie both suicidal ideation and NSSI, regarded as mechanisms to reduce emotional distress (Nock & Prinstein, 2004; Weinberg & Klonsky, 2009). Indeed, notes from nursing staff regarding self-harm events indicate some incidences were preceded by emotionally distressing events (e.g., arguments with spouses and clinical staff). This is consistent with Turner et al. (2016), which found heightened interpersonal conflict on the days NSSI occurred. Also consistent was the finding that conflict did not significantly decrease on the day following NSSI, increasing the potential for a second incident. Alternatively, engaging in NSSI may also act as a method of practicing for a future suicide attempt in an absence of a capability to suicide (Joiner, 2005). Future studies should look to further explore the underlying mechanisms behind this relationship.

Figure 5. Cross-lagged panel analysis of suicidal ideation and thwarted belongingness on Day 1 (IDEATION 1, BELONG 1), Day 2 (IDEATION 2, BELONG 2), and Day 3 (IDEATION 3, BELONG 3). Panels A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (* p < .05, ** p < .001). See the online article for the color version of this figure.
Clinical and Theoretical Implications

The interpersonal theory of suicide (Joiner, 2005) suggests that heightened perceived burdensomeness and thwarted belongingness is associated with thoughts of suicide. This position is supported in the current study, with evidence of both factors predicting suicidal ideation on the next day. In addition, an interaction between interpersonal factors appeared to have a consistent reciprocal relationship with suicidal ideation. The theory, however, does not specify the feedback relationship that thoughts of suicide may have upon interpersonal cognitions and thus Figure 8 depicts the possible reciprocal relationships. Moreover, the current study has shown the value of short-term measurement of interpersonal factors and suicide risk. Doing so allows for an understanding of the proximal and dynamic relationships among the predictors of risk.

In terms of clinical implications, the current study indicates a need for more intensive assessment of suicide and interpersonal factors within psychiatric settings. Changes in either factor may create a feedback loop, whereby risk factors and thoughts of suicide may drive each other. This is particularly problematic when not detected early, and rumination of suicide and interpersonal adversity occurs for prolonged periods of time. Clinical intervention may therefore be important in disrupting this process by targeting perceptions of burden and a lack of belonging. Findings also suggest that interpersonal factors are a significant predictor of suicidal ideation on the next day. Although only weak effects were found, this still provides valuable information in the prediction of a complex phenomenon and improves the ability to detect imminent fluctuations in suicidal ideation.

NSSI has been acknowledged as a stepping stone to acquiring the capability to engage in more severe suicidal behaviors (Joiner, 2005). However, the limited ability to predict NSSI events means even within a well-monitored psychiatric facility an ability to overcome a fear of pain can gradually be acquired. The current study showed that in the lead up to a NSSI incident there is a growth in perceptions of interpersonal adversity and suicidal ideation. Predicting a NSSI event can be aided through consistent

Figure 6. Cross-lagged panel analysis of suicidal ideation and the interaction between perceived burdensomeness and thwarted belongingness on Day 1 (IDEATION 1, INTERACTION 1), Day 2 (IDEATION 2, INTERACTION 2), and Day 3 (IDEATION 3, INTERACTION 3). Panels A and B represent results for low and high ideation groups, respectively. All correlations are shown, with significant correlations asterisked and boldfaced (*p < .05, **p < .001). See the online article for the color version of this figure.
monitoring over time to identify when there is sufficient deterioration in a patient’s clinical progress. Enhanced monitoring of deteriorating patients can help prevent early NSSI events. As perceived burdensomeness and suicidal ideation remained high following NSSI, there is also a need to enhance supervision to ensure further events do not occur. In the longer term, clinical interventions may aim to improve a patient’s coping mechanisms when experiencing significant emotional distress to prevent incidences of suicidal ideation and NSSI.

Directions for Future Studies and Limitations

The use of a tailored questionnaire delivery system, such as the one used in the present study, permitted questions about burdensomeness and belongingness to be asked of patients, but conditional upon the presence of ideation. This required patients to report some level of suicidal ideation to answer questions regarding their interpersonal circumstances. This design decision means that the present study cannot speak to the possibility that burdensomeness and belongingness may serve a different role among people who have not reported any suicidal ideation and this limitation could be addressed in future research. Otherwise, it provides information regarding a clinical sample that is at a heightened risk of desiring suicide and engaging in NSSI than the general population. It describes the mechanisms surrounding fluctuations in suicidal ideation and provides clinically useful information to assist patients who are more likely to require assistance.

The current study opted to assess patients every 24 hr for suicidal ideation and interpersonal deficits, although time between responses could occur over slightly shorter or longer periods. Approximately 80% of people completed the questionnaire in “working hours” between 8 a.m. and 5 p.m.; with a mean at 11:30 a.m. Importantly, most patients (71.1%) completed the questionnaire either on consecutive mornings or afternoons/evenings, and some switched from morning to

Table 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>W</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Intercept</td>
<td>-2.28</td>
<td>.23</td>
<td>98.68</td>
<td>.10***</td>
<td>[.86–1.48]</td>
</tr>
<tr>
<td></td>
<td>TB</td>
<td>.12</td>
<td>.14</td>
<td>.70</td>
<td>1.12</td>
<td>[.86–1.48]</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>.97</td>
<td>.33</td>
<td>8.68</td>
<td>2.64**</td>
<td>[.139–5.05]</td>
</tr>
<tr>
<td>Step 2</td>
<td>Intercept</td>
<td>-2.28</td>
<td>.23</td>
<td>98.63</td>
<td>.10***</td>
<td>[.29–3.94]</td>
</tr>
<tr>
<td></td>
<td>TB</td>
<td>.07</td>
<td>.67</td>
<td>.01</td>
<td>1.07</td>
<td>[.26–22.94]</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>.89</td>
<td>1.15</td>
<td>.60</td>
<td>2.43</td>
<td>[.26–22.94]</td>
</tr>
<tr>
<td></td>
<td>Interaction (TB × PB)</td>
<td>.15</td>
<td>1.98</td>
<td>.01</td>
<td>1.16</td>
<td>[.02–56.39]</td>
</tr>
<tr>
<td>Step 3</td>
<td>Intercept</td>
<td>-2.42</td>
<td>.27</td>
<td>81.25</td>
<td>.09***</td>
<td>[.36–6.97]</td>
</tr>
<tr>
<td></td>
<td>TB</td>
<td>.46</td>
<td>.76</td>
<td>.37</td>
<td>1.58</td>
<td>[.26–47.12]</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>1.25</td>
<td>1.33</td>
<td>.88</td>
<td>3.48</td>
<td>[.00–21.02]</td>
</tr>
<tr>
<td></td>
<td>Interaction (TB × PB)</td>
<td>-1.29</td>
<td>2.21</td>
<td>.34</td>
<td>.27</td>
<td>[.00–21.02]</td>
</tr>
<tr>
<td></td>
<td>Suicidal ideation</td>
<td>1.57</td>
<td>.34</td>
<td>20.76</td>
<td>4.79***</td>
<td>[2.44–9.40]</td>
</tr>
</tbody>
</table>

Note. W = Wald statistic; OR = odds ratio; CI = confidence interval; TB = Thwarted Belongingness; PB = Perceived Burdensomeness.

** p < .01. *** p < .001.
afternoon/evening (15%) or vice versa (13.9%). Hence, although people could complete the questionnaire at any time during the day, there was reasonable consistency from day to day. A balance between providing a degree of freedom in response times and utilizing stringent assessment protocols to minimize potential measurements error should be weighed up in future studies.

Although the daily assessments used in the current study were not as frequent as Kleiman et al. (2017), it allowed for data to be gathered for a greater number of patients. As a result, important interactions could be assessed, and several effects determined. However, more frequent assessments may prevent short-term fluctuations in suicide from being missed. In addition, it may also allow for assessments of interpersonal changes closer to the occurrence of a change in suicidal desire. In addition, there was not a standard time for patients to complete questionnaires, as they were allowed to complete them at their own discretion. Future studies should look to determine an optimal balance between the amount of detail, frequency of measurement, and sample size.

The current study opted to assess only burdensomeness and belongingness due to limitation in the number of questionnaire items that could be implemented into daily assessment. Thus, there were elements of the interpersonal theory of suicide that were not included. For instance, hopelessness is suggested to mediate the relationship between interpersonal factors and suicidal ideation. Future studies could look to assess whether an interaction between perceived burdensomeness, thwarted belongingness and hopelessness is a significant driver of future suicidal ideation. Although recent studies have identified that changes in acquired capability can occur within short periods of time (Wadman et al., 2017), the extent to which they interact with changes in interpersonal deficits to heighten risk of NSSI and suicide attempts is a task for future research.

In conclusion, the current study provides one of the first assessments of the short-term reciprocal relationships between the interpersonal factors of belongingness and burdensomeness on the one hand and suicidal ideation on the other. Findings suggest a reciprocal causal relationship between suicidal thoughts and interpersonal risk factors. In addition, it was the first to assess the relationship between suicidal thinking, interpersonal factors and NSSI. Results indicate that suicidal ideation was a significant predictor of a future NSSI attempt. This sets the groundwork for future studies which can look to conduct more proximal assessments of suicide risk. Doing so will allow for a greater understanding of how other factors drive suicide risk. By attempting to understand why sudden short-term fluctuations in suicidal thoughts occur, clinicians can be aided in predicting and preventing suicide attempts.

References


Received September 26, 2017
Revision received March 9, 2018
Accepted March 12, 2018

---

**E-Mail Notification of Your Latest Issue Online!**

Would you like to know when the next issue of your favorite APA journal will be available online? This service is now available to you. Sign up at [https://my.apa.org/portal/alerts/](https://my.apa.org/portal/alerts/) and you will be notified by e-mail when issues of interest to you become available!