The Relationship between Non-Suicidal Self-Injury and Suicidal Ideation: The Role of Emotion Reactivity and Negative Problem Orientation

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THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND SUICIDAL IDEATION: THE ROLE OF EMOTION REACTIVITY AND NEGATIVE PROBLEM ORIENTATION

By

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A DISSERTATION

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THE RELATIONSHIP BETWEEN NON-SUICIDAL SELF-INJURY AND SUICIDAL IDEATION: THE ROLE OF EMOTION REACTIVITY AND NEGATIVE PROBLEM ORIENTATION

By Victoria E. Quiñones

Dissertation Advisor: Dr. Emily A. P. Haigh


Research suggests that non-suicidal self-injury (NSSI) precedes and increases risk for suicidal thoughts and behaviors, but the reasons for this are not understood (Hamza et al., 2012). The trajectory from NSSI to suicidal thoughts and behaviors likely reflects a complex interaction of emotional, cognitive, and physiological factors. Indeed, research indicates that the way individuals react to emotional experiences (i.e., emotion reactivity) and approach problem solving confers risk for NSSI and suicidal thoughts and behaviors. The current study proposed an integrated model to test whether emotion reactivity (self-report and electrodermal activity) mediates the relationship between NSSI history and suicidal ideation (SI), and whether a maladaptive approach to problem solving (i.e., negative problem orientation) moderates this relationship. One hundred six adults and college students completed the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007), and self-report questionnaires including the Emotion Reactivity Scale (ERS; Nock et al., 2008), the Social Problem Solving Inventory-Revised (SPSI-R; D’Zurilla et al., 2002), and the Beck Scale for Suicidal Ideation (BSS; Beck & Steer, 1991). Participants then completed a baseline task (neutral video), participated in a social
stress task (i.e., Cyberball; Williams & Jarvis, 2006), completed a recovery task (neutral video) and participated in a positive mood induction. Electrodermal activity was recorded throughout the paradigm. Participants were emailed 6-8 weeks after Session 1 to complete the BSS again. Results showed that individuals in the NSSI/high SI group endorsed greater emotion reactivity than individuals in the NSSI/low SI group, but did not differ in negative problem orientation. Individuals with an NSSI history endorsed greater emotion reactivity and negative problem orientation than individuals without an NSSI history, but did not differ in electrodermal reactivity. The proposed moderated mediation model was not significant.

Overall, results suggest that self-reported emotion reactivity, but not physiological reactivity, contributes to SI among individuals with an NSSI history. Negative problem orientation may increase vulnerability for SI uniquely among individuals without an NSSI history. Future research should examine whether a more potent stress task would reveal group differences in skin conductance reactivity. Finally, replication using a larger sample size is needed.
DEDICATION

I dedicate this dissertation to my parents, who have provided endless support and unconditional love throughout my life. Thank you for teaching me very early on the importance of working hard and learning as much as possible. You two have always inspired me and I could not have done this without your love and support.
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TABLE OF CONTENTS

DEDICATION..............................................................................................................iii

ACKNOWLEDGEMENTS..........................................................................................iv

LIST OF TABLES........................................................................................................xi

LIST OF FIGURES.......................................................................................................xiv

Chapter

1. INTRODUCTION....................................................................................................1

NSSI Overview..........................................................................................................3

Prevalence.................................................................................................................3

Age...............................................................................................................................4

Gender..........................................................................................................................5

Race/Ethnicity..............................................................................................................7

Sexual Orientation...................................................................................................8

Functions of NSSI....................................................................................................9

The Relationship between NSSI and Suicide .........................................................11

NSSI and Increased Risk for Suicidal Thoughts and Behaviors.........................13

Emotion Reactivity...................................................................................................15

Emotion Reactivity and NSSI...............................................................................17

Emotion Reactivity and Suicide.............................................................................18

Emotion Reactivity, NSSI, and Suicide.................................................................19

Social Problem Solving.........................................................................................22

Social Problem Solving and NSSI..........................................................................23
Social Problem Solving and Suicide .............................................. 24
Problem Solving as a Moderator between
Emotion Reactivity and Suicide ............................................... 28
Problem Solving as a Moderator between
NSSI and Suicide .................................................................. 29
Electrodermal Activity ................................................................ 31
Electrodermal Activity and NSSI ............................................... 32
Electrodermal Activity and Suicide .......................................... 33
Electrodermal Activity, NSSI, and Suicide .............................. 36
Overview and Statement of Purpose ....................................... 38
Research Hypotheses ............................................................... 43

2. METHODS AND PROCEDURES ............................................. 47
Participant Recruitment ......................................................... 47
Undergraduate Subject Pool Recruitment ........................... 47
Community Recruitment ......................................................... 47
Study Criteria ........................................................................... 48
Experimenters ......................................................................... 48
Prescreen Measure ................................................................. 49
Self-Harm Behaviors Questionnaire (SHBQ) ....................... 49
Structured Clinical Interview ............................................... 49
The Self-Injurious Thoughts and Behaviors Interview (SITBI) ... 49
Questionnaire Measures ......................................................... 50
Demographic Information………………………………………..50
Beck Scale for Suicidal Ideation (BSS)…………………………50
Emotion Reactivity Scale (ERS)…………………………………51
Social Problem Solving Inventory – Revised (SPSI-R)………..52
Positive and Negative Affect Schedule – Expanded Form
(PANAS-X).............................................................................52
Visual Analogue Scale (VAS).................................................53
Physiological Measure..........................................................54
Electrodermal Activity (EDA).................................................54
Experimental Task..............................................................55
Cyberball..............................................................................55
Procedure............................................................................56
Session 1............................................................................56
Session 2............................................................................60
3. RESULTS........................................................................63
Descriptives........................................................................64
Reliability............................................................................70
Preliminary Analyses..........................................................71
Manipulation Check............................................................73
Hypothesis 1.......................................................................79
Hypothesis 2.......................................................................79
Hypothesis 3.......................................................................80
Hypothesis 4.......................................................................81
Appendix D: Counseling Resources

Appendix E: Recruitment Emails

Appendix F: Session One Compensation Schedule

Appendix G: Session One Consent Forms

Appendix H: Session One Questionnaires

Appendix I: Session One Suicide Risk Assessment

Appendix J: Session One Debriefing Form

Appendix K: Session Two Invite

Appendix L: Session Two Consent Form

Appendix M: Session Two Measure of Suicidal Ideation

Appendix N: End of Study Message for Participants

Appendix O: Post-Session 2 Emails

BIOGRAPHY OF THE AUTHOR
LIST OF TABLES

Table 1. Study Procedure Chart ......................................................... 62
Table 2. Demographic Descriptive Statistics ........................................ 66
Table 3. Age by NSSI History ............................................................... 67
Table 4. Race/Ethnicity by NSSI Group ............................................... 68
Table 5. Marital Status by NSSI Group ............................................... 68
Table 6. Education Level by NSSI Group ............................................ 69
Table 7. Gender by NSSI Group ......................................................... 70
Table 8. Descriptive Statistics of Self-Report Measures .......................... 71
Table 9. Correlations between Study Variables ..................................... 72
Table 10. Correlations between Study Variables by NSSI History .............. 73
Table 11. Descriptive Statistics for Session 1 Mood Measures ................. 74
Table 12. Descriptive Statistics for Session 1 Mood Measures by NSSI History ................................................................. 75
Table 13. Descriptive Statistics for Session 1 Mood Measures within NSSI Group ................................................................. 76
Table 14. Descriptive Statistics for Change in Session 1 Mood Measures by NSSI History ................................................................. 77
Table 15. Descriptive Statistics for Change in Session 1 Mood Measures within NSSI Group ................................................................. 78
Table 16. Descriptive Statistics for Session 1 SCL ................................... 79
Table 17. Group Differences in Emotion Reactivity and Negative Problem Orientation by NSSI History ......................................................... 80
Table 18. Differences in Emotion Reactivity and Negative Problem Orientation within NSSI Group……………………………………….82

Table 19. Group Differences in Baseline Skin Conductance Level and Skin Conductance Reactivity by NSSI History…………………………………….83

Table 20. Differences in Baseline Skin Conductance Level and Skin Conductance Reactivity within NSSI Group……………………………………...86

Table 21. Baseline Suicidal Ideation as a Moderator between NSSI History and Skin Conductance Reactivity…………………………………….....88

Table 22. Emotion Reactivity as a Mediator between NSSI and Baseline Suicidal Ideation, and Negative Problem Orientation as a Moderator between Emotion Reactivity and Baseline Suicidal Ideation………………………………………………………..………....90

Table 23. Emotion Reactivity as a Mediator between NSSI and Suicidal Ideation at 6-8 Week Follow-up, and Negative Problem Orientation as a Moderator between Emotion Reactivity and Suicidal Ideation at 6-8 Week Follow-up…………………………………………………….92

Table 24. Skin Conductance Reactivity as a Mediator between NSSI and Baseline Suicidal Ideation, and Negative Problem Orientation as a Moderator between Skin Conductance Reactivity and Baseline Suicidal Ideation…………………………………………………….94
Table 25. Skin Conductance Reactivity as a Mediator between NSSI and Suicidal Ideation at 6-8 Week Follow-up, and Negative Problem Orientation as a Moderator between Skin Conductance Reactivity and Suicidal Ideation at 6-8 Week Follow-up.................................96

Table 26. Correlations between Skin Conductance Reactivity and Suicidal Ideation at Baseline and at 6-8 Week Follow-Up.................................97

Table 27. Correlations between Skin Conductance Reactivity and Suicidal Ideation at Baseline and at 6-8 Week Follow-Up by NSSI Group...........98
LIST OF FIGURES

Figure 1. The Pathway from NSSI to Suicide.............................................14
Figure 2. Expected Mediation.................................................................22
Figure 3. Problem Solving as a Moderator between NSSI History and
           Suicidal Thoughts and Behaviors...............................................30
Figure 4. Expected Mediation.................................................................38
Figure 5. Expected Moderation Model for Hypothesis 7..............................44
Figure 6. Expected Moderated Mediation Model for Hypothesis 8...............45
Figure 7. Expected Moderated Mediation Model for Hypothesis 9..............45
Figure 8. Sensor Placement.................................................................55
Figure 9. Group Differences in Skin Conductance Reactivity for Each
           Minute of Ostracism by NSSI History........................................84
Figure 10. Group Differences in Skin Conductance Reactivity for Each
           Minute of Ostracism within NSSI Group.......................................87
CHAPTER ONE

INTRODUCTION

Suicide, the intentional act of inflicting harm on oneself with the intention of ending one’s life, is responsible for approximately 800,000 deaths each year (WHO, 2020). Suicide is also the second leading cause of death among individuals who are 15-29 years of age, and for each suicide, many more individuals think about and engage in self-injury (CDC, 2020; WHO, 2020). From 1999 to 2016, suicide rates have increased in almost every state (CDC, 2020). Self-injurious thoughts and behaviors typically precede and increase risk for suicide (Nock et al., 2008; Nock & Favazza, 2009; Prinstein et al., 2008).

Self-injurious thoughts and behaviors is an umbrella term, which refers to a range of experiences in which people either think about or engage in a behavior in order to injure themselves. These types of behaviors are classified as either suicidal or non-suicidal self-injurious thoughts and behaviors and are thought to differ in function and in lethality. Suicidal self-injurious thoughts and behaviors are defined as thoughts about or engagement in self-destructive behavior with suicidal intent. This includes suicidal ideation, suicide plans, preparatory acts, or suicide attempts. Suicidal ideation refers to suicidal thoughts that may be fleeting or may occur for long periods of time. Suicide plans are thoughts about how someone may engage in suicidal behavior, which includes plans about one’s suicide method or time frame. Preparatory acts refer to behaviors that an individual engages in to get ready for a suicide attempt, while suicide attempts are self-injurious behaviors that an individual initiates with intent to die. These behaviors may include suicide attempts that were interrupted (i.e., a suicide attempt in which the
individual takes steps toward making the attempt but was then stopped by someone else) or aborted (i.e., when an individual has suicide intent but changes their mind before carrying out the suicidal act) (Haigh & Quinones, 2017; Nock & Favazza, 2009; Nock et al., 2008).

Non-suicidal self-injurious (NSSI) thoughts and behaviors refer to thoughts and behaviors about hurting oneself without the intent to die. This may include suicide threats/gestures, and thoughts and acts of NSSI (Haigh & Quinones, 2017; Nock & Favazza, 2009; Nock et al., 2008). Suicide threats/gestures are described as making threats to commit suicide when one does not have intent to die by suicide, or doing something to lead someone to believe that one wants to commit suicide in order to communicate with others. Thoughts and acts of NSSI include thoughts about engaging in NSSI or engaging in some other non-lethal form of self-injurious behavior without suicidal intent (Haigh & Quinones, 2017; Martinson, 2007; Nock & Favazza, 2009; Nock, Holmberg, Photos & Michel, 2007; Nock et al., 2008).

It is necessary to assess for and differentiate between different types of self-injurious behaviors since these behaviors often precede and increase risk for suicide (Nock et al., 2008; Nock & Favazza, 2009; Prinstein et al., 2008). Indeed, suicide attempts are among the strongest risk factors for eventual suicide, and NSSI often precedes and increases risk for suicidal thoughts and behaviors. The mechanisms that account for the trajectory from NSSI to suicide are unclear. Factors that are associated with both NSSI and suicide thoughts and behaviors may hold important clues. More specifically, research has determined that specific emotional (i.e., emotion reactivity), cognitive (i.e., maladaptive social problem solving), and physiological factors (i.e.,
electrodermal activity) are independently related to NSSI and suicidal ideation. The goal of the current study was to examine the interaction of these specific factors among a sample of individuals with or without a history of NSSI in the prediction of suicidal ideation over time. The following section will provide an overview of NSSI, including the prevalence of NSSI, the proposed functions of NSSI, and how it may increase risk for suicidal thoughts and behaviors.

**NSSI Overview**

NSSI, a prominent risk factor for suicidal thoughts and behaviors, is highly prevalent among young adults (Nock & Prinstein, 2004) and therefore a major public health concern (Nock & Favazza, 2009; Prinstein et al., 2008). NSSI behaviors range in lethality and severity and include behaviors such as skin cutting, wound picking, self-hitting, skin picking, and more. NSSI is a dangerous behavior, as it may result in serious injury or hospitalization, and is highly comorbid with many psychological disorders. Studies have shown that NSSI is often comorbid with Major Depressive Disorder [MDD], Borderline Personality Disorder [BPD], anxiety disorders, Post-Traumatic Stress Disorder [PTSD], substance use disorders, dissociative disorders, and Schizophrenia (Briere & Gil, 1998; Favazza, 1998; Haw, Hawton, Houston & Townsend, 2001; Klonsky, Oltmanns, & Turkheimer, 2003; Linehan, 1993). A better understanding of how NSSI increases risk for suicide is needed to inform intervention and prevention strategies to reduce suicidal thoughts and behaviors.

**Prevalence**

The prevalence of NSSI was examined in a survey of 439 adults in the US aged 19 to 92 years (Klonsky, 2011). The lifetime prevalence of NSSI was 5.9%, and the 12-
month prevalence rate was 0.9%. Among the adults surveyed, 3.2% endorsed a history of engaging in self-injury 1 to 4 times, 1.4% reported engaging in NSSI 5 to 9 times, and 1.3% endorsed engaging in NSSI ≥ 10 times. Approximately 14-17% of young adults have reported engaging in NSSI in their lifetime (Serras, Saules, Cranford, & Eisenberg, 2010; Whitlock, Eckenrode, & Silverman, 2006). In addition, many community-based studies have examined prevalence rates in adolescence and report that 15-20% of adolescents endorse a lifetime history of NSSI (Heath, Schaub, Holly, & Nixon, 2009). Systematic reviews suggest that the prevalence of NSSI has not significantly changed over time, but has remained stable (Muehlenkamp, Claes, Havertape & Plener, 2012; Swannell, Martin, Page, Hasking, & St. John, 2014). Specifically, Swannell et al. (2014) conducted a systematic review, meta-analysis, and meta-regression guided by the PRISMA Protocol and Cochrane guidelines and found that although differences in prevalence initially emerged in adjusted analyses between 1990 and 2012, once methodological factors (i.e., response format, number of NSSI methods specified, incentive for participating, anonymity, mode of measurement, and research focus) were statistically controlled, prevalence rates were no longer significantly different throughout those years. Similarly, Muehlenkamp et al. (2012) conducted a systematic review to examine the prevalence of NSSI in adolescents between 2005 and 2011 and found that the percentage of adolescents endorsing a history of NSSI was slightly higher in 2011 compared to 2005, but the prevalence rates appear to have stabilized during that time period.

**Age.** The age of onset of NSSI typically occurs between ages 14 and 24 (Klonsky, 2007). Research examining the risk factors for NSSI in adolescents and adults has found
that most participants retrospectively reported engaging in NSSI in the middle adolescent years, with behavior declining in early adulthood (Wan, Xu, Chen, Hu & Tao, 2015). In order to further examine this, Plener, Schumacher, Munz and Groschwitz (2015) conducted a systematic review of studies including longitudinal data about NSSI and deliberate self harm. In the investigations examining prevalence of NSSI specifically, they found that studies examining NSSI in younger adolescents were more likely to show increases in rates of NSSI over time, whereas studies that examined prevalence in older adolescents and young adults were more likely to show decreases in rates of NSSI over time. This suggests that younger adolescents tend to report higher prevalence rates of NSSI, and thus may be a group that is at particularly high risk for engaging in this behavior.

**Gender.** Research is unclear regarding whether there are gender differences in the prevalence of NSSI. Some research suggests that in adolescence, females tend to report higher rates of NSSI compared to males. In a large survey study, gender differences in the prevalence of NSSI among 7,126 high school students (approximately evenly split by gender) in the Kansas City metropolitan area were examined (Sornberger, Heath, Toste & McLouth, 2012). Results revealed that female adolescents were more likely to report having “frequently” engaged in NSSI compared to males. However, male and female adolescents did not significantly differ on their endorsement of engaging in NSSI “only once,” or engaging in NSSI “a few times.” Similarly, in an internet-based survey conducted among a random sample of 8,300 undergraduate and graduate students drawn from a random 8-college sample, women were more likely than men to have repeatedly engaged in NSSI (Whitlock et al., 2006). Of note, this sample contained significantly
more females than the student population from which they were drawn, so it is possible that these results were skewed.

In contrast, other research has failed to detect gender differences in the prevalence of NSSI. In a study examining risk factors for NSSI among a predominantly female sample of 540 high school students, no gender differences in NSSI were found (Muehlenkamp & Gutierrez, 2007). However, the predominantly female sample may have contributed to these null results. Findings from a random-digit dialing sample of 439 US-based adults reported similar prevalence rates of NSSI among men and women (Klonsky, 2011). In this study, there was a greater percentage of female participants as well. Finally, a systematic review of 53 studies failed to find support for gender differences in the prevalence of NSSI (Cipriano, Cella, & Cotrufo, 2017). It has been suggested that the overrepresentation of women in the majority of studies of NSSI may confound findings that there are gender differences in NSSI. However, as reviewed, the literature is mixed with some studies reporting gender differences in samples in which females are not overrepresented (Sornberger et al., 2012), and other studies failing to find gender differences in samples in which women are overrepresented (Klonsky, 2011).

Additional large-scale epidemiological studies where males and females are equally represented are needed to clarify whether there are gender differences in NSSI.

Research has revealed a clear gender difference in the methods used for NSSI (Sornberger et al., 2012; Whitlock et al., 2006). Sornberger et al. (2012) found that while females were more likely to cut and scratch their arms and legs, male adolescents were more likely to bang their head, punch and burn themselves, and self-injure their chest and face. Whitlock et al. (2006) found that among university students, females were also
significantly more likely to pinch themselves and injure their thighs, while males were more likely to injure their hands, for example by punching objects in order to injure themselves. Future studies on the prevalence of NSSI should continue to assess for gender differences in NSSI methods and locations to ensure an accurate account of prevalence rates.

**Race/Ethnicity.** Few studies have examined ethnic/racial differences in the prevalence of NSSI, and research conducted thus far is inconclusive. A few studies have failed to find any ethnic/racial differences in NSSI (Croyle, 2007; Klonsky, 2011; Serras et al., 2010; Wilcox et al., 2012). A survey of 5,689 university students representing various ethnic groups did not reveal any significant ethnic differences in self-reported history of NSSI within the past year (Serras et al., 2010). Croyle (2007) found that NSSI prevalence in the last year did not differ between Hispanic (predominantly Mexican American) and non-Hispanic White university participants (total $N = 442$). Klonsky (2011) utilized a random-digit dialing sample of 439 adults in the US, and did not find differences either in past year or lifetime history of NSSI. Similarly, Wilcox et al. (2012) administered a survey to university students in the mid-Atlantic region of the USA and did not find ethnic group differences in past-year NSSI history. Of note, this sample was not representative given that they oversampled students with a history of illicit drug use.

Other research has found that minority students report less engagement in NSSI compared to white students (Chesin, Moster & Jeglic, 2013; Gratz, 2006; Gratz & Roemer, 2008). Among a diverse sample of 709 emerging adult (i.e., individuals in late adolescence, ages 18-25) undergraduate students, White participants did not differ from Asian participants; however, both groups endorsed significantly higher rates of clinically
significant NSSI (i.e., at least 5 lifetime occurrences of NSSI) compared to Black and Hispanic emerging adults (Chesin et al., 2013). In order to determine whether there are racial/ethnic differences in NSSI prevalence rates, additional research with larger racially/ethnically diverse samples is necessary. Future research should also distinguish between clinically significant and non-clinically significant NSSI, which may lead to firmer conclusions about racial/ethnic differences in the prevalence of NSSI.

**Sexual Orientation.** Recent research suggests that individuals who identify as gay/lesbian, bisexual, or are questioning their sexuality are more vulnerable to NSSI behaviors as evidenced by higher prevalence of NSSI behaviors for these individuals (Batejan, Jarvi, & Swenson, 2015). In a meta-analysis of eleven published and four unpublished studies that examined the relationship between sexual orientation and risk for NSSI, sexual minorities were three times more likely to engage in NSSI, compared to their heterosexual counterparts. More specifically, individuals who identified as bisexual were the most likely to engage in NSSI, while individuals who identified as questioning or did not endorse a specific sexual orientation (i.e., endorsed “other”), were more likely to engage in NSSI than individuals who identified as gay or lesbian. Research has suggested that bisexual individuals may be at particularly high risk because bisexual individuals may experience a lack of support from both the heterosexual and gay/lesbian communities, contributing to a “doubly stigmatized identity” (Ross, Dobinson, & Eady, 2010, p. 501). It has been speculated that those who are questioning their sexual orientation are at higher risk for NSSI due to the stress associated with having an undetermined aspect of their identity (i.e., sexual orientation) (Batejan et al., 2015).
Functions of NSSI

Although there are likely many reasons why individuals engage in NSSI, four commonly endorsed functions have been studied (Nock & Prinstein, 2004). Specifically, it has been proposed that individuals engage in NSSI to reduce tension and decrease negative feelings/emotional states (i.e., automatic-negative reinforcement). For others, they may engage in NSSI because it produces a more desirable physiological state (i.e., automatic-positive reinforcement), such as engaging in self-harm to elicit a particular emotion. Yet another reason for engaging in NSSI might be to escape from one’s internal task demands (i.e., social negative reinforcement). In other words, an individual may engage in self-harm to avoid doing something that one does not want to do, or to avoid being punished by others. Finally, it has been theorized that NSSI functions to facilitate social positive reinforcement. In this sense, one may engage in NSSI to gain access to specific materials or attention; for example, to signal they are unhappy and elicit a reaction from others.

Psychometric research has provided support for the four-factor functional model of NSSI. Nock and Prinstein (2004) conducted a confirmatory factor analysis (CFA) of the Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997) questionnaire in a sample of 108 adolescent inpatients. The FASM was originally developed to examine the function, methods, and frequency of NSSI. Results revealed that the theoretically derived four-factor model fit the data. Although there were more parsimonious models (one-factor, two-factor, and three-factor models), the four-factor model was retained given its theoretical significance. This four-factor model has been independently confirmed in a US-based community sample of 633 adolescents (Lloyd-
Richardson, Perrine, Dierker, & Kelley, 2007), and in a community sample of 3,097 Swedish adolescents (Dahlstrom, Zetterqvist, Lundh, & Svedin, 2015).

Independent support for a three-factor solution (Young, Sproeber, Groschwitz, Preiss, & Plener, 2014) has also been found. Young et al. (2014) conducted principal components (varimax) analysis in a sample of 452 15-year-old German school students, which yielded a three-factor solution. The three factors were labeled 1) interpersonal influence and communication (e.g., “to receive more attention from your parents or friends”), 2) automatic functions (e.g., “to stop bad feelings”), and 3) peer avoidance-attraction (e.g., “to feel more a part of a group”). Dahlstrom et al. (2015) also found that a three-factor model consisting of the following factors: social influence, automatic functions, and nonconformist peer identification fit the data. Kaess et al. (2013) found support for a three-factor solution (i.e., interpersonal influence, automatic functions, and peer identification) in a sample of 13-26 year old German psychiatric inpatients.

Although the four-factor model has been influential and is theoretically sound, Klonsky, Glenn, Styer, Olino, and Washburn (2015) highlight several limitations of the four-factor structure. They pointed out that Nock and Prinstein’s (2004) small sample size may have been associated with reduced power to detect differences in model fit among competing models. Some of the correlations between the factors were relatively high, which suggests that they may actually represent the same latent factor (e.g., the Social Positive and Social Negative functions correlated at .78), and the automatic-negative function consists of only two items, which may impact reliability and replicability. Finally, they argued that a data-driven exploratory factor analysis (EFA) of
the four-factor model could potentially offer a more accurate way to identify the latent independent constructs.

In a sample of patients seeking treatment for NSSI, Klonsky et al. (2015) conducted an EFA, using two measures of functions of NSSI: the Inventory of Statements About Self-Injury (ISAS; Klonsky & Glenn, 2009) and the FASM (Lloyd et al., 1997). They found that a two-factor model fit the data well. The two factors were labeled Social functions (e.g., influencing others, facilitating peer-bonding), and Intrapersonal functions (e.g., reducing negative emotions, ending dissociative experiences).

Regardless of whether researchers have proposed two, three, or four factor functional models of NSSI, the functions have consistently reflected both intrapersonal and interpersonal functions, and many studies have found that intrapersonal functions are more commonly endorsed (Dahlstrom et al., 2015; Kaess et al., 2012; Klonsky & Glenn, 2009, Klonsky et al., 2015; Nock & Prinstein, 2004).

**The Relationship between NSSI and Suicide**

Several theories have been proposed to explain the relationship between NSSI and suicide (Hamza, Stewart & Willoughby, 2012). The most prominent theories include the Gateway Theory of Suicide (Hamza et al., 2012), Joiner’s Theory of Acquired Capability for Suicide (2005), the Third Variable Theory (Hamza et al., 2012), and an Integrated Model (Hamza et al., 2012). The Gateway Theory of Suicide proposes that NSSI and suicidal behaviors (i.e., suicide attempts), are similar in that both behaviors involve intentional self-harm. As individuals tend to engage in NSSI at younger ages than individuals who engage in suicidal behaviors, it has been suggested that these behaviors exist along a continuum of self-injurious behaviors (Ougrin et al., 2012). It is theorized
that NSSI serves as a gateway to engaging in more lethal self-injurious behaviors, and over time, self-injurious behaviors become more severe and lethal (i.e., they progress from NSSI to suicide attempts).

Joiner’s Acquired Capability for Suicide (Joiner, 2005) is similar to the Gateway Theory of Suicide, in that this theory also proposes that NSSI precedes suicidal behaviors (Hamza et al., 2012). However, Joiner’s Theory extends the Gateway Theory by proposing that individuals who engage in NSSI habituate to the pain associated with self-injury, and develop an acquired capability for suicide. Specifically, habituation to pain associated with self-injurious behaviors increases an individual’s ability to engage in more severe and lethal forms of self-injurious behaviors, like suicide attempts.

The Third Variable Theory (Hamza et al., 2012) suggests that the association between NSSI and more serious, lethal, suicidal behaviors is due to a random third variable. For example, psychological distress may be a potential third variable since extreme levels of psychological distress are associated with both NSSI and suicidal behaviors. Other examples include psychiatric diagnoses common among individuals who engage in NSSI or suicidal behaviors (e.g., MDD, BPD), or a genetic vulnerability that is common to individuals who engage in either behavior, such as carrying a gene that reduces serotonin uptake (i.e., short allele for 5-HTT).

Given that there is evidence in support of each of the theories, Hamza et al. (2012) proposed an integrated model, which specifies a direct path from NSSI to suicidal behaviors that is moderated by interpersonal distress. Specifically, the relationship between NSSI and suicidal behavior is greater under higher levels of interpersonal distress. In line with the Third Variable Theory, Hamza et al. (2012) identify shared risk
factors (e.g., psychological distress, psychiatric diagnoses of MDD or BPD, short allele for 5-HTT) for NSSI and suicidal behavior; however, they suggest that controlling for these factors does not eliminate the direct link between NSSI and suicidal behavior. Finally, consistent with Joiner’s (2005) theory, the integrated model includes an indirect path from NSSI to suicidal behavior through an acquired capability for suicide. An integrated model most likely best reflects the complexity involved in predicting risk for suicidal thoughts and behaviors.

**NSSI and Increased Risk for Suicidal Thoughts and Behaviors**

There is empirical support for each of the theories reviewed above, including strong evidence that a history of NSSI precedes and predicts suicidal thoughts and behaviors (Figure 1), which is in line with the Gateway Theory of Suicide (Hamza et al., 2012). Hamza and Willoughby (2016) examined the longitudinal association among NSSI, suicidal ideation, and suicide attempts in a sample of 940 emerging adults. Results showed that participants who had engaged in NSSI at baseline were 2.04 times more likely to experience suicidal ideation, and 3.46 times more likely to attempt suicide within 4 years. These results remained significant after baseline level of suicidal ideation and presence of a suicide attempt history were statistically controlled. Similarly, results from the Treatment of Resistant Depression in Adolescents (TORDIA) Study (N= 270), found that baseline NSSI significantly predicted suicide attempts at 24 week follow-up (Asarnow et al., 2011). Findings from the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT) found that baseline NSSI was associated with suicide attempts at 28-week follow-up (Wilkinson, Kelvin, Roberts, Dubicka & Goodyer, 2011).
Studies that have focused on the frequency of NSSI have generally found that more frequent NSSI is more strongly associated with suicidal thoughts and behaviors (Guan, Fox & Prinstein, 2012; Prinstein et al., 2008; Whitlock et al., 2013), which is in line with the Gateway Theory of Suicide. Whitlock et al. (2013) assessed whether specific frequencies of NSSI (i.e., once, 2-5 times, 6-20 times, and >20 times) predict future suicidal behaviors among a large sample (N=1,466) of university student participants. Among participants who reported no suicidal thoughts or behaviors at baseline, higher frequencies of NSSI predicted suicidal thoughts and behaviors at 3-year follow-up. Individuals who endorsed more than 20 incidents of NSSI and a history of mental health treatment had greatest risk for suicidal thoughts and behaviors at follow-up. In addition, Guan et al. (2012) examined the relationship among NSSI, suicidal ideation, and attempts in a community sample of rural high school students (N=399) and found that NSSI frequency predicted suicide attempts at 2.5-year follow-up. Specifically, each one-unit increase in history of NSSI predicted a sevenfold increase in suicidal ideation or attempt, even after controlling for baseline suicidal ideation and depressive symptoms. Finally, research has shown that greater NSSI frequency was associated with significantly lower suicidal ideation remission following discharge from the hospital (Prinstein et al., 2008).

Figure 1. *The Pathway from NSSI to Suicide*

*Note.* NSSI as a predictor of eventual suicide.
Taken together, the literature suggests that NSSI is particularly prevalent among young adults, and individuals who identify as gay/lesbian, bisexual or “questioning.” Additionally, individuals are most likely to endorse engaging in NSSI for intrapersonal functions (e.g., reducing negative emotions), and NSSI increases risk for suicidal thoughts and behaviors. Generally, research has focused on one or two variables in the prediction of suicidal thoughts and behaviors. Thus, an integrated model is necessary to examine the pathway from NSSI to suicide over time.

The present dissertation examined the interaction of emotion reactivity and social problem solving in the prediction of suicidal ideation among individuals with or without a history of NSSI. The following section will review theory and empirical research on emotion reactivity, as a risk factor for both NSSI and suicidal thoughts and behaviors.

**Emotion Reactivity**

Emotion reactivity, or the extent to which an individual is sensitive to emotions and experiences them intensely and persistently before returning to their normal level of arousal, is theorized to impact the relationship between NSSI and suicide (Nock et al., 2008). This differs from emotion dysregulation, which encompasses multiple ways of responding to negative affective states (i.e., non-acceptance of emotions, lack of understanding of emotions, difficulty modulating or controlling responses to distress, and being unwilling to experience negative affective states), rather than emphasizing one’s arousal or emotional reaction during stressful events (Glenn & Klonsky, 2010; Gratz & Roemer, 2004). Research has found support for an association between emotion reactivity and NSSI (Andover & Morris, 2014; Glenn, Blumental, Klonsky & Hajcak, 2011; Jacobson, Hill, Pettit & Grozeva, 2015; Jenkins & Schmitz, 2012; Kleiman,
Several theories have been proposed to account for the relationship between emotion reactivity and self-injurious behaviors including Marsha Linehan’s Theory of Emotion Dysregulation in BPD (1993) and Baumeister’s (1990) Escape Theory of Suicide. Linehan’s Theory of Emotion Dysregulation in BPD (1993) states that difficulties in emotion regulation precede self-injurious thoughts and behaviors. Emotion reactivity may predispose individuals to difficulties in emotion regulation, which in turn increases risk for NSSI and suicide (Nock et al., 2008). Since emotion reactivity is associated with deficits in emotion regulation and self-injurious behaviors may take place in other disorders besides BPD, Linehan’s (1993) Theory of Emotion Dysregulation in BPD may explain the relationship between emotional factors (i.e., emotion dysregulation and emotion reactivity) and NSSI.

According to the Escape Theory of Suicide (Baumeister, 1990), suicide may occur in the context of a stressful life event. In response to the stressful life event, the individual may become emotionally reactive to stress and may experience deficits in cognitive functioning due to this distress. As a result, the individual becomes motivated to escape the experience and themselves by attempting suicide. This theory may explain the relationship between emotion reactivity and suicide.
Emotion Reactivity and NSSI

The research on the relationship between emotion reactivity and NSSI is largely comprised of cross-sectional studies (Andover & Morris, 2014; Glenn et al., 2011; Jacobson et al., 2015; Jenkins & Schmitz, 2012; Kleiman et al., 2014; Nock et al., 2008; Zelkowitz et al., 2016). This body of research has provided evidence that individuals with a history of NSSI report engaging in NSSI to reduce tension (i.e., for automatic negative reinforcement). Nock and colleagues (2009) found that adolescents and young adults who reported feelings of rejection, self-hatred, anger toward oneself/another, and/or feeling numb/nothing increased the odds of engaging in NSSI. Further these negative affective states were also associated with suicidal ideation. Jenkins & Schmitz (2012) conducted a retrospective cross-sectional study of 84 undergraduates to examine the relationship between affect dysregulation and NSSI. Emotion reactivity was measured using the ERS (Nock et al., 2008), and positive and negative affect were measured using the PANAS (Watson, Clark & Tellegen, 1988), which was included as part of the Form and Function of Self-Injury Scale (FAFSI; Jenkins, Conner, & Alloy, 2011). In order to retrospectively assess for affect after engaging in NSSI, the instructions were modified, and participants were asked to indicate how they felt immediately after engaging in self-harm. Higher levels of emotion reactivity predicted increases in self-reported positive and negative affect after engaging in NSSI. Specifically experiencing positive affect after NSSI, but not negative affect, significantly predicted a greater lifetime frequency of NSSI.

Research has examined differences in emotion reactivity among individuals who engage in NSSI compared to individuals who do not engage in NSSI. Glenn et al. (2011) found that among 78 college students, those with a history of NSSI reported greater
emotional sensitivity, emotional arousal/intensity, and emotional persistence, measured by the ERS (Nock et al., 2008). Similarly, results from a cross-sectional study of 87 adolescents and young adults (Nock et al., 2008) found that individuals with a history of NSSI reported higher emotion reactivity than individuals without a history of NSSI. Further, emotion reactivity mediated the relationship between psychopathology and NSSI. In addition, results from another cross-sectional study of 379 undergraduate students found that emotion reactivity predicted NSSI, but not above and beyond the impact of emotion regulation (Zelkowitz et al., 2016).

**Emotion Reactivity and Suicide**

Research has found that emotion reactivity is also associated with depression, suicidal ideation, and behaviors. In a systematic review of neuropsychological and neuroimaging studies to examine dysfunctional cognitive processes in suicidal behavior, Jollant et al. (2011) found that individuals who have attempted suicide experience greater sensitivity to emotion-related stimuli. Similarly, in a cross-sectional study that examined the convergent and discriminant validity of the ERS (Nock et al., 2008), Evans et al. (2016) found that adolescents who reported a history of suicidal ideation endorsed higher levels of emotion reactivity than those who did not. While it was also found that emotion reactivity predicted suicidal ideation history, depressive symptoms accounted for this relationship. In a longitudinal study, Polanco-Roman, Moore, Tsypes, Jacobson and Miranda (2018) examined the relationship between emotion reactivity and suicidal ideation at 12-month follow-up. After controlling for suicidal ideation at baseline, depressive symptoms and discomfort expressing positive emotions mediated the relationship between emotion reactivity and suicidal ideation at 12-month follow-up.
Emotion Reactivity, NSSI, and Suicide

A smaller body of research has investigated the relationship between emotion reactivity, NSSI and suicide-related thoughts and behavior. Nock and colleagues (2009) conducted a 2-week Ecological Momentary Assessment (EMA) study of 30 adolescents and young adults to investigate the specific negative affective states that precede self-injurious behaviors. Results revealed that the same negative affective states (i.e., emotion reactivity) preceded both NSSI and suicidal ideation. However, compared to NSSI, participants endorsed a greater frequency of negative affective states prior to suicidal thoughts. This finding suggests that individuals experiencing suicidal ideation may experience greater emotion reactivity than individuals engaging in NSSI.

Using data from a large cross-sectional sample of 1,914 undergraduate students, Kleiman et al. (2014) examined whether emotion reactivity mediates the relationship between 1) depression and NSSI, and 2) depression and suicide attempt. Results showed that among women, emotion reactivity mediated both relationships. However, emotion reactivity did not mediate either of these relationships among men. Similarly, in another cross-sectional study, Nock et al. (2008) examined the relationships among psychopathology, emotion reactivity, and self-injurious behaviors (i.e., NSSI, suicide attempts, and suicidal ideation). Emotion reactivity mediated the relationship between psychopathology and NSSI, and psychopathology and suicidal ideation; however, emotional reactivity did not mediate the relationship between psychopathology and suicide attempts. These findings suggest that emotion reactivity may influence both NSSI and suicidal ideation, but its impact on suicide attempts is unclear.
To date, researchers have yet to directly investigate whether emotion reactivity mediates the relationship between NSSI and suicide. However, Liu, You, Ying, Li & Shi (2020) examined whether NSSI mediates the relationship between emotion reactivity and suicidal ideation in a cross-sectional study of adolescents in China. They found that NSSI did mediate the relationship between emotion reactivity and suicidal ideation, and also found that this relationship was moderated by self-efficacy. In another study, Anestis et al. (2014) examined whether NSSI mediates the relationship between emotion regulation and suicide attempts in three cross-sectional studies involving undergraduates (Study 1 $N = 1,317$; Study 2 $N = 706$) and adult inpatients (Study 3 $N = 93$). Results showed that a history of NSSI mediated the relationship between negative urgency (i.e., a component of emotion regulation, described as a tendency to act impulsively in response to a negative affective state), and lifetime suicide attempt history. The results of these studies suggest that emotional factors (i.e., emotion reactivity) may impact the relationship between NSSI and suicidal behaviors.

The factors that mediate the relationship between emotion reactivity and self-injurious behaviors (i.e., NSSI, suicidal ideation, and suicide attempts) have been examined in a cross-sectional sample of 94 adolescents and young adults (Najmi et al., 2007). The propensity to suppress unwanted thoughts was associated with the presence and frequency of NSSI, suicidal ideation, and suicide attempts. However, suppression mediated the relationship only between emotional reactivity and the frequency of NSSI and suicidal ideation.

While the previously reviewed studies provide consistent evidence for a relationship among emotion reactivity, NSSI, and suicidal ideation, more research is
needed to clarify the nature of this relationship. In general, there are only a few published studies in this area, and findings are largely based on mediation analyses in a cross-sectional sample, so causation cannot be inferred (Cole & Maxwell, 2003; Maxwell & Cole, 2007). Using mediation analyses in a cross-sectional sample is also not ideal since mediation, by definition, should be used to measure change over time. According to Maxwell and Cole (2007), mediation in a cross-sectional sample may produce estimates of longitudinal parameters that are biased and thus inaccurate. In addition, this research has largely relied upon self-report, and retrospective data—both of which are susceptible to social desirability and recall bias. Further, it is likely that our understanding of the trajectory from NSSI to suicidal ideation may be advanced by capturing the physiological responses that participants have in the context of emotional distress.

In summary, given that emotion reactivity is associated with both NSSI and suicidal behaviors, it is possible that this construct may mediate the progression from NSSI to suicidal thinking. Research has yet to examine whether emotion reactivity mediates the relationship between NSSI and suicidal thoughts and behaviors. The current project examined both a self-report and physiological measure of emotion reactivity to investigate whether emotion reactivity mediates the relationship between NSSI and suicidal ideation over time (Figure 2).
Figure 2: *Expected Mediation*

**Note.** Emotion reactivity as a mediator between NSSI and suicidal ideation.

In addition to emotion reactivity, social problem solving has been identified as an important risk factor for both NSSI and suicide that may impact the trajectory from NSSI to suicidal ideation. The following section will review the relevant research on social problem solving as it relates to NSSI and suicidal ideation.

**Social Problem Solving**

Social problem solving is a set of cognitive-behavioral processes related to the way an individual defines problems, identifies or discovers effective solutions, makes decisions, and implements solutions (D’Zurilla & Goldfried, 1971; D’Zurilla, Nezu, & Maydeu-Olivares, 2002). The extent to which one can effectively solve problems has a significant impact on all areas of functioning including mental well-being. Indeed, a large body of research shows that deficits in social problem solving are associated with depressive symptoms, NSSI, and suicidal thoughts and behaviors (Andrews, Martin, Hasking, & Page, 2014; D’Zurilla, Chang, Nottingham, & Faccini, 1998; Grover et al., 2009; Nock & Mendes, 2008; Pollock & Williams, 1998, 2004; Priester & Clum, 1993; Reinecke, DuBois, & Schultz, 2001; Rotheram-Borus, Trautman, Dopkins & Shrout, 1990; Sadowski & Kelley, 1993; Schotte & Clum, 1982, 1987; Speckens & Hawton,
Importantly, evidence also suggests that adaptive problem solving may be a protective factor against suicidal ideation (Quinones, Jurska, Fener, & Miranda, 2015; Schotte, Cools, & Payvar, 1990).

D’Zurilla and Nezu’s (1982; 1990) model of social problem solving has generated impressive amounts of research support. According to this model, social problem solving consists of problem orientation, or an individual’s appraisal of a problem, which may be negative (i.e., negative problem orientation [NPO]) or positive (i.e., positive problem orientation [PPO]). The social problem solving model also refers to problem solving skills, or the way an individual approaches understanding their problem and finding solutions. These skills include approaching problems in a rational way (rational problem solving style [RPS]), impulsive or careless way (impulsive/carelessness problem solving style [ICS]), or avoiding problems (avoidance problem solving style [AS]). In order to assess these different dimensions of problem solving, D’Zurilla and Nezu (1990) developed the Social Problem Solving Index (SPSI; D’Zurilla & Nezu, 1990) and published a subsequent revision (SPSI-Revised; D’Zurilla et al., 2002).

**Social Problem Solving and NSSI**

The theory that self-injurious behaviors are associated with problem solving deficits has generated a significant body of research (McAuliffe et al., 2006; McLaughlin, Miller, & Warwick, 1996). A major limitation of this work is that many studies have failed to distinguish between NSSI and suicidal self-injurious behaviors. The distinction between NSSI and suicide attempts is important because research suggests that self-injurious behaviors differ in terms of their function (Nock & Favazza, 2009; Nock et al.,
In the few studies that have distinguished self-injurious behaviors, NSSI is associated with problem solving deficits. For example, among a sample of adolescents and young adults, those with a history of NSSI reported lower levels of self-efficacy and generated more maladaptive problem solving solutions during a performance-based problem solving task than individuals without a history of NSSI (Nock & Mendes, 2008). In a large prospective study of 1,973 Australian adolescents, poor problem solving coping at baseline was associated with NSSI at 1-year follow-up (Andrews et al., 2014).

**Social Problem Solving and Suicide**

A large body of research supports an association between problem solving deficits and suicidal ideation and behaviors (Speckens & Hawton, 2005). According to the Diathesis-Stress Theory of Suicide (Schotte & Clum, 1982; 1987), an inability to solve problems in conjunction with cognitive rigidity, interacts with problem-related stress, to elicit hopelessness. Hopelessness, in turn, is thought to contribute to suicidal ideation and behaviors. To validate this theory, researchers have examined various components of social problem solving such as the number of solutions that individuals generate for given problems, the relevance of proposed solutions, how individuals appraise their problem solving ability, and whether they implement solutions.

In order to examine the relationship between problem solving deficits and suicidal thoughts and behaviors, research has examined differences in social problem solving between suicidal and non-suicidal individuals, and between individuals with and without a suicide attempt history. Among a sample of 100 psychiatric patients, Schotte and Clum (1987) found that compared to non-suicidal patients, patients who reported suicidality exhibited greater cognitive rigidity and generated significantly fewer solutions to given
problems on the Means-Ends Problem-Solving Procedure (MEPS; Platt, Spivack, & Bloom, 1975). Further, compared to non-suicidal controls, patients who reported being suicidal were: 1) more likely to expect negative consequences from the solutions they generated, 2) more likely to produce more irrelevant solutions to problems, and 3) reported being less likely to actually use the solutions. These findings are consistent with other research using the Suicide Probability Scale (SPS; Cull & Gill, 1982), which showed that students at risk for suicide had more negative perceptions of their problem solving abilities than students who were not suicidal (Zeyrek, Gencoz, Bergman, & Lester, 2009). A study of adolescent psychiatric inpatients found that adolescents with a suicide attempt history endorsed more difficulty generating solutions to problems and implementing the solutions than non-hospitalized youth without a suicide attempt history; however, they did not endorse more difficulty than psychiatric inpatients without a suicide attempt history (Sadowski & Kelley, 1993). Similarly, Rotheram-Borus et al. (1990) found that compared to psychiatric and non-psychiatric controls, non-depressed and depressed suicide attempters endorsed being more focused on their problems and generated fewer solutions during the MEPS Task (Platt et al., 1975).

Researchers have also examined how stress may interact with problem solving to increase risk for suicide. In a study examining this in a college population, college students were divided into “good” and “poor” problem solvers, defined by the ratio of relevant to irrelevant solutions generated to solve a given problem (Schotte & Clum, 1982). Results revealed that compared to poor problem solvers who reported low levels of stress and good problem solvers who reported low or high levels of stress, poor problem solvers who endorsed high levels of stress were significantly more likely to
consider suicide. Priester and Clum (1993) also found that stress interacted with problem solving deficits to predict suicidal ideation. In a sample of 282 college students, Priester and Clum (1993) found that stress experienced 6 to 8 days before an exam interacted with problem solving deficits to predict future suicidal ideation 2 to 8 days after the exam was taken.

The relationship between different types of stress (i.e., life event stress, chronic stress), problem solving ability, and suicidal behaviors has been examined among a sample of youth psychiatric inpatients who endorsed suicidal ideation or a recent nonfatal suicide attempt at a hospital (Grover et al., 2009). Individuals who reported both high life event stress and maladaptive problem solving skills as measured by the Problem Solving Inventory (PSI; Heppner & Petersen, 1982) were more likely to endorse suicidal ideation or a suicide attempt. For individuals who reported high levels of chronic stress and maladaptive problem solving skills, they were more likely to report suicidal ideation, but no history of suicide attempt. This suggests that problem solving skills impact risk for suicidal ideation regardless of the type of stress experienced (i.e., chronic stress or life event stress). For suicide attempts, problem solving skills appear to be more related to major life events, rather than chronic stress.

Other work has examined how an individual’s approach to social problem solving contributes to increased risk for suicide (Linda, Marroquín, & Miranda, 2012; Pollock & Williams, 1998; 2004; Quinones et al., 2015). An active problem solving approach refers to taking distinct steps to solve problems, whereas passive problem solving occurs when an individual relies on others, chance, or fate to solve their problems (Linehan, Camper, Chiles, Strosahl, & Shearin, 1987). Research has found that individuals with a history of
suicide attempt are less likely to solve problems in an active way and generate fewer solutions to problems (Pollock & Williams, 1998; 2004). These results are in line with more recent research, which shows that individuals with a history of suicide attempts generate more passive solutions to problems than non-attempters (Linda et al., 2012; Quinones et al., 2015).

In addition to examining active versus passive problem solving styles, the relationships between the problem solving styles, described in D’Zurilla & Nezu’s (1982; 1990) problem solving model, and suicide risk have also been examined. Results from a college sample found that maladaptive problem solving styles (NPO, AS, and ICS) were positively associated with suicide risk (D’Zurilla, et al., 1998), a finding replicated in a sample of inpatient suicide ideators and suicide attempters. Further, PPO was associated with less suicide risk in the inpatient sample. D’Zurilla et al. (1998) also examined the relationship between these problem solving styles and self-appraisal of suicidal ideation among a sample of psychiatric inpatients. Participants were asked “to what extent are suicidal thoughts a problem for you?” Results showed that NPO was positively associated with suicidal ideation, and PPO was negatively associated with suicidal ideation; however, ICS, AS and RPS were unrelated to suicidal ideation. It is possible, however, that the lack of association of ICS, AS, and RPS with suicidal ideation is not as reliable as studies that employ a validated measure of suicidal ideation, rather than a single question, as used in this study.

The association between problem solving styles and suicidal ideation was also examined in a cross-sectional sample of 105 adolescent psychiatric inpatients (Reinecke et al., 2001). Maladaptive problem solving styles (ICS, AS, and NPO) were positively
associated with suicidal ideation, while PPO was negatively associated with suicidal ideation. The adolescent psychiatric inpatients with a history of suicide attempts reported higher NPO, but did not differ from other inpatients (i.e., those without a suicide attempt history) in regard to other problem solving styles (ICS, AS, PPO, RPS). Finally, the relationship between social problem solving and suicidality was mediated by depression and hopelessness. The research above suggests that various deficits in social problem solving, including maladaptive problem solving styles, and having a negative appraisal of problems may increase risk for suicidal ideation and behaviors. Negative problem orientation specifically may be associated with a greater risk for suicide than other problem solving styles (ICS, AS, PPO, RPS) as it differentiates individuals with vs. without a history of suicide attempts.

**Problem Solving as a Moderator between Emotion Reactivity and Suicide**

In line with Baumeister’s (1990) Escape Theory of Suicide, researchers have examined how cognitive factors, such as problem solving deficits, may exacerbate the relationship between emotional factors (e.g., emotion reactivity) and suicidal ideation and behaviors (Dour, Cha & Nock, 2011; Joiner et al., 2001; Nezu et al., 2017). Dour et al. (2011) found that emotion reactivity was associated with a suicide attempt history, but only among young adults who had poor problem solving skills. Among individuals with good problem solving skills, emotion reactivity and suicide attempt history were unrelated. Similarly, the relationship among emotion reactivity, social problem solving style, and suicidal ideation was examined in a cross-sectional sample of veterans (Nezu et al., 2017). Veterans with a suicide attempt history reported higher levels of emotion reactivity, greater NPO, and higher ICS compared to veterans in the no suicide attempt
control group. Further, moderation analyses revealed that an adaptive problem solving style buffered against the impact of emotion reactivity on suicidal ideation.

According to Fredrickson’s (1988) Broaden and Build Hypothesis, positive emotions broaden one’s cognition, increase exploration and experimentation, and contribute to greater problem solving ability. Joiner et al. (2001) tested this hypothesis by examining the relationships among positive emotions, problem solving attitudes, and suicidal thinking in 60 suicidal patients. Consistent with the Broaden and Build Hypothesis, suicidal patients who endorsed higher levels of baseline positive affect endorsed significantly reduced symptoms of suicidal ideation at 6- and 12-month follow-up. They also found that the relationship between positive affect and suicidal thinking was reduced when changes in problem solving attitudes were statistically controlled for. These findings demonstrate that the interaction of emotional factors and problem solving is associated with suicidal thinking among individuals who are at risk for suicide.

**Problem Solving as a Moderator between NSSI and Suicide**

There is some evidence to suggest that social problem solving may influence the relationship between NSSI and suicide. In a cross-sectional study of 380 college students (Walker, Hirsch, Chang, & Jeglic, 2017), students who endorsed greater problem solving abilities had a lower likelihood of endorsing a history of suicidal behaviors regardless of whether they had engaged in NSSI. Further analyses revealed important ethnic/racial differences. When analyses were stratified by ethnicity, this finding held only for individuals who identified as White. However, when depression was controlled, greater problem solving abilities were associated with a lower likelihood of reporting suicidal
behaviors in individuals with an NSSI history who identified as Hispanic, in addition to those who identified as White.

Collectively, these studies establish that individuals with a history of NSSI, suicide attempts, and current suicidal ideation have deficits in problem solving. These deficits in problem solving may contribute to self-injurious behaviors and increase the likelihood that individuals with a history of NSSI will graduate to suicidal behaviors (Figure 3). Many of these studies are limited by the fact that they are cross-sectional and rely upon self-report measures. Additional research, specifically a longitudinal multi-method approach, is necessary to examine whether problem solving influences the relationship between emotion reactivity and suicidal ideation, and between NSSI and suicidal ideation. One approach for increasing our understanding of the relationship between NSSI and suicide is to study underlying psychophysiological processes associated with emotional reactivity such as electrodermal activity (EDA). The next section provides an overview of EDA and reviews its relationship to NSSI and suicide.

Figure 3. Problem Solving as a Moderator between NSSI history and Suicidal Thoughts and Behaviors

Note. Maladaptive problem solving increases relationship between NSSI history and suicidal ideation and behaviors.
Electrodermal Activity

EDA or skin conductance provides a direct representation of sympathetic activity and is reliably associated with psychopathological and emotional states, such as anxiety, depression, threat, and pleasant and unpleasant stimuli (Cacioppo, Tassinary, & Berntson, 2007; Dawson, Schell, & Filion, 2000; Sarchiapone et al., 2018). EDA has been described as an umbrella term for changes in the electrical conductance of the skin, which is dependent on the quantity of sweat secreted by eccrine sweat glands (Groscurth, 2002; Sarchiapone et al., 2018). EDA is commonly used as an index of affective intensity of a stimulus or an indicator of general arousal/activation or attention. Given that EDA is sensitive to many different states, the interpretation of skin conductance level (SCL) is based on the context and conditions under which it occurs. In the context of an experimental paradigm, it is crucial that the experiment is controlled (i.e., only one aspect of the stimulus changes while others stay the same), in order to determine the psychological states or processes associated with SCL.

EDA, for the current study, was utilized as a physiological index of emotion reactivity. This is consistent with literature which has generally found that skin conductance increases when people view pictures that they perceive to be emotional (i.e., pleasant or unpleasant) as opposed to pictures they perceive to be neutral (Cacioppo et al., 2007). Typically, in studies that examine differences in skin conductance, the stimuli that are rated as more arousing yield greater skin conductance reactivity. Given the relationship among emotion reactivity, NSSI, and suicidal thoughts and behaviors, skin conductance reactivity was examined as a potential physiological index that influences the relationship between NSSI and suicidal ideation.
Electrodermal Activity and NSSI

Since individuals who engage in NSSI exhibit greater emotional reactivity to stress, it has been suggested that they may also be more physiologically reactive to stress than individuals who do not engage in NSSI. Only a few published studies have examined electrodermal reactivity among individuals who engage in NSSI. These studies show that individuals who engage in NSSI exhibit increased electrodermal reactivity in response to stress and decreases in electrodermal reactivity after being exposed to imagery of NSSI (Haines, Williams, Brain, & Wilson, 1995; Nock & Mendes, 2008; Welch, Linehan, Sylvers, Chittams, & Rizvi, 2008).

As one test of the functional model of NSSI, research has examined stress-mediated EDA among individuals with a history of NSSI. Nock and Mendes (2008) examined skin conductance reactivity to a distress tolerance task in 62 adolescents and young adults (ages 12-19) with a history of NSSI and 30 matched controls without a history of NSSI. Individuals with a history of NSSI demonstrated greater skin conductance reactivity to a distress tolerance task than those without a history of NSSI. These results suggest that individuals with an NSSI history experience higher physiological arousal in response to distress.

In a study designed to examine individual differences in psychophysiological arousal, researchers asked a sample of 38 adult men to imagine a past episode of NSSI while recording EDA (Haines et al., 1995). In line with the tension-reduction model, participants with a history of NSSI had increased skin conductance reactivity when they imagined a stressful life event, their environment, and their behaviors prior to engaging in NSSI, and decreased arousal when the incident (i.e., engaging in NSSI) was imagined.
No group differences were found in terms of physiological arousal when participants were instructed to imagine an accident, an aggressive event, or a neutral event.

Welch et al. (2008) examined SCRs to NSSI-related guided imagery among 42 adults who met diagnostic criteria for BPD. They found that while participants did not experience significant decreases in SCR when they were exposed to imagery of NSSI, they did experience significant decreases during recovery. This finding provides partial support of the tension-reduction model.

**Electrodermal Activity and Suicide**

The relationship between EDA and suicide has generally found that individuals with a history of suicidal behaviors demonstrate electrodermal hyporeactivity at baseline and in response to habituation tasks (Edman, Asberg, Levander, & Schalling, 1986; Jandl Steyer, & Kaschka, 2010; Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013, Wolfersdorf, Straub, Barg, Keller, & Kaschka, 1999). This finding has led some researchers to speculate that electrodermal hyporeactivity is a marker for suicide risk (Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013). Many studies that examine electrodermal reactivity employ a habituation paradigm, which often involves the administration of a repetitive tone that is not significant to the participant while recording EDA (Jandl et al., 2010). Habituation occurs when individuals begin to elicit smaller physiological reactions to presentations of repetitive stimuli. The examination of physiological responses to habituation tasks among individuals who have thought about, attempted, or committed suicide has provided additional information about risk for suicide.
Edman et al. (1986) found that individuals who had attempted suicide tended to habituate to a series of 21 tones relatively quickly. Specifically, the distribution of the data was bimodal, with participants split into two groups: a fast habituation group and a slow habituation group. Participants who endorsed a history of violent suicide attempts comprised the fast habituation group, while participants who endorsed a history of non-violent attempts were evenly distributed into both groups. The majority of individuals who experienced suicidal ideation without a suicide attempt history were in the slow habituation group. Finally, four participants in the study who eventually committed suicide were in the fast habituation group.

Other studies have examined individual differences in electrodermal reactivity among individuals with a history of either violent or non-violent suicide attempts (Jandl, et al., 2010; Wolfersdorf et al., 1999). Jandl et al. (2010) examined differences in skin conductance habituation among 50 patients with MDD plus either 1) a history of violent suicide attempt, 2) a non-violent suicide attempt, or 3) no suicide attempt history. Individuals with a non-violent or violent suicide attempt did not differ from each other on skin conductance reactivity; however, they exhibited faster habituation compared to individuals who had never attempted suicide. Similarly, Wolfersdorf et al. (1999) examined differences in EDA among 504 depressed inpatients who were not suicidal, suicidal ideators, and those who had either violent or non-violent suicide attempts. Depressed participants with a history of violent suicide attempts had significantly reduced habituation compared to depressed participants with suicidal thoughts, and depressed participants without suicidal thoughts. Interestingly, depressed participants with a history of violent suicide attempts did not significantly differ from depressed
participants with a history of non-violent suicide attempts. These findings may suggest that EDA differentiates individuals at different points in the trajectory to suicide (i.e., suicidal ideation, suicide attempts), with reduced habituation rates being associated with higher risk for suicide, but not distinguishing violent from non-violent attempts.

Thorell (2009) conducted a meta-analysis on the relationship between electrodermal hyporeactivity and suicidal behaviors to examine the utility, sensitivity, and specificity of electrodermal hyporeactivity in predicting suicide attempts and suicide. Sensitivity was conceptualized as the percentage of patients considered hyporeactive among individuals who made a violent suicide attempt or eventually committed suicide. Specificity was defined as the percentage of patients who didn’t make a violent suicide attempt or commit suicide, among individuals who were electrodermally reactive. Among a sample of 279 depressed patients and 59 healthy participants, sensitivity was found to be 96.6%, and the specificity was found to be 92.9%. These results suggest that electrodermal hyporeactivity has utility in predicting a violent suicide attempt or suicide.

Thorell et al. (2013) conducted a subsequent replication study and examined whether results were independent of depressive symptom severity, age, gender, or trait anxiety. The sample consisted of 783 depressed inpatient participants who participated in a habituation task while EDA was recorded. In line with the previous meta-analysis, results revealed that the sensitivity and specificity for either violent suicide attempts or suicide were 74% and 88%, and the sensitivity and specificity for suicide exclusively were 83% and 98%. Findings were independent of gender, age, depressive symptom severity, or trait anxiety. These findings provide additional evidence for the utility of using a measure of EDA to predict violent suicide attempts and suicide.
Finally, Sarchiapone et al. (2018) conducted a systematic review, which suggests that individuals who are depressed and have a history of suicide attempts show electrodermal hyporeactivity in response to habituation tasks, in comparison to depressed patients who do not have a suicide attempt history and healthy controls. In their review, Sarchiapone et al. (2018) found that electrodermal hyporeactivity is predictive of the choice of a violent method for suicide attempts or completed suicide, but also acknowledges that there are discrepant findings regarding whether electrodermal hyporeactivity is more predictive of violent versus non-violent suicide attempts as discussed above.

**Electrodermal Activity, NSSI, and Suicide**

As reviewed above, research has examined the relations between EDA and NSSI, and between EDA and suicidal thoughts and behaviors, but has not examined the role that EDA may play in the trajectory from NSSI to suicide. One study examining the relation between EDA and NSSI showed that adolescents and young adults who engage in NSSI experience increased electrodermal reactivity in response to a distress tolerance task compared to those without an NSSI history (Nock & Mendes, 2008). In addition, another study found that men with a history of NSSI experienced decreases in electrodermal reactivity after being exposed to imagery of NSSI (Haines et al., 1995), and another study found that adults with BPD experienced decreases in SCR during a recovery period that took place after being exposed to imagery of NSSI (Welch et al., 2008). These results are in line with the functional model of NSSI, as this model states that individuals may be more emotionally and physiologically reactive to stress and may engage in NSSI in order to reduce this arousal (Nock & Prinstein, 2004). Separate studies have examined the
relationship between EDA and suicidal thoughts and behaviors. These studies have consistently shown that individuals who attempt suicide, regardless of whether the attempt was violent or non-violent, exhibit electrodermal hyporeactivity (Edman et al., 1986; Jandl et al, 2010; Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013, Wolfersdorf et al., 1999). Studies have also consistently shown that electrodermal hyporeactivity has high sensitivity and specificity for predicting violent suicide attempts and suicide (Thorell, 2009).

Several gaps in the literature on EDA, NSSI, and suicide remain. For example, research has not examined electrodermal reactivity in response to a stress task in individuals experiencing thoughts of suicide, or individuals who have engaged in suicidal behaviors, despite the fact that most theories implicate the role of stress in suicide behaviors (Baumeister, 1990; Hamza et al., 2012; Joiner, 2005; Klonsky & May, 2015; Linehan, 1993; Nock & Prinstein, 2004; Schotte & Clum, 1982; 1987). Further it is unclear whether EDA impacts the transition from NSSI to suicidal ideation. Since stress may be a trigger for both NSSI and suicidal thoughts and behaviors (Nock & Prinstein, 2004; Schotte & Clum, 1982; 1987), research is needed to investigate how individuals who are experiencing suicidal ideation and have a history of NSSI physiologically react to stress. The current dissertation was the first, to our knowledge, to examine the relationships among EDA, NSSI, and suicidal ideation (Figure 4).

In order to examine how individuals with a history of NSSI and current suicidal ideation react to stress in the current dissertation, EDA was measured before and after participants engaged in a social stress task. The social stress task used in the current dissertation was Cyberball (Williams & Jarvis, 2006). Cyberball is an online ball game,
in which participants think they are playing against other people, but are actually playing with programmed opponents. For the first third of the game they are included, and afterwards they are excluded from the game with no warning. This task reliably produces feelings of social stress and ostracism (Hartgerink, Van Beest, Wicherts, & Williams, 2015). The current study is the first to our knowledge to examine differences in EDA in response to Cyberball in this population (i.e., individuals with a history of NSSI and suicidal ideation).

Figure 4: Expected Mediation

Note. Electrodermal activity as a mediator between NSSI and suicidal ideation.

Overview and Statement of Purpose

Suicide is a leading cause of death worldwide and is the second leading cause of death for adolescents and young adults 15-29 years of age (WHO, 2020). NSSI has been identified as a prominent risk factor for future suicidal ideation and behavior (Nock, 2017). Longitudinal research has shown that both NSSI history and NSSI frequency predict future suicidal ideation (Guan et al., 2012; Hamza & Willoughby, 2016; Whitlock et al., 2013) and future suicide attempts (Asarnow et al., 2011; Guan et al., 2012; Hamza & Willoughby, 2016; Whitlock et al., 2013; Wilkinson et al., 2011). It remains unclear why individuals with a history of NSSI are at higher risk for future suicidal behaviors. Research indicates that the way individuals react to emotional experiences (i.e.,
emotional reactivity) and approach problem solving is associated with both NSSI and suicidal thoughts and behaviors.

Emotion reactivity, or the extent to which an individual is sensitive to emotions, experiences them intensely, and experiences them persistently before returning to their normal level of arousal (Nock et al., 2008), may contribute to the path from NSSI to future suicidal thoughts and behaviors. According to the functional model of NSSI (Nock & Prinstein, 2004), the most commonly reported function associated with NSSI is to reduce tension and negative affect (i.e., automatic negative reinforcement). Support for the functional model of NSSI has predominantly come from cross-sectional surveys, which show that individuals who engage in NSSI report being more emotionally reactive to stress than individuals who do not endorse having a history of NSSI (Glenn et al., 2011; Nock et al., 2008). Similarly, in a study utilizing EMA, individuals with a history of NSSI reported engaging in NSSI in the context of negative affective states such as feeling rejected, self-hatred, anger toward oneself/another, and/or feeling numb/nothing (Nock et al., 2009).

Emotion reactivity has also been identified as a potential risk factor for suicidal thoughts and behaviors (Evans et al., 2016; Jollant et al., 2011; Polanco-Roman et al., 2018). Nock et al. (2009) found that negative affective states were more strongly associated with self-reported suicidal ideation, while other longitudinal research revealed that emotion reactivity was associated with suicidal ideation over time (Polanco-Roman et al., 2018). The current dissertation examined whether emotion reactivity mediates the relationship between NSSI and suicidal ideation.
Another important construct or set of processes that may help clarify the relationship between NSSI and suicidal behaviors is maladaptive social problem solving. (McAuliffe et al., 2006; McLaughlin et al., 1996; Speckens & Hawton, 2005). Social problem solving is a set of cognitive-behavioral processes related to the way an individual defines problems, identifies or discovers effective solutions, makes decisions, and implements solutions (D’Zurilla & Goldfried, 1971; D’Zurilla et al., 2002). Research has also shown that problem solving style may interact with emotion reactivity to increase risk for suicidal thoughts and behaviors (Dour et al., 2011; Nezu et al., 2017). For instance, in a sample of adolescents and young adults, poor problem-solving skills strengthened the relationship between emotion reactivity and suicide attempts (Dour et al., 2011). In addition, a more adaptive problem-solving style was protective and buffered against the impact of emotion reactivity on suicidal ideation in a sample of veterans (Nezu et al., 2017). Taken together, these findings suggest that emotion reactivity may interact with problem solving style to increase risk for suicide.

While there is support for the relationship between problem solving deficits and increased suicidal thoughts and behaviors, less is known about the relationship between NSSI and problem solving deficits. In one of the few studies to examine this relationship, Nock & Mendes (2008) found that adolescents with an NSSI history report lower self-efficacy during a problem solving task, and choose more maladaptive problem solving solutions compared to individuals without an NSSI history. In addition, results from a prospective study found that poor problem solving coping predicted the onset of NSSI at 1-year follow-up (Andrews et al., 2014).
Little research has focused on the role that problem solving may play in the trajectory from NSSI to suicide. In the only published study, examining whether social problem solving ability moderated the relationship between NSSI and suicidal behaviors, college students who reported greater problem solving abilities were at a lower risk for suicidal behaviors, regardless of whether they had a history of engaging in NSSI (Walker et al., 2017). Future research is needed to examine the role of specific maladaptive problem solving styles in the progression from NSSI to suicidal ideation.

Finally, in line with the functional model of NSSI, the relationship between NSSI and future suicidal behavior may be related to physiological processes mediated by the sympathetic nervous system (i.e., EDA). Indeed, separate lines of research have examined the relationship between NSSI and EDA and suicidal behavior and EDA. Individuals with a history of NSSI have greater skin conductance reactivity in response to a stressor and also show decreases in reactivity after being exposed to imagery of NSSI (Haines et al., 1995; Nock & Mendes, 2008; Welch et al., 2008). Research examining EDA in individuals with a history of suicide attempts, or in individuals who eventually attempted or committed suicide, typically show electrodermal hyporeactivity in response to habituation tasks (Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013). To better understand these apparent differences in physiological reactivity and their impact on the trajectory from NSSI to suicidal behaviors, research must examine the relationships between EDA, NSSI, and suicidal thoughts and behaviors within the same study.

In summary, the literature suggests that emotion reactivity, problem solving, and suicidal ideation are interrelated and may account for the trajectory from NSSI to suicide.
Indeed, results from cross-sectional pilot data provide preliminary support for examining how these factors interact. As part of pilot research, individuals with a history of NSSI completed self-report measures of emotion reactivity, maladaptive social problem solving (i.e., negative problem orientation, impulsive/carelessness problem solving, and avoidant problem solving), and suicidal ideation (Quiñones, Delcourt, Boucher & Haigh, 2018). Results revealed that emotion reactivity and negative problem orientation were positively associated with suicidal ideation in individuals with an NSSI history. While these findings provide initial support for the relationships among NSSI, emotion reactivity, negative problem orientation, and suicidal ideation, the results are limited by the cross-sectional nature of the data, which prevents inferences about causality, the small sample size ($N = 34$), and the fact that the pilot research relied solely upon self-report questionnaire data.

The current dissertation sought to replicate and extend these preliminary results in several ways. First, this study examined the relationship between NSSI and suicidal ideation over time. Participants completed an in-person laboratory study and a subsequent online battery of questionnaires 6 to 8 weeks later. Second, in addition to collecting a self-report data on emotion reactivity, the current study included a physiological measure of emotion arousal (i.e., EDA). Finally, the study aimed to be well-powered to detect hypothesized effects.

The overarching aim of this dissertation is to examine an integrated model of the relationship between NSSI and suicidal ideation over time using a multi-method approach. Specifically, the goal of this dissertation is to examine the relationship between NSSI and suicidal ideation over time (Aim 1) and determine whether emotion reactivity
(self-report and EDA) and social problem solving (i.e., negative problem orientation) influence this relationship (Aim 2).

**Research Hypotheses**

The goal of this study was to examine the interplay amongst emotional reactivity (self-report and physiological), negative problem orientation and suicidal ideation among individuals with or without a history of NSSI. Based on a review of prior research, pilot data, and applicable theoretical models, the following hypotheses were proposed:

1. Individuals with a history of NSSI will report significantly more negative problem orientation (NPO on the SPSI-R) than individuals without a history of NSSI.

2. Individuals with a history of NSSI will report higher total emotion reactivity than individuals without a history of NSSI, as evidenced by self-report (ERS).

3. Individuals with NSSI/high SI (BSS) will report significantly more negative problem orientation (NPO on the SPSI-R) than individuals with NSSI/low SI, and individuals without a history of NSSI.

4. Individuals with NSSI/high SI (BSS) will report higher emotion reactivity than individuals with NSSI/low SI, and individuals without a history of NSSI, as evidenced by self-report (ERS).

5. Individuals with a history of NSSI will be more physiologically reactive to stress than individuals without a history of NSSI, as evidenced by increased skin conductance reactivity (a physiological index of emotion reactivity) after being ostracized during Cyberball (Williams & Jarvis, 2006).
6. Individuals with NSSI/high SI (BSS), NSSI/low SI, and individuals without a history of NSSI will show significant differences in skin conductance reactivity. This hypothesis is exploratory.

7. NSSI history will predict increases in physiological reactivity to stress after being ostracized during Cyberball (Williams & Jarvis, 2006), and this relationship will be moderated by suicidal ideation at baseline (BSS during Session 1) such that low levels of suicidal ideation will increase the relationship between NSSI and physiological reactivity and high levels of suicidal ideation will decrease the relationship between NSSI and physiological reactivity (Figure 5).

Figure 5. Expected Moderation Model for Hypothesis 7

Note. Hypothesized Moderation Model. Suicidal ideation as a moderator between NSSI and skin conductance reactivity.

8. NSSI history will predict increases in suicidal ideation (BSS) at baseline and at 6-8 week follow-up, and this relationship will be mediated by emotion reactivity (ERS). The relationship between emotion reactivity and suicidal ideation will be moderated by negative problem orientation (NPO on the SPSI-R) such that high levels of NPO will increase the relationship between emotion reactivity and suicidal ideation (Figure 6).
Figure 6. *Expected Moderated Mediation Model for Hypothesis 8*

Note. Hypothesized Moderated Mediation Model. Emotion reactivity as a mediator between NSSI and suicidal ideation (at baseline and at 6-8 week follow-up) and negative problem orientation (NPO) as a moderator of the relationship between emotion reactivity and suicidal ideation.

9. NSSI history will predict increases in suicidal ideation (BSS) at baseline and at 6-8 week follow-up, and this relationship will be mediated by skin conductance reactivity. The relationship between skin conductance reactivity and suicidal ideation will be moderated by negative problem orientation (NPO on the SPSI-R), such that high levels of NPO will increase the relationship between skin conductance reactivity and suicidal ideation (Figure 7).

Figure 7. *Expected Moderated Mediation Model for Hypothesis 9*

Note. Hypothesized Moderated Mediation Model. Skin conductance reactivity as a mediator between NSSI and suicidal ideation (at baseline and at 6-8 week follow-up) and negative problem orientation (NPO) as a moderator of the relationship between skin conductance reactivity and suicidal ideation.
10. Skin conductance reactivity will be inversely associated with suicidal ideation (BSS) at baseline, and will be inversely associated with suicidal ideation (BSS) at 6-8 week follow-up.
CHAPTER TWO

METHODS AND PROCEDURES

Participant Recruitment

Participants were 106 individuals, 18 to 43 years of age ($M = 20.27$, $SD = 4.45$), who were undergraduate students enrolled at the University of Maine (UMaine) in Orono or were from the surrounding community. Power analysis using the G*Power 3.1.9.2 program (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that a total sample size of 77 participants would result in an 80% chance of detecting a medium effect. A sample size of 106 individuals was recruited to account for possible equipment malfunction and participants who did not complete the study.

Undergraduate Subject Pool Recruitment. Undergraduate students were recruited from the UMaine Psychology Department subject pool using Sona Systems (2018). They were recruited to participate in The Self-Injurious Behaviors Study (Cognitive and Physiological Differences between Self-Injurious Thoughts and Behaviors IRB # 2016-11-05), a study examining how students with and without a history of self-injurious behaviors respond to stress, in the Maine Mood Lab (MML). Potential participants completed the screening questionnaire, via Qualtrics (2018), an online survey system (Appendix C) and were then sent a link to SONA to sign up for the study (Appendix E). Students who chose to participate were compensated for each hour that they participated in the study (Appendix F). They earned up to 2 research credits for participating in this particular study.

Community Recruitment. Participants were also recruited from the community surrounding UMaine in Orono via email announcement boards (e.g., UMaine
Announcements listserv, which is visible to students, faculty and staff of the University), Facebook advertisements, and flyers placed in public areas (Appendix A). Interested community members were sent the link to the prescreen informed consent (Appendix B) and questionnaire (Appendix C) and subsequently were sent a link to SONA to sign up for the study (Appendix E). Community participants were compensated $20 for the session. Community members who chose to participate were compensated for each hour that they participated in the study, and if they did not complete the entire study, they received prorated payment to reflect the number of hours that they participated (Appendix F).

**Study Criteria**

General criteria required that participants be 18 years of age or older to participate. Individuals who had a history of NSSI and individuals without a history of NSSI were recruited to participate in the study.

**Experimenters**

The primary experimenter for this study was the primary author. In addition, psychology graduate students and undergraduate research assistants who completed the Institutional Review Board for the Protection of Human Subjects (IRB) required training modules at UMaine assisted with the study. Predominantly graduate students with a thorough background and additional training in suicide risk assessment served as the experimenter and completed the structured clinical interview to assess for history of self-injurious thoughts and behaviors, administered questionnaires, completed physiological equipment hookup, and conducted suicide risk assessments. Undergraduate research assistants were trained on study procedures including assisting in monitoring, data
cleaning, data analysis, and participant recruitment (e.g., scheduling study participants and posting flyers for the study).

**Prescreen Measure**

**Self-Harm Behaviors Questionnaire (SHBQ).** The Self-Harm Behaviors Questionnaire (SHBQ; Gutierrez, Osman, Barrios, & Kopper, 2001) is a self-report questionnaire that assesses lifetime history of self-harm. This questionnaire includes questions about the history of self-harm behavior, and follow-up questions about the age of first and last episode, the method, frequency of the behavior, whether they’ve disclosed their engagement in self-harm to other people, and whether they had to seek medical attention as a result of engaging in self-harm. A modified version of this screener was used to recruit people who had a history of self-harm. The SHBQ was used as a screener because it has shown good internal consistency, convergent validity, and discriminative validity and is widely used in research examining history of self-harm behaviors, specifically NSSI (Gutierrez et al., 2001).

**Structured Clinical Interview**

**The Self-Injurious Thoughts and Behaviors Interview (SITBI).** The Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007) is a structured clinical interview that assesses the frequency, severity, presence, and other characteristics of a range of self-injurious thoughts and behaviors, including suicidal ideation, suicide plan, suicide gesture, suicide attempt, thoughts of NSSI, and history of engaging in NSSI. The SITBI was used to correctly classify self-injurious thoughts and behaviors (e.g., NSSI). The SITBI was used in this study because it has shown strong test-retest reliability over a 6-month period, strong interrater reliability, and construct validity.
Many other measures of self-harm behaviors do not differentiate between various self-injurious thoughts and behaviors, with some classifying all self-harm behaviors as suicide attempts or “parasuicide” (Nock et al., 2007). The use of the SITBI addresses this limitation, and this is the only structured clinical interview of which we are aware that differentiates between various self-injurious thoughts and behaviors.

**Questionnaire Measures**

**Demographic Information.** This questionnaire includes questions about participants’ age, gender, race/ethnicity, marital status, and education.

**Beck Scale for Suicidal Ideation (BSS).** The Beck Scale for Suicidal Ideation (BSS; Beck & Steer, 1991) is a 21-item self-report questionnaire that measures active and passive suicidal thoughts that an individual has experienced within the past week. Items on the BSS are responded to on a 0- to 2- point Likert Scale, with higher scores representing more active thoughts about attempting suicide. Scores on the BSS can range from 0 to 42. The BSS has been shown to be a reliable and valid measure of suicidal ideation in outpatient and inpatient samples. In addition, the BSS demonstrates strong concurrent validity (> .90) with clinical ratings of suicidal ideation for both of these groups and shows high internal consistency (Beck, Steer, & Ranieri, 1988). This measure was used to quantify presence and severity of suicidal ideation and to determine whether participants have “high” or “low” levels of suicidal ideation. Due to its strong psychometric properties and utility in various samples (i.e., adults in inpatient and outpatient settings), and due to research suggesting that higher scores are associated with more severe suicidal ideation (Holi et al., 2005) it was selected over other measures of
present suicidal ideation (e.g., Suicide Ideation Questionnaire (SIQ; Reynolds, 1998), Columbia Suicide Severity Rating Scale (C-SSRS; Posner, 2007)) for the current study. This measure was used to quantify presence and severity of suicidal ideation and was used to determine whether participants have “high” or “low” levels of suicidal ideation in Hypotheses 3, 4, and 6, used as a hypothesized moderator in Hypothesis 7, and used as a hypothesized outcome in Hypotheses 8, 9, and 10. A BSS total score > 6 was considered a “high” level of suicidal ideation, whereas a BSS total score ≤ 6 was considered a “low” level of suicidal ideation. This was determined by examining the distribution of BSS total scores for participants with a history of NSSI in preliminary data. Additionally, other research has found this cut-off meaningful as well (Holi et al., 2005).

**Emotion Reactivity Scale (ERS).** The Emotion Reactivity Scale (ERS; Nock et al., 2008) is a 21-item self-report measure assessing individuals’ experience of emotion reactivity on a regular basis. Items on the ERS are scored on a Likert Scale ranging from 0 (*Not at all like me*) to 4 (*Completely like me*). The ERS has three subscales: sensitivity (8 items), arousal/intensity (10 items), and persistence (3 items). The total ERS score can be derived by summing all items in the scale. The ERS total score and the three subscales (sensitivity, arousal/intensity, and persistence) have demonstrated strong internal consistency, and the ERS has demonstrated construct and criterion-related validity (Nock et al., 2008). This measure was used to quantify emotion reactivity, which is used as a hypothesized outcome in Hypotheses 2 and 4, and as a hypothesized mediator in Hypothesis 8. This measure was selected due to the aforementioned psychometric properties, its utility in measuring emotion reactivity particularly among individuals in
this population (i.e., individuals with a history of NSSI), and because it measures the different components of emotion reactivity that contribute to NSSI according to theory and prior research (Nock et al., 2008). No other measures of which we are aware specifically measure these components in this particular population.

**Social Problem Solving Inventory – Revised (SPSI-R).** The Social Problem Solving Inventory – Revised (SPSI-R; D’Zurilla et al., 2002) is a 52-item self-report questionnaire that measures five dimensions of problem solving. The long version of the measure was used in this study. Each item is rated on a scale ranging from 0 (*Not at all true of me*) to 4 (*Extremely true of me*). The SPSI-R has demonstrated good reliability and validity (D’Zurilla et al., 2002). The SPSI-R was included in this study, rather than the SPSI-R:SF due to its strong psychometric properties and more frequent use in research examining the relationship between negative problem orientation and suicidal thoughts and behaviors. In the present study we chose to focus on negative problem orientation, which is a hypothesized outcome in Hypotheses 1 and 3 and as a hypothesized moderator in Hypotheses 8 and 9.

**Positive and Negative Affect Schedule – Expanded Form (PANAS-X).** The Positive and Negative Affect Schedule (PANAS-X; Watson & Clark, 1994) is a 60-item expanded version of the original Positive and Negative Affect Schedule (Watson et al., 1988), and assesses positive and negative affect, as well as 11 specific affective states (e.g., fatigue, sadness, fear, etc.). In this study, positive and negative affect were being assessed at the present moment. Participants were asked to indicate the extent to which they were experiencing the 60 affective adjectives on a Likert Scale ranging from 1 (*Very Slightly or Not at All*) to 5 (*Extremely*). This scale was administered five times to assess
for stress-mediated mood reactivity and recovery. Participants completed the PANAS-X after the structured clinical interview (SITBI; Nock et al., 2008), after watching the neutral baseline video, after playing Cyberball (Williams & Jarvis, 2006), after watching the recovery video, and after the positive mood induction. Research has shown adequate internal consistency, test-retest reliability, and construct validity (Watson & Clark, 1994). This measure was used during preliminary analyses, included as part of the manipulation check for this study since the tension reduction model suggests that individuals with a history of NSSI are more emotionally reactive to stress, and thus would experience greater changes in affect compared to those without a history of NSSI (Nock & Prinstein, 2004).

**Visual Analogue Scale (VAS).** The Visual Analogue Scale (VAS) is a measure used to assess ratings and changes in current mood in response to a stress-task [i.e., being ostracized while playing Cyberball (Williams & Jarvis, 2006)]. Participants were presented with a 100-mm line with “sad” and “happy” at the 0- and 100-mm points, and were asked to mark the numerical value that represented their mood. This scale was also administered five times [after the structured clinical interview (SITBI; Nock et al., 2008), after watching the neutral baseline video, after playing Cyberball (Williams & Jarvis, 2006), after watching the recovery video, and after the positive mood induction] in order to assess for stress-mediated mood reactivity and recovery. Research has demonstrated that the VAS had adequate test-retest reliability, and concurrent validity (Folstein & Luria, 1973; Little & McPhail, 1973). This measure was used during preliminary analyses, also included as part of the manipulation check for this study because in accordance with the tension reduction model, individuals with a history of NSSI are
expected to experience greater changes in mood compared to those without a history of NSSI (Nock & Prinstein, 2004).

**Physiological Measure.**

**Electrodermal Activity (EDA).** Two noninvasive self-sticking disposable sensors were placed on the heal of participants’ non-dominant hand by a female experimenter to measure changes in the electrical conductance of the skin and collect GSR data for Skin Conductance Level (SCL) calculations (Figure 8). MindWare Technologies Ltd. (2009) hardware and Biolab 3.1 analysis software was set to collect GSR data falling within -5 and 5 volts with a sampling rate of 1000 Hz. Seven non-invasive self-sticking disposable sensors were placed on participants’ right collarbone, jugular notch, bottom right rib, bottom left rib, sternum, and on their mid-back and upper-back, within 1.5 inches of the jugular notch and sternum sensors as part of a separate investigation. Participants were asked to sit with good posture with their non-dominant hand face up on either the desk or on their lap during physiological data collection. In the present study, EDA was examined as our physiological measure of emotion reactivity given its high sensitivity and specificity for predicting suicide, and given prior research suggesting it differentiates individuals with and without a history of NSSI (Haines et al., 1995; Nock & Mendes, 2008; Thorell et al., 2013; Welch et al., 2008). SCL was used as the hypothesized outcome variable in Hypotheses 5, 6, and 7, a hypothesized predictor variable in Hypothesis 10, and as a hypothesized mediator in Hypothesis 9.
Experimental Task

**Cyberball.** Cyberball (Williams & Jarvis, 2006) is a computerized task in which a participant plays a virtual ball toss game with two programmed players. Each participant was “Player 2” and was instructed to toss a ball, when received, to either “Player 1” or “Player 3.” Each participant was unaware that the two other players were programmed to include him or her in the first one-third of the game (the first 40 throws, which lasted for approximately 1.5 minutes), and to exclude him or her without warning for the last two-thirds of the game (80 throws, which lasted for approximately 3.5 minutes). Each participant was excluded in order to induce feelings of social stress and ostracism. This game was played on a desktop computer via E-Prime (2015) software. A meta-analysis of 120 studies examining the effect of ostracism in Cyberball showed that Cyberball is particularly effective in producing these feelings (Harterink et al., 2015). This particular task was chosen because research suggests a relationship between social stress and NSSI (Fox, Hammond & Mezulis, 2018).
Procedure

Session 1. Eligible participants came to the MML, which is located in 329 Corbett Hall at UMaine in Orono. Each participant was greeted by a research assistant trained in a standardized study procedure (Table 1). After participants arrived, a research assistant reviewed an informed consent form, ensured comprehension of the informed consent form and study, and answered any participant questions (Appendix G). As part of the consenting process, participants were informed about the tasks that they were asked to complete (i.e., they completed an interview of self-injurious behaviors, watched a short nature film, completed an online ball game, and watched two more short videos while physiological recording was taken), the amount of time that the study would take (i.e., approximately two hours), and the amount of compensation they would receive for their participation (i.e., $20.00 or a prorated amount for community participants, and one credit per hour for student participants). Participants were also informed that their involvement in the study was voluntary and that they had the option to discontinue participation at any point during the study session.

Participants were informed of the risks and benefits associated with participation. Specifically, they were informed that they may experience discomfort answering questions and that these questions may be skipped, and they were also informed that a risk assessment might be conducted if there was any indication that they were at risk for self-harm. It was explained that their participation would contribute to our understanding of the relation between self-injurious behaviors and the way people think. Regarding confidentiality of their data, participants were told that an identification number would be assigned to them and that the cross-index linking their name to their ID number would be
stored using software that provides additional security on a password-protected computer in a locked office and would be deleted in December 2020. Given all of this information, if participants indicated that they were interested in participating, the study began.

Following informed consent, the experimenter introduced the SITBI by saying “These questions ask about thoughts and feelings of suicide and self-injurious behaviors. Please listen carefully and respond as accurately as you can.” The experimenter answered any questions that the participant had about the structured clinical interview and then once all questions were answered, the SITBI (Nock et al., 2008) was administered. The SITBI was administered to determine if the participant had a history of engaging in NSSI.

After the administration of the SITBI, the female experimenter prepared the participant to be hooked up to psychophysiological equipment. Participants were asked if they had any skin allergies to medical tape or Band-Aids before sensors were attached. They were asked to remove jewelry; to turn off their cell phone, as this can interfere with psychophysiological recordings; and to place their belongings in a box, which was kept in the study room with them, but away from the sensors. After participants did this, they were brought to the restroom to wash their hands with Neutrogena soap because it allows for optimal sensor attachment on their palm and to use the restroom if necessary. If participants were chewing gum, they were asked to spit it out.

When the participant came back from the restroom, the female experimenter briefly explained the procedure (showed the participant the diagram in Figure 8 which showed where sensors are placed) for electrode placement and ensured that the participant was comfortable with the procedure. Small-talk (e.g., about the participant’s major at school, their classes, the weather) was made in order to make participants more
comfortable. Before attaching the sensors, an abrasive alcohol swab was used to clean the areas for sensor attachment. Then, the non-abrasive self-sticking sensors were placed on the heel of each participant’s non-dominant hand, each participant’s right collarbone, jugular notch, bottom right rib, bottom left rib, sternum, and on their mid-back and upper-back, within 1.5 inches of the jugular notch and sternum sensors. In order to ensure that each sensor was secure, medical tape was used to secure the lead that was attached to each sensor.

Once sensor hookup was complete, the research assistant who was in charge of monitoring using Mindware Biolab 3.1 (2009) software checked that the signals were being received in order to ensure that sensors were accurately placed. If necessary, sensors were readjusted before participants began the paradigm. Once sensors were accurately placed, participants were asked to sit in front of a computer with good posture (i.e., with their back straight against the chair), and with their legs uncrossed for the remainder of the study.

Participants were told that they would be alternating between completing questionnaires on a tablet and completing tasks on the computer. Directions, video, and audio for the computer tasks were presented using E-Prime (2015) computer software. The participants began by completing a battery of questionnaires via Qualtrics (2018) on an electronic tablet. Participants completed a questionnaire inquiring about their demographic information. The order of the other questionnaires was randomized and assessed current symptoms of suicidal ideation (BSS; Beck & Steer, 1991), emotion reactivity (ERS; Nock et al., 2008), negative problem orientation (SPSI-R; D’Zurilla et al., 2002), positive and negative affect (PANAS-X; Watson & Clark, 1994), and current
mood (VAS) (See Appendix H). After completing these questionnaires, participants watched a 7-minute neutral video about Alaska’s Denali National Park. The purpose of this video was to allow participants’ physiological responses to reach a normal baseline and to enable them to acclimate to electrode placement. Afterwards, participants completed the PANAS-X (Watson & Clark, 1994) and VAS once again.

Next, participants read the instructions for playing Cyberball (Williams & Jarvis, 2006) on the computer. For the first one-third of the ball-toss game (first 40 throws), participants were included. Then, they were suddenly excluded for the next two-thirds of the game without warning or explanation (next 80 throws). The game lasted approximately five minutes. Afterwards, participants were instructed to complete the PANAS-X (Watson & Clark, 1994) and VAS once again.

Next, participants watched another 7-minute neutral video about Alaska, for a recovery period. Then, they completed the VAS and PANAS-X (Watson et al., 1988) once again. After this, participants watched a comical 3-minute video about Maru the Cat in order to induce a positive mood, and then the VAS and PANAS-X (Watson et al., 1988) were completed for the last time.

At the end of Session One, participants were debriefed and were provided a copy of the debriefing form (Appendix J). They had the opportunity to ask the experimenter any questions that they had about the study or their participation in the study and were appropriately compensated for their participation. All participants were provided with the list of counseling services on campus and in the community surrounding UMaine (Appendix D), and were told, “This referral list is provided for your information. If/when you would like counseling for distressing issues, these are some of the available options
in this area. The list includes a variety of resources, some of which are low cost while others vary based on an hourly rate.” The female experimenter assisted with electrode removal if necessary.

A risk assessment was conducted with all participants who indicated in any way that they were at risk for current self-harm or suicide (Appendix I). The risk assessment included questions about endorsement of suicidal ideation, intent, plan, history of suicide attempts, access to means, and whether the participant had made preparations to attempt suicide. If the participant endorsed present suicidal ideation, intent, plan, gesture, or recent suicide attempt, the experimenter consulted with a licensed clinical psychologist affiliated with UMaine in order to discuss how to proceed. If the participant was at imminent risk for suicide and hospitalization was deemed necessary, the participant would be encouraged to go to the emergency department of the hospital for an evaluation. The experimenter would follow the participant to the hospital in their own vehicle. If the participant was at imminent risk for self-harm or suicide, and self-admission was not a viable option, the experimenter called law enforcement and asked them to escort the participant to the emergency department. Over the course of this study, none of our participants had to be hospitalized.

Session 2. Within six to eight weeks of participating in Session 1, participants were contacted via email with a link to a battery of questionnaires (Appendix K). Prior to completing the battery of questionnaires (Appendix M), they completed the informed consent form (Appendix L), which included details about what they would be asked to do (i.e., complete a battery of questionnaires), the amount of time it should take (i.e., approximately 5-10 minutes), the aforementioned potential risks and benefits of
participating, compensation (i.e., be entered in a raffle for a 1 in 10 chance to win a $25.00 VISA gift card), their right to terminate participation at any time or to skip questions, and the aforementioned information regarding their confidentiality as participants. In order to retain participants, participants were contacted three times via email at 6-week, 7-week, and 8-week follow-up. The style of the emails was edited throughout this study in order to attract participant’s attention and encourage participation. Participants who completed Session 2 were entered in a raffle for a 1 in 10 chance to win a $25.00 VISA gift card.

The battery of questionnaires was randomized and included a measure of suicidal ideation (BSS; Beck & Steer, 1991). In accordance with recommendations from the Connected and Open Research Ethics (CORE) Platform (https://thecore.ucsd.edu/), a web-based resource which includes resources shared by researchers, technologists, ethics board members and stakeholders for conducting ethical research, all participants received the following message at the end of the study: “If you are having thoughts of harming yourself please call 911, go to the nearest emergency room or call the National Hopeline Network at (1-800-SUICIDE/1-800-784-2433) or Suicide Prevention Lifeline at 1-800-273-8255. If you are experiencing severe depressive symptoms please contact a physician or mental health professional” (Appendix N). The last page of the survey also included the list of counseling services on campus and in the community surrounding UMaine (Appendix D). Additionally, a clinician followed-up with any participant (via email) who endorsed suicide intent during Session 2 (Appendix O). Participants who did not endorse suicide intent were also sent an email with a list of resources. Full study procedure is presented in Table 1 on the next page.
<table>
<thead>
<tr>
<th>Time</th>
<th>Task Category</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>Self-report measure</td>
<td>SHBQ: History of self-harm behaviors</td>
</tr>
<tr>
<td>Session 1</td>
<td>Structured Clinical Interview</td>
<td>SITBI: History of self-injurious thoughts and behaviors (i.e., suicidal ideation, suicide plan, suicide gesture, suicide attempt, thoughts of NSSI, NSSI behavior)</td>
</tr>
<tr>
<td>Self-report measures</td>
<td></td>
<td>Demographic Information: age, sex, race, ethnicity, marital status, and education level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BSS: Suicidal ideation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERS: Emotion reactivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPSI-R: Negative problem orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PANAS-X: Positive and negative affect</td>
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<tr>
<td></td>
<td></td>
<td>VAS: Negative mood</td>
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<td>Baseline</td>
<td>SCL while viewing 7-minute clip of Alaska Denali Park Video</td>
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</tr>
<tr>
<td>Cyberball</td>
<td>SCL during inclusion and exclusion periods</td>
<td></td>
</tr>
<tr>
<td>Recovery</td>
<td>SCL while viewing 7-minute clip of Alaska Denali Park Video</td>
<td></td>
</tr>
<tr>
<td>Positive Mood Induction</td>
<td>SCL while viewing 3-minute clip of Maru the Cat</td>
<td></td>
</tr>
<tr>
<td>Debriefing</td>
<td>Provide and review debriefing form</td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>Self-report measures</td>
<td>BSS: suicidal ideation</td>
</tr>
</tbody>
</table>

*Note. SHBQ = Self Harm Behaviors Questionnaire; SITBI = Self-Injurious Thought and Behaviors Interview; BSS = Beck Scale for Suicidal Ideation; ERS = Emotion Reactivity Scale; SPSI-R = Social Problem Solving Inventory – Revised; PANAS – X = Positive and Negative Affect Schedule – Expanded Form; VAS = Visual Analogue Scale; SCL = Skin Conductance Level.*
CHAPTER THREE

RESULTS

The central aim of this study was to examine the relationship between NSSI and suicidal ideation, and the role of emotion reactivity and negative problem orientation in this relationship. A structured clinical interview was used to examine whether participants had a history of NSSI, or other self-injurious thoughts or behaviors. Self-report questionnaires were used to test study hypotheses regarding differences in emotion reactivity and negative problem orientation between individuals with vs. without history of NSSI (i.e., Hypotheses 1 and 2) and individuals with a history of NSSI and high vs. low levels of suicidal ideation (i.e., Hypotheses 3 and 4), and to examine the relations among NSSI history, emotion reactivity, negative problem orientation, and suicidal ideation (i.e., Hypothesis 8). A social stress task and changes in skin conductance level (SCL) were used to further examine differences in emotion reactivity in individuals with vs. without a history of NSSI (i.e., Hypothesis 5) and individuals with a history of NSSI and high vs. low levels of suicidal ideation (Hypothesis 6), and to examine the role of emotion reactivity in the trajectory from NSSI to suicidal ideation (i.e., Hypotheses 7, 9, and 10). Physiological data were collected and amplified with Mindware hardware and Biolab (2009) acquisition software at a sampling rate of 1000 Hz. All analyses were conducted using IBM SPSS Version 26.0.0.0 (IBM Corp., 2019).

Prior to analyses, data were inspected for potential univariate outliers, defined as z-scores exceeding +/-3.29 (Tabachnick & Fidell, 2007, p.73). All outliers that were detected were winsorized (i.e., extreme values were changed to the most extreme value that was not an outlier) in order to preserve the general pattern of variability in the data.
and reduce the skew of the distribution (Field, 2009). Outlier data for negative problem orientation \((n = 2)\), negative affect \((n = 4)\), and suicidal ideation at time 2 \((n = 1)\) were windsorized to address extreme values. Outlier data for baseline skin conductance \((n = 1)\), and skin conductance reactivity \((n = 1)\) were windsorized as well. In addition, 5 subjects were removed from analyses using the VAS and PANAS-X due to completing these measures at the wrong times. Furthermore, 5 cases were excluded from analyses examining baseline skin conductance, and 7 were excluded from analyses examining skin conductance reactivity, due to poor signals or too much noise in those data. Finally, 10 subjects were missing baseline SCL data and 11 were missing SCL data during the exclusion period. In order to examine multivariate outliers, Mahalanobis Distance was used. No multivariate outliers were identified.

**Descriptives**

A sample of 106 participants was recruited from the University of Maine and the surrounding community. All 106 participants completed Session 1. Of these, 50 (47.2%) participants reported a history of NSSI, and 56 (52.8%) participants did not report a history of NSSI. Of the 50 participants who endorsed a history of NSSI, 18 (36%) endorsed high levels of suicidal ideation at baseline, and 32 (64%) endorsed low levels of suicidal ideation at baseline. Of the 106 Session 1 participants, 35 (33%) completed Session 2, with 20 (57.14%) having a history of NSSI, and 15 (42.86%) not reporting a history of NSSI.

The sample was predominantly female \((n = 64, 60.4\%)\) European American \((n = 92, 86.8\%)\), never married/single \((n = 98, 92.5\%)\), and high school educated \((n = 62,\)
58.5%), with a mean age of 20.27 years ($SD = 4.45$). Sample descriptive statistics are presented in Table 2.
Table 2: *Demographic Descriptive Statistics*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
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<tr>
<td>Multiple Races</td>
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<td>4.7</td>
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<tr>
<td>African American</td>
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<td>.9</td>
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</tr>
<tr>
<td>Native American</td>
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<td>1.9</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Omitted Responses</td>
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<td>.9</td>
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<td>Marital Status</td>
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<td>92.5</td>
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<tr>
<td>Separated</td>
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<td>2.8</td>
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<tr>
<td>Common law marriage</td>
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<td>.9</td>
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<tr>
<td>Divorced</td>
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<td>.9</td>
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<td>Education</td>
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<td></td>
</tr>
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<td>17</td>
<td></td>
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<td>4 Years College with Degree</td>
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<td>.9</td>
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<td>A.A. or other degree that is not a B.A. or B.S.</td>
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<td>.9</td>
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</tr>
<tr>
<td>Age in Years</td>
<td>20.27</td>
<td>4.45</td>
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<td></td>
<td>18-43</td>
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<tr>
<td>History of NSSI</td>
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</tr>
<tr>
<td>No NSSI History</td>
<td>56</td>
<td>52.8</td>
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<tr>
<td>NSSI History</td>
<td>50</td>
<td>47.2</td>
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</table>
Differences in age by NSSI history were examined using independent samples t-tests (Table 3). Levene’s test for homogeneity of variance was not significant for age, $F(104) = .490, p = .486$. This indicates that the assumption underlying t-test was met.

There were no significant differences by group for age $[t(104) = .160, p = .873, \text{Cohen's } d = .03]$.

Table 3: Age by NSSI History

<table>
<thead>
<tr>
<th></th>
<th>No NSSI History $(n = 56)$</th>
<th>NSSI History $(n = 50)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>20.34</td>
<td>20.20</td>
</tr>
<tr>
<td>SD</td>
<td>4.86</td>
<td>4.01</td>
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<tr>
<td>Sample Range</td>
<td>18-43</td>
<td>18-40</td>
</tr>
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</table>

Chi square analyses were used to examine differences in race/ethnicity in both individuals with vs. without a history of NSSI (Table 4). Given that the sample was predominately European American $(n = 92, 86.8\%)$, race categories were collapsed into two dichotomous groups (i.e., European American, non-European American) to meet Chi-square assumption of expected frequencies (i.e., frequencies in each cell should be greater than 5). Results revealed that there were no significant differences between groups by NSSI history, $x^2(1) = 1.51, p = .220$. 
Table 4: *Race/Ethnicity by NSSI Group*

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>No NSSI History (n = 56)</th>
<th>NSSI History (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>European American</td>
<td>47(83.9%)</td>
<td>45(90%)</td>
</tr>
<tr>
<td>Asian</td>
<td>4(7.1%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Multiple Races</td>
<td>3(5.4%)</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>African American</td>
<td>0(0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Native American</td>
<td>2(3.6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1(1.8%)</td>
<td>2(4%)</td>
</tr>
<tr>
<td>Omitted Responses</td>
<td>0(0%)</td>
<td>1(2%)</td>
</tr>
</tbody>
</table>

Fisher’s exact test was used to examine differences in marital status of participants across NSSI history, since expected frequencies in each cell were not greater than 5 (Table 5). Given that the sample was predominately never married \(n = 98, 92.5\%\), the marital status categories were collapsed into two groups (i.e., never married and other (e.g., divorced/married)). Results showed that there were no significant differences between groups by NSSI history, \(p = .720\).

Table 5: *Marital Status by NSSI Group*

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>No NSSI History (n = 56)</th>
<th>NSSI History (n = 50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never Married/Single</td>
<td>51(91.1%)</td>
<td>47(94%)</td>
</tr>
<tr>
<td>Married</td>
<td>3(5.4%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Separated</td>
<td>2(3.6%)</td>
<td>1(2%)</td>
</tr>
<tr>
<td>Common Law Marriage</td>
<td>0 (0%)</td>
<td>1(2%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>0 (0%)</td>
<td>1(2%)</td>
</tr>
</tbody>
</table>
Chi-square analyses were used to examine differences in educational level of participants across NSSI history (Table 6). Given that the majority of the sample was high-school educated \((n = 62, 58.5\%)\), education level was collapsed into two dichotomous groups (i.e., high school education and greater than high school education) in order to meet Chi-square assumption of expected frequencies (i.e., frequencies in each cell should be greater than 5). Results revealed that there were no significant differences between groups by NSSI history, \(x^2(1)= .01, p = .923\).

Table 6: *Education Level by NSSI Group*

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>No NSSI History ((n= 56))</th>
<th>NSSI History ((n = 50))</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>33(58.9%)</td>
<td>29(58%)</td>
</tr>
<tr>
<td>1 Year College or Technical School</td>
<td>15(26.8%)</td>
<td>7(14%)</td>
</tr>
<tr>
<td>2+ Years College without Degree</td>
<td>6(10.7%)</td>
<td>12(24%)</td>
</tr>
<tr>
<td>4 Years College with Degree</td>
<td>1(1.8%)</td>
<td>1(2%)</td>
</tr>
<tr>
<td>Postgraduate MD, Ph.D.</td>
<td>1(1.8%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>A.A. or other degree that is not a B.A. or B.S.</td>
<td>0(0%)</td>
<td>1(2%)</td>
</tr>
</tbody>
</table>

Chi-square analyses were used to examine differences in gender in individuals with vs. without a history of NSSI (Table 7). Statistical analyses focused on subjects who identified as male or female \((n = 105, 99.1\%, \text{with 1 subject identifying as non-binary})\) to meet the Chi-square assumption of expected frequencies (e.g., frequencies in each cell should be greater than 5). Results revealed that the group of subjects with a history of NSSI had significantly more females than subjects without a history of NSSI, \(x^2(1)= 13.41, p < .001\).
Table 7: Gender by NSSI Group

<table>
<thead>
<tr>
<th>Gender</th>
<th>No NSSI History</th>
<th>NSSI History</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>( n = 56 )</td>
<td>( n = 50 )</td>
</tr>
<tr>
<td>Female</td>
<td>25(44.6%)(_a)</td>
<td>39(78%)(_b)</td>
</tr>
<tr>
<td>Male</td>
<td>31(55.4%)</td>
<td>10(20%)</td>
</tr>
<tr>
<td>Non-binary</td>
<td>0(0%)</td>
<td>1(2%)</td>
</tr>
</tbody>
</table>

*Note.* Values with different subscripts are statistically significant at \( p < .05 \).

**Reliability**

Reliability was examined for all self-report measures. All self-report measures demonstrated good internal consistency (\( \alpha \) range from .88 to .97) in this study sample.

Descriptive statistics for self-report measures are presented in Table 8 on the next page.
Table 8. Descriptive Statistics of Self-Report Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Internal Consistency (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERS</td>
<td>33.71</td>
<td>22.79</td>
<td>0-84</td>
<td>.97</td>
</tr>
<tr>
<td>SPSI-R NPO</td>
<td>27.58</td>
<td>10.82</td>
<td>10-49</td>
<td>.94</td>
</tr>
<tr>
<td>BSSS₁</td>
<td>2.94</td>
<td>5.17</td>
<td>0-18</td>
<td>.92</td>
</tr>
<tr>
<td>BSSS₂</td>
<td>3.66</td>
<td>5.16</td>
<td>0-17</td>
<td>.90</td>
</tr>
<tr>
<td>PANAS-X NPRE</td>
<td>14.13</td>
<td>4.36</td>
<td>10-26</td>
<td>.88</td>
</tr>
<tr>
<td>PANAS-X NPOST</td>
<td>14.80</td>
<td>5.63</td>
<td>9-33</td>
<td>.89</td>
</tr>
<tr>
<td>PANAS-X PPRE</td>
<td>24.38</td>
<td>9.07</td>
<td>10-49</td>
<td>.92</td>
</tr>
<tr>
<td>PANAS-X PPOST</td>
<td>20.51</td>
<td>8.88</td>
<td>10-47</td>
<td>.94</td>
</tr>
</tbody>
</table>

Note. ERS = Emotion Reactivity Scale, SPSI-R NPO = Social Problem Solving Inventory-Revised Negative Problem Orientation, BSS = Beck Scale for Suicidal Ideation, S₁ = Session 1, S₂ = Session 2, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale, PRE = pre-Cyberball, POST = post-Cyberball.

Preliminary Analyses

Pearson bivariate correlations were conducted to examine the relations between the study variables (i.e., emotion reactivity (ERS), negative problem orientation (SPSI-R NPO) and suicidal ideation (BSS at time 1 and time 2)) within the full sample (Table 9). Consistent with hypotheses, emotion reactivity was significantly positively associated with suicidal ideation at time 1, \( r(104) = .46, p < .001 \), and time 2, \( r(33) = .36, p = .032 \), such that reports of greater emotion reactivity were associated with greater suicidal
ideation at baseline and at 6-8 week follow-up in the full sample. Also consistent with hypotheses, negative problem orientation was significantly positively associated with suicidal ideation at time 1, \( r(104) = .47, p < .001 \), and time 2, \( r(33) = .40, p = .018 \), such that reports of greater negative problem orientation was associated with greater suicidal ideation at baseline and 6-8 week follow-up as well.

Table 9: Correlations between Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emotion Reactivity (ERS)</td>
<td>__</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Negative Problem Orientation (SPSI-R NPO)</td>
<td>.81*</td>
<td>__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Baseline Suicidal Ideation (BSS time 1)</td>
<td>.46*</td>
<td>.47*</td>
<td>__</td>
<td></td>
</tr>
<tr>
<td>4. Suicidal Ideation at 6-8 week follow-up (BSS time 2)</td>
<td>.36*</td>
<td>.40*</td>
<td>.86*</td>
<td>__</td>
</tr>
</tbody>
</table>

Note. ERS = Emotion Reactivity Scale, SPSI-R NPO = Social Problem Solving Inventory-Revised Negative Problem Orientation, BSS = Beck Scale for Suicidal Ideation

**p < .01, *p < .05

Pearson bivariate correlations were also used to examine relations between the study variables [i.e., emotion reactivity (ERS), negative problem orientation (SPSI-R NPO) and suicidal ideation (BSS at time 1 and time 2)] in each group (i.e., individuals with vs. without a history of NSSI) (Table 10). In individuals with or without a history of NSSI, emotion reactivity was significantly positively correlated with suicidal ideation at time 1, \( r(48) = .30, p = .035 \), and \( r(54) = .46, p < .001 \), respectively but not at time 2, \( r(18) = .27, p = .246 \), and \( r(13) = .38, p = .164 \), respectively. Negative problem orientation was significantly positively correlated with suicidal ideation at time 1 and 2 for individuals without a history of NSSI, \( r(54) = .49, p < .001 \), and \( r(13) = .52, p = .046 \),
respectively, but not for individuals with a history of NSSI, \( r(48) = .27, p = .056 \), and \( r(18) = .17, p = .483 \), respectively.

Table 10: Correlations between Study Variables by NSSI History

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emotion Reactivity (ERS)</td>
<td></td>
<td>.71**</td>
<td>.30*</td>
<td>.27</td>
</tr>
<tr>
<td>2. Negative Problem Orientation (SPSI-R NPO)</td>
<td>.83**</td>
<td></td>
<td>.27</td>
<td>.17</td>
</tr>
<tr>
<td>3. Baseline Suicidal Ideation (BSS time 1)</td>
<td>.46**</td>
<td>.49**</td>
<td></td>
<td>.84**</td>
</tr>
<tr>
<td>4. Suicidal Ideation at 6-8 week follow-up (BSS time 2)</td>
<td>.38</td>
<td>.52*</td>
<td>.90**</td>
<td></td>
</tr>
</tbody>
</table>

*Note. ERS = Emotion Reactivity Scale, SPSI-R NPO = Social Problem Solving Inventory-Revised Negative Problem Orientation, BSS = Beck Scale for Suicidal Ideation. Correlations for individuals with an NSSI history are above the diagonal, and correlations for individuals without an NSSI history are below the diagonal.

**p<.01, *p<.05

Manipulation Check

Related samples t-tests were used to examine whether there were significant differences in mood and positive and negative affect after playing Cyberball, for the full sample (Table 11) and by group (Table 12 and 13). It was expected that mood and affect would significantly decrease, and it was also expected that individuals with a history of NSSI would experience greater decreases in mood, increases in negative affect, and decreases in positive affect compared to individuals without a history of NSSI.

Differences in change in mood and in positive and negative affect were also explored for individuals with a history of NSSI/high SI and individuals with a history of NSSI/low SI. In the full sample, mood and positive affect significantly decreased after Cyberball, \( t(98) = 6.29, p < .001 \), Cohen’s \( d = .45 \), and \( t(95) = 7.42, p < .001 \), Cohen’s \( d = .44 \) and negative affect significantly increased, \( t(96) = -2.24, p = .027 \), Cohen’s \( d = .15 \).
Table 11: Descriptive Statistics for Session 1 Mood Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>Sample range</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS\textsubscript{PRE}</td>
<td>67.20</td>
<td>21.21</td>
<td>7-100</td>
</tr>
<tr>
<td>VAS\textsubscript{POST}</td>
<td>57.18</td>
<td>22.96</td>
<td>8-100</td>
</tr>
<tr>
<td>PANAS-X \textsubscript{N\textsubscript{PRE}}</td>
<td>14.17</td>
<td>4.44</td>
<td>10-26</td>
</tr>
<tr>
<td>PANAS-X \textsubscript{N\textsubscript{POST}}</td>
<td>14.92</td>
<td>5.71</td>
<td>9-33</td>
</tr>
<tr>
<td>PANAS-X \textsubscript{P\textsubscript{PRE}}</td>
<td>24.38</td>
<td>8.93</td>
<td>10-49</td>
</tr>
<tr>
<td>PANAS-X \textsubscript{P\textsubscript{POST}}</td>
<td>20.45</td>
<td>8.84</td>
<td>10-47</td>
</tr>
</tbody>
</table>

Note. VAS = Visual Analogue Scale, \textsubscript{PRE} = pre-Cyberball, \textsubscript{POST} = post-Cyberball, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale.

Individuals with a history of NSSI showed significant decreases in positive affect and mood after playing Cyberball, $t(44) = 5.79, p < .001$, Cohen’s $d = .53$ and $t(45) = 4.93, p < .001$, Cohen’s $d = .60$ but did not show significant changes in negative affect after playing Cyberball, $t(45) = -1.18, p = .243$, Cohen’s $d = .12$. Individuals without a history of NSSI showed significant decreases in positive affect, $t(50) = 4.91, p < .001$, Cohen’s $d = .44$ and mood, $t(52) = 3.99, p < .001$, Cohen’s $d = .40$ and increases in negative affect, $t(50) = -2.08, p = .043$, Cohen’s $d = .18$ after playing Cyberball.
Table 12: Descriptive Statistics for Session 1 Mood Measures by NSSI History

<table>
<thead>
<tr>
<th></th>
<th>No NSSI History (n = 56)</th>
<th></th>
<th></th>
<th>NSSI History (n = 50)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>VAS&lt;sub&gt;PRE&lt;/sub&gt;</td>
<td>69.19</td>
<td>21.67</td>
<td>7-100</td>
<td>64.87</td>
<td>20.65</td>
</tr>
<tr>
<td>VAS&lt;sub&gt;POST&lt;/sub&gt;</td>
<td>62.40</td>
<td>19.98</td>
<td>28-100</td>
<td>51.17</td>
<td>24.86</td>
</tr>
<tr>
<td>PANAS-X N&lt;sub&gt;PRE&lt;/sub&gt;</td>
<td>13.75</td>
<td>4.49</td>
<td>10-26</td>
<td>14.65</td>
<td>4.37</td>
</tr>
<tr>
<td>PANAS-X N&lt;sub&gt;Post&lt;/sub&gt;</td>
<td>14.57</td>
<td>4.91</td>
<td>9-31</td>
<td>15.30</td>
<td>6.52</td>
</tr>
<tr>
<td>PANAS-X P&lt;sub&gt;PRE&lt;/sub&gt;</td>
<td>27.48</td>
<td>8.90</td>
<td>10-49</td>
<td>20.87</td>
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<td>23.49</td>
<td>9.13</td>
<td>10-47</td>
<td>17.02</td>
<td>7.16</td>
</tr>
</tbody>
</table>

Note. VAS = Visual Analogue Scale, <sub>PRE</sub> = pre-Cyberball, <sub>POST</sub> = post-Cyberball, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale.

Both individuals with a history of NSSI/high SI and individuals with a history of NSSI/low SI showed significant decreases in positive affect, \( t(17) = 3.58, p = .002 \), Cohen’s \( d = .78 \), and \( t(26) = 4.54, p < .001 \), Cohen’s \( d = .44 \), respectively, and significant increases in negative mood after playing Cyberball, \( t(17) = 4.60, p < .001 \), Cohen’s \( d = .97 \), and \( t(27) = 2.91, p = .007 \), Cohen’s \( d = .47 \), respectively, but did not show significant changes in negative affect after playing Cyberball, \( t(17) = -1.98, p = .064 \), Cohen’s \( d = .31 \), and \( t(27) = -.05, p = .961 \), Cohen’s \( d = .01 \), respectively. Individuals without a history of NSSI showed significant increases in negative mood and negative affect after playing Cyberball, \( t(52) = 3.99, p < .001 \), Cohen’s \( d = .40 \) and \( t(50) = -2.08, p = .043 \), Cohen’s \( d = .18 \), and showed significant decreases in positive affect after playing Cyberball, \( t(50) = 4.91, p < .001 \), Cohen’s \( d = .44 \).
Table 13: Descriptive Statistics for Session 1 Mood Measures within NSSI Group

<table>
<thead>
<tr>
<th></th>
<th>NSSI History/High SI (n = 18)</th>
<th>NSSI History/Low SI (n = 32)</th>
<th>No NSSI History (n = 56)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
</tr>
<tr>
<td>VASSPRE</td>
<td>56.89</td>
<td>19.10</td>
<td>15-100</td>
</tr>
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<td>VASPOST</td>
<td>39.06</td>
<td>17.72</td>
<td>8-77</td>
</tr>
<tr>
<td>PANAS-X NPRE</td>
<td>15.22</td>
<td>4.18</td>
<td>10-26</td>
</tr>
<tr>
<td>PANAS-X NPost</td>
<td>16.83</td>
<td>5.97</td>
<td>10-33</td>
</tr>
<tr>
<td>PANAS-X PPRE</td>
<td>19.11</td>
<td>6.26</td>
<td>10-38</td>
</tr>
</tbody>
</table>

Note. VAS = Visual Analogue Scale, PRE = pre-Cyberball, POST = post-Cyberball, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale.

Next, a series of independent samples t-tests was examined in order to determine whether individuals with a history of NSSI experienced greater changes in mood and in negative and positive affect compared to individuals without a history of NSSI (Table 14). Change scores were computed by subtracting VAS and PANAS-X - negative and positive scores after Cyberball from VAS and PANAS-X - negative and positive scores before Cyberball, at baseline (pre-post). Levene’s tests for homogeneity of variance were not significant for the analyses, indicating that the assumptions underlying t-tests examining the differences in changes in mood, negative affect, and positive affect were met, $F(97) = 3.72, p = .057$, $F(95) = .82, p = .368$, and $F(94) = .70, p = .405$, respectively. Results revealed that the change in mood, positive affect, and negative affect did not significantly differ for individuals with or without a history of NSSI, $t(97) = -1.71, p = .091$, Cohen’s $d = .34$, $t(94) = .06, p = .951$, Cohen’s $d = .01$, and $t(95) = -.18, p = .855$, Cohen’s $d = .04$ respectively.
Table 14: Descriptive Statistics for Change in Session 1 Mood Measures by NSSI History

<table>
<thead>
<tr>
<th></th>
<th>No NSSI History</th>
<th></th>
<th></th>
<th>NSSI History</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
</tr>
<tr>
<td>VASDS</td>
<td>7.96</td>
<td>14.52</td>
<td>-29-40</td>
<td>13.70</td>
<td>18.84</td>
<td>-20-58</td>
</tr>
<tr>
<td>PANAS-X NDS</td>
<td>-0.65</td>
<td>2.95</td>
<td>-10-5</td>
<td>-0.52</td>
<td>3.78</td>
<td>-15-8</td>
</tr>
<tr>
<td>PANAS-X PDS</td>
<td>4.00</td>
<td>5.82</td>
<td>-5-32</td>
<td>3.93</td>
<td>4.56</td>
<td>-6-22</td>
</tr>
</tbody>
</table>

Note. VAS = Visual Analogue Scale, DS = difference score, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale.

Finally, a series of one-way ANOVAs was conducted to examine whether individuals with a history of NSSI/high SI, individuals with a history of NSSI/low SI, and individuals without a history of NSSI experienced significantly different changes in mood and in negative and positive affect (Table 15). A BSS total score > 6 was considered a “high” level of suicidal ideation, whereas a BSS total score ≤ 6 was considered a “low” level of suicidal ideation. This was determined by examining the distribution of BSS total scores for participants with a history of NSSI in preliminary data. Hypotheses were exploratory.

Levene’s tests for homogeneity of variance were not significant for any of the analyses indicating that the assumptions underlying ANOVA examining the differences in changes in mood, negative affect, and positive affect were met, $F(2,96) = 1.76, p = .178, F(2,94) = .36, p = .702, and F(2,93) = .27, p = .764$, respectively. Neither of the independent between-groups ANOVAs yielded statistically significant effects, $F(2,96) = 2.39, p = .097, \eta^2 = .05, F(2,94) = 1.28, p = .282, \eta^2 = .03, F(2,93) = .11, p = .893, \eta^2 = .002$. 
Table 15: Descriptive Statistics for Change in Session 1 Mood Measures within NSSI Group

<table>
<thead>
<tr>
<th></th>
<th>NSSI History/High SI (n = 18)</th>
<th>NSSI History/Low SI (n = 32)</th>
<th>No NSSI History (n = 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
</tr>
<tr>
<td>VAS&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>17.83</td>
<td>16.45</td>
<td>-8-50</td>
</tr>
<tr>
<td>PANAS-X&lt;sub&gt;NDS&lt;/sub&gt;</td>
<td>-1.50</td>
<td>3.29</td>
<td>-7-4</td>
</tr>
<tr>
<td>PANAS-X&lt;sub&gt;PDS&lt;/sub&gt;</td>
<td>4.39</td>
<td>5.20</td>
<td>-1-22</td>
</tr>
</tbody>
</table>

*Note. VAS = Visual Analogue Scale, DS = difference score, PANAS-X = Positive and Negative Affect Scale – Expanded Form; N = negative affect general dimension scale; P = positive affect general dimension scale.*

Next, related samples t-tests were used to examine whether there were significant changes in SCL after playing Cyberball, for the full sample (Table 16). First the difference between baseline SCL, computed by averaging the last three minutes of SCL during the baseline period, and the exclusion period (i.e., average of the second and third minutes of ostracism during Cyberball) was examined in the full sample, and then the difference between SCL during the inclusion period (i.e., average of two minute period when the participant is included in Cyberball) and SCL during the exclusion period was examined. Typical values for SCL range from 1-40uS (Venables & Christie, 1980).

In the full sample, SCL significantly increased from baseline to exclusion, \( t(92) = -6.01, p < .001 \), Cohen’s \( d = .21 \). In addition, SCL significantly decreased from the inclusion period of Cyberball to the exclusion period of Cyberball, \( t(94) = 2.16, p = .033 \), Cohen’s \( d = .08 \).
Table 16: *Descriptive Statistics for Session 1 SCL*

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>Sample range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline SCL</td>
<td>6.33</td>
<td>3.60</td>
<td>.92-17.64</td>
</tr>
<tr>
<td>Inclusion SCL</td>
<td>7.52</td>
<td>4.12</td>
<td>.83-20.08</td>
</tr>
<tr>
<td>Exclusion SCL</td>
<td>7.15</td>
<td>4.20</td>
<td>.75-20.27</td>
</tr>
</tbody>
</table>

*Note. SCL = Skin Conductance Level.*

**Hypothesis 1**

Hypothesis 1 stated that individuals with a history of NSSI would be significantly more likely to report having a negative problem orientation, compared to individuals without a history of NSSI (Table 17). An independent samples t-test was conducted to examine this hypothesis. Levene’s test for homogeneity of variance was not significant, $F(104) = 1.45, p = .231$, indicating that the assumption underlying t-test was met. Results revealed that individuals with a history of NSSI endorsed significantly greater negative problem orientation than individuals without a history of NSSI, $t(104) = -6.54, p < .001$, Cohen’s $d = 1.27$.

**Hypothesis 2**

Hypothesis 2 stated that individuals with a history of NSSI would report significantly greater emotion reactivity than individuals without a history of NSSI. An independent samples t-test was conducted to examine this hypothesis (Table 17). Levene’s test for homogeneity of variance was not significant, $F(104) = 3.07, p = .083$, indicating that the assumption underlying t-test was met. Results revealed that individuals with a history of NSSI endorsed significantly greater emotion reactivity than individuals without a history of NSSI, $t(104) = -5.00, p < .001$, Cohen’s $d = .97$. 79
Table 17: Group Differences in Emotion Reactivity and Negative Problem Orientation by NSSI History

<table>
<thead>
<tr>
<th></th>
<th>No NSSI History</th>
<th>NSSI History</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>(n = 50)</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td><strong>ERS</strong></td>
<td>24.27&lt;sup&gt;a&lt;/sup&gt;</td>
<td>18.94</td>
</tr>
<tr>
<td></td>
<td>0-69</td>
<td></td>
</tr>
<tr>
<td><strong>SPSI-R NPO</strong></td>
<td>22.09&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.38</td>
</tr>
<tr>
<td></td>
<td>10-40</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ERS = Emotion Reactivity Scale, SPSI-R NPO = Social Problem Solving Inventory-Revised Negative Problem Orientation. Values with different subscripts are statistically significant at *p* < .05.

**Hypothesis 3**

Hypothesis 3 stated that individuals with a history of NSSI/high SI would be significantly more likely to report having a negative problem orientation, compared to individuals with a history of NSSI/low SI (Table 18). A series of One-Way ANOVAs was conducted to test this hypothesis. A BSS total score > 6 was considered a “high” level of suicidal ideation, whereas a BSS total score ≤ 6 was considered a “low” level of suicidal ideation. This was determined by examining the distribution of BSS total scores for participants with a history of NSSI in preliminary data.

The assumption of homogeneity of variance was tested and satisfied based on Levene’s F-test, *F*(2,103), = .35, *p* = .707. The independent between-groups ANOVA yielded a statistically significant effect, *F*(2,103) = 23.79, *p* < .001, η² = .32. To evaluate the nature of the differences between the three means further, the statistically significant ANOVA was followed-up with a priori planned comparisons using contrast analyses. Both individuals with a history of NSSI/high SI, and individuals with a history of NSSI/low SI reported significantly greater negative problem orientation than individuals without a history of NSSI, *t*(103) = 6.09, *p* < .001, Cohen’s *d* = 1.69, and *t*(103) = 4.90, *p*
< .001, Cohen’s $d = 1.07$, respectively. Individuals with a history of NSSI/high SI and individuals with a history of NSSI/low SI did not significantly differ on negative problem orientation $t(103) = -1.91, p = .058$, Cohen’s $d = .53$

**Hypothesis 4**

Hypothesis 4 stated that individuals with a history of NSSI/high SI would report significantly greater emotion reactivity than individuals with a history of NSSI/low SI (Table 18). A series of One-Way ANOVAs was conducted to test this hypothesis. As in Hypothesis 3 above, a BSS total score $> 6$ was considered a “high” level of suicidal ideation, whereas a BSS total score $\leq 6$ was considered a “low” level of suicidal ideation.

The assumption of homogeneity of variance was tested and satisfied based on Levene’s F-test, $F(2,103) = 1.12, p = .330$. The independent between-groups ANOVA yielded a statistically significant effect, $F(2,103) = 15.00, p < .001$, $\eta^2 = .23$. To evaluate the nature of the differences among the three means further, the statistically significant ANOVA was followed-up with a priori planned comparisons using contrast analyses. Individuals with a history of NSSI/high SI reported significantly greater emotion reactivity than individuals with a history of NSSI/low SI, $t(103) = -2.05, p = .043$, Cohen’s $d = .56$, and individuals without a history of NSSI, $t(103) = 5.07, p < .001$, Cohen’s $d = 1.34$. Individuals with a history of NSSI/low SI also reported significantly greater emotion reactivity than individuals without a history of NSSI, $t(103) = 3.48, p = .001$, Cohen’s $d = .78$. 
Table 18: Differences in Emotion Reactivity and Negative Problem Orientation within NSSI Group

<table>
<thead>
<tr>
<th></th>
<th>NSSI History/High SI (n = 18)</th>
<th>NSSI History/Low SI (n = 32)</th>
<th>No NSSI History (n = 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Sample Range</td>
</tr>
<tr>
<td>ERS</td>
<td>52.11a</td>
<td>22.60</td>
<td>4-84</td>
</tr>
<tr>
<td>SPSI-R NPO</td>
<td>37.00a</td>
<td>9.27</td>
<td>15-49</td>
</tr>
</tbody>
</table>

Note. ERS = Emotion Reactivity Scale, SPSI-R NPO = Social Problem Solving Inventory-Revised Negative Problem Orientation. Values with different subscripts are statistically significant at \( p < .05 \).

Hypothesis 5

Hypothesis 5 stated that individuals with a history of NSSI would be more physiologically reactive to stress than individuals without a history of NSSI, as evidenced by increased skin conductance reactivity (a physiological index of emotion reactivity) after being ostracized during Cyberball (Williams & Jarvis, 2006), a social stress task. Differences in average skin conductance reactivity were examined, and differences were examined for each minute of ostracism as well. SCL ranges were within expectation. In order to examine differences in average skin conductance reactivity, baseline skin conductance level (SCL) was computed by averaging the last three minutes of baseline SCL, and the second and third minutes of SCL during ostracism were averaged together and then subtracted from baseline SCL. The second and third minute were averaged together because for the majority of participants, these were the last two minutes of ostracism. In order to examine differences for each minute of ostracism, each minute of ostracism during Cyberball (Williams & Jarvis, 2006) was subtracted from baseline SCL.

First, differences in SCL at baseline were examined (Table 18). When differences were examined, Levene’s test for homogeneity of variance was not significant, indicating
that the assumption underlying t-test was met, \( F(94) = .54, p = .466 \). Results revealed however, that baseline SCL did not significantly differ by NSSI group, \( t(94) = -.02, p = .988 \), Cohen’s \( d = .003 \).

Then, differences in average skin conductance reactivity were examined (Table 19). When differences in SCL reactivity were examined, Levene’s test for homogeneity of variance was once again not significant, indicating that the assumption underlying t-test was met, \( F(91) = .48, p = .490 \). Consistent with the aforementioned findings, results revealed that individuals with a history of NSSI did not exhibit significantly greater skin conductance reactivity than individuals without an NSSI history, \( t(91) = .12, p = .903 \), Cohen’s \( d = .03 \).

Table 19: Group Differences in Baseline Skin Conductance Level and Skin Conductance Reactivity by NSSI History

<table>
<thead>
<tr>
<th></th>
<th>No NSSI History</th>
<th></th>
<th>NSSI History</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
<td>Sample Range</td>
<td>( M )</td>
</tr>
<tr>
<td>SCL Baseline</td>
<td>6.33</td>
<td>3.68</td>
<td>.92-17.64</td>
<td>6.34</td>
</tr>
<tr>
<td>SCL Skin Conductance Reactivity</td>
<td>-.81</td>
<td>1.24</td>
<td>-4.90-1.42</td>
<td>-.84</td>
</tr>
</tbody>
</table>

*Note. SCL = Skin Conductance Level.*

In order to examine differences for each minute of skin conductance reactivity, independent samples t-tests were conducted for minutes 1-4 of skin conductance reactivity after Cyberball (Figure 9). For the majority of participants, the length of Ostracism was 3 minutes, but a smaller portion of participants took 4 minutes to play Cyberball after being ostracized. Levene’s tests for homogeneity of variance were not significant for any of the analyses \( F(90) = .13, p = .718 \) for minute 1, \( F(88) = .21, p = .646 \) for minute 2, \( F(91) = .11, p = .737 \) for minute 3, and \( F(19) = .13, p = .725 \) for
minute 4], indicating that the assumption underlying t-tests were met. However, results revealed that individuals with a history of NSSI did not exhibit significantly greater skin conductance reactivity than individuals without a history of NSSI at minute 1, \( t(90) = .26, p = .793 \), Cohen’s \( d = .06 \), minute 2, \( t(88) = .53, p = .598 \), Cohen’s \( d = .11 \), minute 3, \( t(91) = -.41, p = .685 \), Cohen’s \( d = .08 \), or minute 4, \( t(19) = .57, p = .573 \), Cohen’s \( d = .30 \).

Figure 9: Group Differences in Skin Conductance Reactivity for Each Minute of Ostracism by NSSI History

Note. No significant differences in skin conductance reactivity were found for individuals with or without a history of NSSI.

Hypothesis 6

Hypothesis 6 stated that there would be differences in skin conductance reactivity after being ostracized during Cyberball (Williams & Jarvis, 2006) between individuals who reported NSSI/high SI, NSSI/low SI, and individuals who did not report an NSSI history. These hypotheses were exploratory. A series of One-Way ANOVAs was conducted to test this hypothesis. Consistent with Hypothesis 5, differences in average
skin conductance reactivity were examined, and differences were examined for each minute of ostracism as well. As in Hypothesis 5, in order to examine differences in average skin conductance reactivity, baseline skin conductance level (SCL) was computed by averaging the last three minutes of baseline SCL, and the second and third minutes of SCL during ostracism were averaged together and then subtracted from baseline SCL. In order to examine differences for each minute of ostracism, each minute of ostracism during Cyberball (Williams & Jarvis, 2006) was subtracted from baseline SCL. As in Hypotheses 3 and 4, a BSS total score > 6 was considered a “high” level of suicidal ideation, whereas a BSS total score ≤ 6 was considered a “low” level of suicidal ideation.

First, differences in SCL at baseline were examined (Table 20). The assumption of homogeneity of variance was tested and satisfied based on Levene’s F-test, \( F(2,93) = .20, p = .823 \). However, the independent between-groups ANOVA did not yield a statistically significant effect, \( F(2,93) = .54, p = .587, \eta^2 = .01 \).

Then, differences in average skin conductance reactivity were examined (Table 19). The assumption of homogeneity of variance was tested and satisfied based on Levene’s F-test, \( F(2,90) = .31, p = .732 \). The independent between-groups ANOVA did not yield a statistically significant effect, \( F(2,90) = .29, p = .749, \eta^2 = .006 \).
Table 20: Differences in Baseline Skin Conductance Level and Skin Conductance Reactivity within NSSI Group

<table>
<thead>
<tr>
<th></th>
<th>NSSI History/High SI ( (n = 16) )</th>
<th>NSSI History/Low SI ( (n = 27) )</th>
<th>No NSSI History ( (n = 53) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
<td>Sample Range</td>
</tr>
<tr>
<td>SCL Baseline</td>
<td>7.08</td>
<td>3.65</td>
<td>1.59-14.74</td>
</tr>
<tr>
<td>Skin Conductance Reactivity</td>
<td>-1.04</td>
<td>1.51</td>
<td>-4.9-.72</td>
</tr>
</tbody>
</table>

Note. SCL = Skin Conductance Level.

In order to examine differences for each minute of skin conductance reactivity, a series of One-Way ANOVAs was conducted for minutes 1-4 of ostracism during Cyberball (Figure 10). Levene’s tests for homogeneity of variance were not significant for any of the analyses indicating that the assumptions underlying ANOVA examining the differences in skin conductance reactivity for minutes 1-4 of ostracism during Cyberball were met, \( F(2,89) = .07, p = .931, F(2,87) = .10, p = .902, F(2,90) = .39, p = .68, \) and \( F(2,18) = .31, p = .736,\) respectively. None of the independent between-groups ANOVAs yielded statistically significant effects, \( F(2,89) = .07, p = .935, \eta^2 = .002, \)
\( F(2,87) = .22, p = .801, \eta^2 = .005, F(2,90) = .55, p = .580, \eta^2 = .01, \) and \( F(2,18) = .28, p = .762, \eta^2 = .03.\)
Figure 10: *Group Differences in Skin Conductance Reactivity for Each Minute of Ostracism within NSSI Group*

Note. No significant differences in skin conductance reactivity were found within NSSI groups.

**Hypothesis 7**

Hypothesis 7 stated that NSSI history would predict increases in skin conductance reactivity after being ostracized during Cyberball (Williams & Jarvis, 2006). Average skin conductance reactivity was computed by averaging the last three minutes of baseline SCL, and subtracting the average of the second and third minutes of SCL during ostracism from baseline SCL. It was also hypothesized that this relationship would be moderated by baseline suicidal ideation, such that low levels of suicidal ideation would increase the relationship between NSSI history and skin conductance reactivity, while high levels of suicidal ideation would decrease the relationship between NSSI and skin conductance reactivity (Table 21). Tests of multicollinearity were performed to examine VIF and tolerance for history of NSSI and baseline suicidal ideation to ensure that they were not redundant or too closely related for regression analyses. Generally, a VIF > 10 indicates that independent variables are too closely related to assess their independent
effects on dependent variables, and a tolerance < .01 indicates that independent variables may be redundant (Tabachnick & Fidell, 2007). Both VIFs were < 10, and both tolerances were >.01. Linear regression analyses with bootstrap estimation (5000 samples) with PROCESS for SPSS (Hayes, 2018) were used to examine whether baseline suicidal ideation moderated the relationship between NSSI history and skin conductance reactivity in the full sample.

Results revealed that neither NSSI history, nor baseline suicidal ideation significantly predicted skin conductance reactivity, $b = -.01$, SE = .30, 95% CI [-.5977, .5864], and $b = .01$, SE = .05, 95% CI [-.0870, .0972], respectively. In addition, suicidal ideation at baseline did not significantly moderate the relationship between NSSI history and skin conductance reactivity, $b = -.02$, SE = .06, 95% CI [-.1352, .0950].

Table 21: Baseline Suicidal Ideation as a Moderator between NSSI History and Skin Conductance Reactivity

<table>
<thead>
<tr>
<th>Step</th>
<th>Variable</th>
<th>$B$</th>
<th>$T$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NSSI History</td>
<td>-.01</td>
<td>-.02</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>BSS Time 1</td>
<td>.01</td>
<td>.11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NSSI History X BSS Time 1</td>
<td>-.02</td>
<td>-.35</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Note.* BSS = Beck Scale for Suicidal Ideation.

**Hypothesis 8**

Hypothesis 8 stated that NSSI history would predict suicidal ideation (BSS) at baseline and at 6-8 week follow-up. It was further hypothesized that this relationship would be mediated by emotion reactivity, and that the relationship between emotion reactivity and suicidal ideation would be moderated by negative problem orientation.
(NPO on the SPSI-R) such that high levels of NPO would increase the relationship between emotion reactivity and suicidal ideation. Tests of multicollinearity were performed to examine VIF and tolerance for history of NSSI, emotion reactivity, and negative problem orientation to ensure that they were not redundant or too closely related for regression analyses. As required, all VIFs were < 10, and all tolerances were > .01. Moderated mediated regression analyses with bootstrap estimation (5000 samples) with PROCESS for SPSS (Hayes, 2018) were used for these analyses.

First, linear regression analyses were conducted examining the hypothesized model predicting baseline suicidal ideation (Table 22). Results revealed that NSSI history significantly predicted emotion reactivity, $b = 20.01$, SE = 4.00, 95% CI [12.0780, 27.9463], but did not significantly predict suicidal ideation at baseline, $b = 1.59$, SE = 1.04, 95% CI [-.4709, 3.6565]. Neither emotion reactivity nor negative problem orientation predicted baseline suicidal ideation, $b = .03$, SE = .04, 95% CI [-.0371, .1025], and $b = .12$, SE = .08, 95% CI [-.0301, .2681], respectively, and the interaction between emotion reactivity and negative problem orientation was not significant, $b = .003$, SE = .002, 95% CI [-.0012, .0068].
Table 22: Emotion Reactivity as a Mediator between NSSI and Baseline Suicidal Ideation, and Negative Problem Orientation as a Moderator between Emotion Reactivity and Baseline Suicidal Ideation.

<table>
<thead>
<tr>
<th>A</th>
<th>Dependent Variable</th>
<th>Predictor</th>
<th>B</th>
<th>SE</th>
<th>T</th>
<th>P</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ERS</td>
<td>NSSI (a)</td>
<td>20.01</td>
<td>4.00</td>
<td>5.00</td>
<td>&lt;.0001</td>
<td>[12.0780, 27.9463]</td>
</tr>
<tr>
<td></td>
<td>NSSI, controlling for ERS (c')</td>
<td>1.59</td>
<td>1.04</td>
<td>1.53</td>
<td>.1289</td>
<td>[-.4709, 3.6565]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ERS (b1)</td>
<td>.03</td>
<td>.04</td>
<td>.93</td>
<td>.3543</td>
<td>[-.0371, .1025]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NPO (b2)</td>
<td>.12</td>
<td>.08</td>
<td>1.58</td>
<td>.1166</td>
<td>[-.0301, .2681]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ERSXNPO (b3)</td>
<td>.003</td>
<td>.002</td>
<td>1.40</td>
<td>.1636</td>
<td>[-.0012, .0068]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>Predictor</th>
<th>Boot SE</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boot indirect effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPO</td>
<td>-1SD</td>
<td>-.05</td>
<td>[-2.1270, 2.1737]</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>.62</td>
<td>[-.6533, 2.2276]</td>
</tr>
<tr>
<td></td>
<td>+1SD</td>
<td>1.36</td>
<td>[-.0349, 2.9642]</td>
</tr>
</tbody>
</table>

*Note. BSS = Beck Scale for Suicidal Ideation, ERS = Emotion Reactivity Scale, NPO = Negative Problem Orientation.*
Next, the model was examined predicting suicidal ideation at time 2 (Table 23). Results revealed that NSSI history did not significantly predict emotion reactivity, $b = 13.82, SE = 8.18$, 95% CI [-2.8204, 30.4537], or suicidal ideation at 6-8 week follow-up, $b = .90, SE = 2.09$, 95% CI [-3.3594, 5.1592]. Neither emotion reactivity nor negative problem orientation predicted suicidal ideation at 6-8 week follow-up, $b = .02, SE = .07$, 95% CI [-.1178, .1634], and $b = .11, SE = .15$, 95% CI [-.1910, .4044], respectively, and the interaction between emotion reactivity and negative problem orientation was not significant, $b = .001, SE = .004$, 95% CI [-.0060, .0082].
Table 23: Emotion Reactivity as a Mediator between NSSI and Suicidal Ideation at 6-8 Week Follow-up, and Negative Problem Orientation as a Moderator between Emotion Reactivity and Suicidal Ideation at 6-8 Week Follow-up

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Predictor</th>
<th>B</th>
<th>SE</th>
<th>T</th>
<th>P</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERS</td>
<td>NSSI (a)</td>
<td>13.82</td>
<td>8.18</td>
<td>1.69</td>
<td>.1005</td>
<td>[-2.8204, 30.4537]</td>
</tr>
<tr>
<td>BSS Time 2 (n = 35)</td>
<td>NSSI, controlling for ERS (c')</td>
<td>.90</td>
<td>2.09</td>
<td>.43</td>
<td>.6692</td>
<td>[-3.3594, 5.1592]</td>
</tr>
<tr>
<td></td>
<td>ERS (b₁)</td>
<td>.02</td>
<td>.07</td>
<td>.33</td>
<td>.7425</td>
<td>[-.1178, .1634]</td>
</tr>
<tr>
<td></td>
<td>NPO(b₂)</td>
<td>.11</td>
<td>.15</td>
<td>.73</td>
<td>.4698</td>
<td>[-.1910, .4044]</td>
</tr>
<tr>
<td></td>
<td>ERSXNPO (b₃)</td>
<td>.001</td>
<td>.004</td>
<td>.31</td>
<td>.7580</td>
<td>[-.0060, .0082]</td>
</tr>
</tbody>
</table>

B

Boot indirect effect

<table>
<thead>
<tr>
<th>NPO</th>
<th>Boot SE</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1SD</td>
<td>.18</td>
<td>[-2.1609, 2.7096]</td>
</tr>
<tr>
<td>Mean</td>
<td>.41</td>
<td>[-1.3421, 2.5009]</td>
</tr>
<tr>
<td>+1SD</td>
<td>.58</td>
<td>[-1.7615, 3.2628]</td>
</tr>
</tbody>
</table>

Note. BSS = Beck Scale for Suicidal Ideation, ERS = Emotion Reactivity Scale, NPO = Negative Problem Orientation.
Hypothesis 9

Hypothesis 9 stated that NSSI history would predict suicidal ideation (BSS) at baseline and at 6-8 week follow-up. It was further hypothesized that this relationship would be mediated by skin conductance reactivity. It was predicted that the relationship between skin conductance reactivity and suicidal ideation would be moderated by negative problem orientation (SPSI-R NPO), such that high levels of NPO would increase the relationship between skin conductance reactivity and suicidal ideation. Tests of multicollinearity were performed to examine VIF and tolerance for skin conductance reactivity and negative problem orientation to ensure that they were not redundant or too closely related for regression analyses. As required, both VIFs were < 10, and both tolerances were > .01. Moderated mediated regression analyses with bootstrap estimation (5000 samples) with PROCESS for SPSS (Hayes, 2018) were used for these analyses.

First, linear regression analyses were conducted examining the hypothesized model predicting baseline suicidal ideation (Table 24). Results revealed that NSSI history did not significantly predict skin conductance reactivity, $b = -.03, SE = .27, 95\% CI [-.5748, .5079]$, or baseline suicidal ideation, $b = 1.72, SE = 1.19, 95\% CI [-.6421, 4.0834]$. Skin conductance reactivity did not predict baseline suicidal ideation, $b = -.11, SE = .39, 95\% CI [-.8874, .6668]$, but negative problem orientation did predict baseline suicidal ideation, $b = .20, SE = .06, 95\% CI [.0866, .3063]$. The interaction between skin conductance reactivity and negative problem orientation was not significant, $b = .04, SE = .04, 95\% CI [-.0366, .1153]$. 
Table 24: Skin Conductance Reactivity as a Mediator between NSSI and Baseline Suicidal Ideation, and Negative Problem Orientation as a Moderator between Skin Conductance Reactivity and Baseline Suicidal Ideation

<table>
<thead>
<tr>
<th>A</th>
<th>Dependent Variable</th>
<th>Predictor</th>
<th>B</th>
<th>SE</th>
<th>T</th>
<th>P</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Skin Conductance Reactivity</td>
<td>NSSI (a)</td>
<td>-.03</td>
<td>.27</td>
<td>-.12</td>
<td>.9026</td>
<td>-.5748, .5079</td>
</tr>
<tr>
<td></td>
<td>BSS Time 1 (n = 93)</td>
<td>NSSI, controlling for Skin Conductance Reactivity (c')</td>
<td>1.72</td>
<td>1.19</td>
<td>1.45</td>
<td>.1514</td>
<td>-.6421, 4.0834</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Conductance Reactivity (b₁)</td>
<td>-.11</td>
<td>.39</td>
<td>-.28</td>
<td>.7785</td>
<td>-.8874, .6668</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NPO(b₂)</td>
<td>.20</td>
<td>.06</td>
<td>3.56</td>
<td>.0006</td>
<td>.0866, .3063</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Conductance Reactivity X NPO (b₃)</td>
<td>.04</td>
<td>.04</td>
<td>1.03</td>
<td>.3058</td>
<td>-.0366, .1153</td>
</tr>
<tr>
<td>B</td>
<td>Boot indirect effect</td>
<td>Boot SE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NPO</td>
<td>-1SD</td>
<td>.02</td>
<td>.20</td>
<td></td>
<td></td>
<td>-.3374, .5073</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>.002</td>
<td>.10</td>
<td></td>
<td></td>
<td>-.1685, .2478</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1SD</td>
<td>-.01</td>
<td>.21</td>
<td></td>
<td></td>
<td>-.4464, .4512</td>
</tr>
</tbody>
</table>

Note. BSS = Beck Scale for Suicidal Ideation, NPO = Negative Problem Orientation.
Next, the model was examined predicting suicidal ideation at time 2 (Table 25). Similarly, NSSI history did not significantly predict skin conductance reactivity, $b = -.04$, $SE = .42$, 95% CI [-.9035, .8163], or suicidal ideation at 6-8 week follow-up, $b = .91$, $SE = 2.11$, 95% CI [-3.4045, 5.2169]. Neither skin conductance reactivity nor negative problem orientation predicted suicidal ideation at 6-8 week follow-up, $b = -.01$, $SE = .98$, 95% CI [-2.0094, 1.9809], and $b = .15$, $SE = .09$, 95% CI [-.0346, .3375], respectively, and the interaction between skin conductance reactivity and negative problem orientation was not significant, $b = .04$, $SE = .07$, 95% CI [-.1048, .1883].
Table 25: Skin Conductance Reactivity as a Mediator between NSSI and Suicidal Ideation at 6-8 Week Follow-up, and Negative Problem Orientation as a Moderator between Skin Conductance Reactivity and Suicidal Ideation at 6-8 Week Follow-up

<table>
<thead>
<tr>
<th>A</th>
<th>Dependent Variable</th>
<th>Predictor</th>
<th>$B$</th>
<th>SE</th>
<th>$T$</th>
<th>$P$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Skin Conductance Reactivity</td>
<td>NSSI (a)</td>
<td>-0.04</td>
<td>0.42</td>
<td>-0.10</td>
<td>0.9184</td>
<td>[-0.9035, 0.8163]</td>
</tr>
<tr>
<td></td>
<td>BSS Time 2 ($n = 34$)</td>
<td>NSSI, controlling for Skin Conductance Reactivity (c')</td>
<td>0.91</td>
<td>2.11</td>
<td>0.43</td>
<td>0.6704</td>
<td>[-3.4045, 5.2169]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Conductance Reactivity (b1)</td>
<td>-0.01</td>
<td>0.98</td>
<td>-0.01</td>
<td>0.9885</td>
<td>[-2.0094, 1.9809]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NPO(b2)</td>
<td>0.15</td>
<td>0.09</td>
<td>1.67</td>
<td>0.1067</td>
<td>[-0.0346, 0.3375]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin Conductance ReactivityXNPO (b3)</td>
<td>0.04</td>
<td>0.07</td>
<td>0.58</td>
<td>0.5648</td>
<td>[-0.1048, 0.1883]</td>
</tr>
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<table>
<thead>
<tr>
<th>B</th>
<th>Boot indirect effect</th>
<th>Boot SE</th>
<th>95% CI</th>
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<tr>
<td></td>
<td>NPO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1SD</td>
<td>-0.02</td>
<td>0.48</td>
<td>[-0.8999, 1.1482]</td>
</tr>
<tr>
<td>Mean</td>
<td>-0.01</td>
<td>0.31</td>
<td>[-0.7610, 0.6269]</td>
</tr>
<tr>
<td>+1SD</td>
<td>-0.03</td>
<td>0.52</td>
<td>[-1.2841, 1.0342]</td>
</tr>
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</table>

Note. BSS = Beck Scale for Suicidal Ideation, NPO = Negative Problem Orientation.
Hypothesis 10

Hypothesis 10 stated that skin conductance reactivity would be inversely associated with suicidal ideation (BSS) at baseline, and with suicidal ideation (BSS) at 6-8 week follow-up in the full sample and by group (i.e., individuals with vs. without a history of NSSI). Skin conductance reactivity was assessed using the SCL change score, computed by averaging the last three minutes of baseline SCL, and subtracting the average of the second and third minutes of SCL during ostracism from baseline SCL. First, bivariate correlations were used in order to examine the relationship between skin conductance reactivity and suicidal ideation at baseline and 6-8 week follow-up in the full sample (Table 26). In the full sample, skin conductance reactivity was not significantly associated with suicidal ideation at baseline, \( r(91) = -.03, p = .758 \) or at 6-8 week follow up, \( r(32) = .05, p = .765 \).

Table 26: Correlations between Skin Conductance Reactivity and Suicidal Ideation at Baseline and at 6-8 Week Follow-Up

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<th>1.</th>
<th>2.</th>
<th>3.</th>
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<tbody>
<tr>
<td>1. Skin Conductance Reactivity</td>
<td>__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. BSS time 1</td>
<td>-.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. BSS time 2</td>
<td>.05</td>
<td>.86**</td>
<td></td>
</tr>
</tbody>
</table>

Note. BSS = Beck Scale for Suicidal Ideation  
**p<.01, *p<.05

Next, bivariate correlations were used to examine these relations in individuals with or without a history of NSSI (Table 27). Consistent with results in the full sample, skin conductance reactivity was not significantly associated with suicidal ideation at baseline or 6-8 week follow-up in individuals with a history of NSSI, \( r(40) = -.07, p = \)
.685, and \( r(17) = .04, p = .877 \), or without a history of NSSI, \( r(49) = .02, p = .909 \), and \\
\( r(13) = .10, p = .734 \).

Table 27: Correlations between Skin Conductance Reactivity and Suicidal Ideation at Baseline and at 6-8 Week Follow-Up by NSSI Group

<table>
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<th>3.</th>
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<tbody>
<tr>
<td>1. Skin Conductance Reactivity</td>
<td></td>
<td>-.07</td>
<td>.04</td>
</tr>
<tr>
<td>2. BSS time 1</td>
<td>.02</td>
<td></td>
<td>.84**</td>
</tr>
<tr>
<td>3. BSS time 2</td>
<td>.10</td>
<td>.90**</td>
<td></td>
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</tbody>
</table>

Note. Correlations for individuals with an NSSI history are above the diagonal, and correlations for individuals without an NSSI history are below the diagonal. BSS = Beck Scale for Suicidal Ideation.

**\( p < .01 \), *\( p < .05 \)
CHAPTER FOUR
DISCUSSION

Prior research has established that NSSI often precedes and predicts suicidal thoughts and behaviors (Asarnow et al., 2011; Guan et al., 2012; Hamza & Willoughby, 2016; Whitlock et al., 2013; Wilkinson et al., 2011) but the factors that contribute to this trajectory are not well understood. The purpose of this study was to examine an integrated model of risk factors proposed to account for the trajectory from NSSI to suicidal ideation. Specifically, this research examined the interplay between emotional reactivity (self-report and EDA), negative problem orientation, and suicidal ideation among individuals with and without a history of NSSI.

Theories such as the Escape Theory of Suicide (Baumeister, 1990), the Theory of Emotion Dysregulation in BPD (Linehan, 1993), and the Diathesis-Stress Theory of Suicide (Schotte & Clum, 1982) suggest that emotion reactivity and problem solving may play a significant role in this trajectory. For instance, the Escape Theory of Suicide (Baumeister, 1990) states that an individual may become emotionally reactive in response to a stressful life event and may experience deficits in cognitive functioning due to this distress, and then as a result may become motivated to escape the experience and themselves by attempting suicide. The Theory of Emotion Dysregulation in BPD (Linehan, 1993) states that emotion dysregulation precedes self-injurious thoughts and behaviors. The Diathesis-Stress Theory of Suicide (Schotte & Clum, 1982) proposes that an inability to solve problems in conjunction with cognitive rigidity may interact with problem-related stress to elicit hopelessness, which in turn contributes to suicidal ideation and behaviors.
The aforementioned theories are supported by prior research suggesting that emotion reactivity and deficits in problem solving are associated with NSSI (Andover & Morris, 2014; Andrews et al., 2014; Glenn et al., 2011; Jacobson et al., 2015; Jenkins & Schmitz, 2012; Kleiman et al., 2014; Nock et al., 2009; Nock et al., 2008; Nock & Mendes, 2008; Zelkowitz et al., 2016), and research suggesting that emotion reactivity and negative problem orientation are associated with suicide risk (D’Zurilla et al, 1998; Evans et al., 2016, Polanco-Roman et al., 2018; Reinecke et al., 2001). Additionally, research has found that emotion reactivity and social problem solving may interact to increase risk for suicidal ideation and behaviors (Dour et al., 2011; Nezu et al., 2017), and that social problem solving may impact the relationship between NSSI and suicidal behaviors (Walker et al., 2017). Research has not specifically examined whether emotion reactivity and problem solving interact to contribute to the trajectory from NSSI to suicide. Furthermore, research has indicated that EDA is associated with NSSI, suicidal ideation, and suicide attempts but has not examined the role it plays in the relationship from NSSI to suicide (Haines et al., 1995; Nock & Mendes, 2008; Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013; Welch et al., 2008). Finally, results of pilot data found that emotion reactivity and negative problem orientation were positively associated with suicidal ideation in individuals with an NSSI history (Quiñones et al., 2018). Therefore, theory, prior literature, and pilot data suggest that emotion reactivity and negative problem orientation may be important factors in the trajectory from NSSI to suicide.

In the present study, it was specifically hypothesized that individuals with a history of NSSI would endorse greater emotion reactivity (self-report and skin
conductance reactivity) and negative problem orientation than individuals without an
NSSI history. It was also hypothesized that individuals with a history of NSSI who
endorsed higher levels of suicidal ideation would report greater levels of self-reported
emotion reactivity and negative problem orientation compared to individuals with a
history of NSSI and low levels of suicidal ideation. Exploratory hypotheses examining
differences in skin conductance reactivity between individuals with a history of NSSI and
high levels of suicidal ideation and individuals with a history of NSSI and low levels of
suicidal ideation were examined as well. Furthermore, it was hypothesized that baseline
suicidal ideation would moderate the relationship between a history of NSSI and skin
conductance reactivity, and that skin conductance reactivity and suicidal ideation would
be inversely associated. Finally, it was hypothesized that emotion reactivity (self-report
and skin conductance reactivity) would mediate the relationship between NSSI and
suicidal ideation and negative problem orientation would moderate the relationship
between emotion reactivity and suicidal ideation. The findings of the present study, the
study implications, the study limitations and future directions, and conclusions of this
dissertation are presented below.

**Emotion Reactivity and NSSI**

As expected, individuals with a history of NSSI reported greater emotion
reactivity than individuals without a history of NSSI. In addition, individuals with a
history of NSSI who endorsed high levels of suicidal ideation reported greater emotion
reactivity than individuals with a history of NSSI who endorsed low levels of suicidal
ideation. These findings are consistent with the tension reduction model of NSSI, which
states that individuals may engage in NSSI in order to reduce negative emotions, and are
consistent with both the Escape Theory of Suicide (Baumeister, 1990) and Linehan’s (1993) Theory of Emotion Dysregulation in BPD, previously described above.

Significant differences between individuals with vs. without a history of NSSI are also consistent with studies that have shown that individuals with a history of NSSI generally report being more emotionally reactive than individuals without a history of NSSI (Andover & Morris, 2014; Glenn et al., 2011; Jacobson et al., 2015; Jenkins & Schmitz, 2012; Kleiman et al., 2014; Nock et al., 2009; Nock et al., 2008; Zelkowitz et al., 2016). Significant differences in emotion reactivity between individuals with a history of NSSI with high vs. low levels of suicidal ideation reported at baseline are consistent with literature suggesting a relationship between emotion reactivity and suicidal ideation (Evans et al., 2016, Polanco-Roman et al., 2018) and are also consistent with prior research suggesting that emotional factors may influence the relationship between NSSI and suicidal behaviors (Anestis et al., 2014; Liu et al., 2020).

However, contrary to prior literature and the tension reduction model, we did not find that individuals with a history of NSSI experienced greater decreases in positive affect, and greater increases in negative affect, and negative mood compared to individuals without a history of NSSI. We also did not find significant differences in change in mood or affect (i.e., negative or positive) between individuals with a history of NSSI and high levels of suicidal ideation and individuals with a history of NSSI and low levels of suicidal ideation. However, the full sample experienced significant decreases in positive affect and significant increases in negative mood and negative affect. While it is possible that Cyberball was not potent enough to elicit differences between these groups, it is also possible that this inconsistency in findings occurred due to the differences in the
measures used. For instance, it is possible that differences were found using the self-report measure at baseline, the ERS, because it assesses self-reported general emotion reactivity, rather than stress-mediated mood reactivity and feelings of ostracism associated with the exclusion period of Cyberball (Hartgerink et al., 2015). Thus, the findings from this dissertation provide further evidence that general, self-reported trait emotion reactivity may be a factor that impacts the relationship between NSSI and suicidal ideation.

**Negative Problem Orientation and NSSI**

As expected, individuals with a history of NSSI reported greater negative problem orientation than individuals without a history of NSSI. Interestingly, while both individuals with a history of NSSI and high levels of suicidal ideation and individuals with a history of NSSI and low levels of suicidal ideation endorsed greater negative problem orientation than individuals without a history of NSSI, individuals with a history of NSSI with high vs. low levels of suicidal ideation did not differ from each other.

The significant difference in negative problem orientation between individuals with and without a history of NSSI is consistent with, and contributes to prior research suggesting that NSSI is associated with deficits in problem solving (Andrews et al., 2014; Nock & Mendes, 2008). Negative problem orientation did not differentiate individuals with a history of NSSI and differing levels of suicidal ideation, but this study did provide evidence for a relationship between negative problem orientation and suicidal ideation. Interestingly, negative problem orientation was significantly positively associated with suicidal ideation for individuals without an NSSI history at baseline and at 6-8 week follow-up, but was not significantly associated with suicidal ideation at baseline or at 6-8
week follow-up for individuals who reported an NSSI history. Both the significant
differences in negative problem orientation between individuals with vs. without a history
of NSSI and the significant relationships between negative problem orientation and
suicidal ideation in individuals without a history of NSSI are consistent with the
Diathesis-Stress Theory of Suicide (Schotte & Clum, 1982; 1987). However, the non-
significant relationships between negative problem orientation and suicidal ideation (at
baseline and at 6-8 week follow-up) in individuals with an NSSI history are not
consistent with this theory.

Additionally, findings showing a relationship between negative problem
orientation and suicidal ideation in individuals without an NSSI history are consistent
with prior research showing a relationship between social problem solving deficits and
suicidal ideation and behaviors (Grover et al., 2009; Linda et al., 2012; Pollock &
Williams, 1998; 2004; Priester & Clum, 1993; Quinones et al., 2015; Rotheram-Borus et
al., 1990; Sadowski & Kelley, 1993; Schotte & Clum, 1982, 1987; Speckens & Hawton,
2005) and between negative problem orientation and suicide risk (D’Zurilla et al., 1998;
Reinecke et al., 2001). However, given that research suggests that NSSI increases risk for
suicidal thoughts and behaviors (Asarnow et al., 2011; Guan et al., 2012; Hamza &
Willoughby, 2016; Prinstein et al., 2008; Whitlock et al., 2013; Wilkinson et al., 2011),
and that NSSI has been associated with social problem solving deficits (Andrews et al.,
2014; Nock & Mendes, 2008), we would also expect negative problem orientation to be
significantly positively associated with suicidal ideation in individuals with an NSSI
history. In addition, given this prior research, we predicted that individuals with a history
of NSSI and high levels of suicidal ideation would endorse significantly greater negative
problem orientation than individuals with a history of NSSI and low levels of suicidal ideation. It is possible that although negative problem orientation is generally maladaptive, it does not contribute to increased risk for suicidal ideation in this already vulnerable group (i.e., individuals with a history of NSSI) but perhaps impacts this group of individuals in other maladaptive ways. For example, it is possible that negative problem orientation contributes to depressive symptoms among individuals with an NSSI history, but does not necessarily contribute to suicidal ideation. Future research is needed to specify the exact impact of negative problem orientation in individuals with a history of NSSI, perhaps by examining the longitudinal relationship between negative problem orientation and depressive symptoms in individuals with a history of NSSI.

**Skin Conductance Reactivity**

Contrary to expectations, individuals with a history of NSSI did not show greater skin conductance reactivity compared to individuals without a history of NSSI. They also did not show different skin conductance level at baseline. Additionally, individuals with a history of NSSI and high levels of suicidal ideation did not show significant differences in skin conductance reactivity compared to individuals with a history of NSSI and low levels of suicidal ideation. Prior research has shown mixed findings with regards to the relationship between NSSI and skin conductance reactivity. Some research has found that individuals who engage in NSSI exhibit increased electrodermal reactivity in response to a distress tolerance task (Nock & Mendes, 2008), and other research has found that individuals with a history of NSSI experienced increased electrodermal reactivity when they imagined a stressful life event, their environment, and their behaviors prior to engaging in NSSI, but then experienced decreased arousal when they imagined engaging
in NSSI (Haines et al., 1995). Other research examining SCRs to NSSI-related guided imagery in adults with BPD found that participants did not experience significant decreases in SCR when exposed to imagery of NSSI but experienced significant decreases during the recovery period (Welch et al., 2008).

To our knowledge, prior research has not examined differences in skin conductance reactivity in individuals with vs. without a history of NSSI using the Cyberball task, and has not examined differences in skin conductance reactivity between individuals with a history of NSSI and differing levels of suicidal ideation. It is possible that this 5-minute task was not potent enough to elicit significantly greater reactivity for individuals with a history of NSSI, compared to individuals without a history of NSSI. This is supported by the results of our manipulation check. While the entire study sample showed significant changes in SCL after Cyberball, and significant changes in mood and in negative and positive affect after being ostracized during Cyberball, the differences in these changes between individuals with and without a history of NSSI were not significant, indicating that individuals with a history of NSSI were not more physiologically reactive after Cyberball than individuals without a history of NSSI, as was hypothesized. Additional research is needed to examine differences between these groups using a more stressful task, perhaps one that is powerful enough to induce greater arousal than the normal stress response produced by Cyberball. It is also possible that a longer stress task would have produced different results. For instance, the initial SCL values found by Nock & Mendes (2008) in their research examining skin conductance reactivity in response to a distress tolerance task in individuals with and without an NSSI history were similar to the skin conductance reactivity scores found in the current study.
However, more pronounced group differences in skin conductance reactivity were not found until the later minutes of the distress tolerance task, which was longer than our approximately 5-minute long Cyberball task.

**Relationship between NSSI and Skin Conductance Reactivity**

Unexpectedly, but in accordance with the results above, history of NSSI did not predict skin conductance reactivity. In addition, self-reported levels of suicidal ideation at baseline did not influence the relationship between NSSI history and skin conductance reactivity. Furthermore, when correlations between skin conductance reactivity and suicidal ideation at baseline and at 6-8 week follow-up were examined, these correlations were non-significant in individuals with or without a history of NSSI.

As mentioned before, prior research has found that individuals with a history of NSSI show increased skin conductance reactivity in response to a distress tolerance task (Nock & Mendes, 2008). Prior research has also found that individuals with a history of NSSI have shown increased skin conductance reactivity in response to imagining a stressful life event, and experienced decreased arousal when they imagined engaging in NSSI (Haines et al., 1995). Research examining the relationship between electrodermal activity and suicide has generally found that individuals with a history of suicidal behaviors demonstrate electrodermal hyporeactivity at baseline and in response to habituation tasks (Edman et al., 1986; Jandl et al., 2010; Sarchiapone et al., 2018; Thorell, 2009; Thorell et al., 2013, Wolfersdorf et al., 1999), but have not shown how these individuals physiologically respond to a stress task. In addition, none of the aforementioned studies have assessed whether their participants with a history of suicidal
behaviors had a history of NSSI and have not examined the role that suicidal thinking may play in the relationship between NSSI and skin conductance reactivity.

While it is possible that suicidal ideation does not influence the relationship between NSSI and skin conductance reactivity, it is also possible that we did not see significant moderation because the stress task used (i.e., Cyberball) was not potent enough to elicit significant physiological reactivity. This may also explain why there was no significant relationship between NSSI history and skin conductance reactivity. Furthermore, this may explain why we did not find significant differences in skin conductance reactivity or in change in mood or affect among individuals with or without an NSSI history, or among individuals with a history of NSSI and differing levels of suicidal ideation. Additional research is needed to examine this relationship, and these differences, using a different stress task that elicits greater emotional and physiological reactivity.

**NSSI, Emotion Reactivity, Negative Problem Orientation, and Suicidal Ideation**

Contrary to expectations, neither of the proposed moderated mediation models, which examined emotion reactivity as a mediator between NSSI history and suicidal ideation and negative problem orientation as a moderator between emotion reactivity and suicidal ideation at baseline and at 6-8 week follow-up, were significant. NSSI history significantly predicted emotion reactivity in the model predicting baseline suicidal ideation, but did not predict emotion reactivity in the model predicting suicidal ideation at 6-8 week follow-up. In both models, NSSI did not predict suicidal ideation after controlling for emotion reactivity. Similarly, neither emotion reactivity, negative problem
orientation, nor the interaction of emotion reactivity and negative problem orientation predicted suicidal ideation at baseline or 6-8 week follow-up.

These findings were surprising given that prior research has shown that NSSI mediates the relationship between emotion reactivity and suicidal ideation (Liu et al., 2020), and between emotion dysregulation and suicide attempts (Anestis et al., 2014), and research has shown that students with greater problem-solving abilities are less likely to engage in suicidal behaviors regardless of whether they have engaged in NSSI (Walker et al., 2017). Other research has indicated that adaptive problem-solving buffers against the effects of emotion reactivity on suicidal ideation in veterans (Nezu et al., 2017) and among young adults with poor problem-solving skills, emotion reactivity was positively associated with suicide attempts (Dour et al., 2011). The current study’s failure to detect a significant interaction between emotion reactivity and negative problem orientation is inconsistent with Baumeister’s (1990) Escape Theory of Suicide. This theory proposes that reactivity and deficits in cognitive functioning, including problem solving, interact to increase risk for suicide. The finding that NSSI predicted emotion reactivity in the model predicting baseline suicidal ideation, but not in the model predicting suicidal ideation at 6-8 week follow-up was partially consistent with Linehan’s (1993) Theory of Emotion Dysregulation in BPD. Furthermore, the finding that negative problem orientation did not predict suicidal ideation in both models is inconsistent with Schotte and Clum’s (1982, 1987) Diathesis-Stress Theory of Suicide.

Although it is possible that emotion reactivity does not mediate the relationship between NSSI and suicidal ideation, and negative problem orientation does not moderate this relationship, it is also possible that these non-significant models reflect insufficient
power. Power analyses using G*power and also incorporating recommendations from Fritz and MacKinnon’s (2007) research on estimating sample size in mediational models suggests that a sample of 142 participants was needed for an 80% chance of detecting a medium effect. Given that $N = 106$ in Session 1, and $N = 35$ in Session 2, it is likely that results are limited by insufficient power. Future research is needed to replicate this study in a larger sample.

Furthermore, sensitivity analyses were conducted using G*power 3.1.9.2 (Faul et al., 2007) in order to determine the minimum effect size needed to obtain significant results for these analyses. Results indicated that the required effect size was $f^2 = .11$ for analyses examining this model predicting baseline suicidal ideation and $f^2 = .35$ in the model predicting suicidal ideation at 6-8 week follow-up. Results suggested that given the current study’s sample size and $\alpha$ level, at least a small effect size was required to obtain significant results if a power of .80 was achieved in the model predicting baseline suicidal ideation, and at least a large effect size was required to obtain significant results in the model predicting suicidal ideation at 6-8 week follow-up.

**NSSI, Skin Conductance Reactivity, Negative Problem Orientation and Suicidal Ideation**

Contrary to hypotheses, the proposed moderated mediation model examining skin conductance reactivity as a mediator between NSSI history and suicidal ideation and examining negative problem orientation as a moderator between skin conductance reactivity and suicidal ideation was non-significant. In both models (predicting baseline suicidal ideation and suicidal ideation at 6-8 week follow-up), NSSI did not predict skin conductance reactivity, and NSSI did not predict suicidal ideation after controlling for
skin conductance reactivity. Skin conductance reactivity also did not predict suicidal ideation in either model. Negative problem orientation predicted baseline suicidal ideation but did not predict suicidal ideation at 6-8 week follow-up. Skin conductance reactivity and negative problem orientation did not interact to significantly predict suicidal ideation in either of the models.

Given that skin conductance reactivity is being used as a physiological index of emotion reactivity, it was surprising that it did not impact the relationship between NSSI and suicidal ideation at baseline or at 6-8 week follow-up. These results are inconsistent with Baumeister’s (1990) Escape Theory of Suicide and Linehan’s (1993) Theory of Emotion Dysregulation in BPD. Also, as mentioned above, it was surprising that negative problem orientation predicted suicidal ideation at baseline, but not at 6-8 week follow-up, and that negative problem orientation did not moderate the relationship between skin conductance reactivity and suicidal ideation. The finding that negative problem orientation significantly predicted baseline suicidal ideation was consistent with Schotte and Clum’s (1982) Diathesis Stress Model of Suicide. However, the finding that negative problem orientation did not predict suicidal ideation at 6-8 week follow-up, and did not strengthen the relationship between emotion reactivity and suicidal ideation in either model was not consistent with Schotte and Clum’s (1982) model. Furthermore, the non-significant moderated mediation model was not consistent with research showing that problem solving moderates the relationship between NSSI and suicidal behaviors (Walker et al., 2017) or with research that shows that problem solving moderates the relationship between emotion reactivity and suicide attempts (Dour et al., 2011; Nezu et al., 2017).
Furthermore, the results of this model including skin conductance reactivity as a mediator are consistent with the finding that there were non-significant differences in skin conductance reactivity in individuals with vs. without a history of NSSI, or in individuals with a history of NSSI and differing levels of suicidal ideation. Thus is it possible that skin conductance reactivity does not play a role in the trajectory from NSSI to suicide, or as mentioned above, it is possible that Cyberball was not stressful enough, or long enough, to elicit a physiological response comparable to the stress that may trigger NSSI or suicidal ideation.

Similar to the aforementioned proposed model using self-reported emotion reactivity as a mediator variable, it is possible that these non-significant models reflect insufficient power. Similar to the aforementioned models, 142 participants were needed for 80% chance of detecting a medium effect. Only $N = 93$ individuals were included in the analyses predicting suicidal ideation at baseline, and only $N = 34$ were included in analyses predicting suicidal ideation at 6-8 week follow-up. Thus, the samples were not large enough to detect a medium effect. Therefore, replication with a larger sample is needed.

Furthermore, sensitivity analyses were conducted using G*power 3.1.9.2 (Faul et al., 2007) in order to determine the minimum effect size needed to obtain significant results for these analyses. Results indicated that the required effect size was $f^2 = .12$ for analyses examining this model predicting baseline suicidal ideation and $f^2 = .37$ for the model predicting suicidal ideation at 6-8 week follow-up. Results suggest that given the current study’s sample size and $\alpha$ level, at least a small effect size was required to obtain significant results if a power of .80 was achieved in the model predicting baseline
suicidal ideation, but a large effect size was required to obtain significant results in the model predicting suicidal ideation at 6-8 week follow-up.

**Implications**

This study has important implications for suicide risk assessment and intervention for individuals with a history of NSSI and for individuals who are at risk for suicidal thoughts and behaviors, and also has valuable implications for clinical research in this area. Results of this dissertation have shown that both self-reported emotion reactivity and negative problem orientation are important emotional and cognitive factors to consider when assessing risk for suicide, and are critical factors to target when providing treatment to individuals with a history of NSSI, who may be at risk for suicidal ideation. Results of this study also have important implications for future research on these constructs in order to better understand how these factors influence the trajectory from NSSI to suicide.

This study provides evidence that emotion reactivity and negative problem orientation are two factors that differentiate individuals with and without a history of NSSI. It is possible that these are factors that may have contributed to the onset of NSSI behaviors. This is important because these are also factors that have been associated with suicide risk in prior research, and may thus make individuals with a history of NSSI more vulnerable to suicidal thoughts and behaviors (D’Zurilla et al., 1998; Evans et al., 2016, Polanco-Roman et al., 2018; Reinecke et al., 2001). With regards to emotion reactivity, findings show that individuals with a history of NSSI and high levels of suicidal ideation endorsed greater emotion reactivity on the ERS, a self-report measure of emotion reactivity, than individuals with a history of NSSI and low levels of suicidal ideation,
which indicates that self-reported emotion reactivity may be an important factor when considering suicide risk among individuals with a history of NSSI. However, emotion reactivity was significantly positively associated with suicidal ideation at baseline and at 6-8 week follow-up in the full sample. When the sample was split by NSSI history, emotion reactivity was associated with baseline suicidal ideation in individuals with and without a history of NSSI. In this sense, emotion reactivity may be important for suicide risk assessments for individuals with or without a history of NSSI.

With regards to negative problem orientation, our findings show that negative problem orientation was associated with baseline suicidal ideation and suicidal ideation at 6-8 week follow-up in individuals without a history of NSSI, but not among individuals with a history of NSSI. Additionally, individuals with a history of NSSI and high levels of suicidal ideation and individuals with a history of NSSI and low levels of suicidal ideation did not differ with regards to negative problem orientation. These findings might suggest that negative problem orientation is more maladaptive among individuals without an NSSI history. Thus, these results suggest that it is important that suicide risk assessments include assessment of negative problem orientation as well.

These findings also have implications for evidence-based interventions for NSSI and suicidal thoughts and behaviors. For instance, Dialectical Behavior Therapy (DBT) is an evidence-based cognitive behavioral treatment that was originally developed for people who were highly suicidal and for individuals who met criteria for BPD (Linehan, 1993; Linehan 2015; Rathus & Miller, 2015). A focus of DBT is to treat individuals who are experiencing pervasive emotion dysregulation, and research on DBT has suggested that DBT can be effective for a variety of diagnoses (Linehan, 1993; Linehan 2015;
Neacsiu, Bohus & Linehan, 2014; Neacsiu, Rizvi & Linehan, 2010; Rathus & Miller, 2015). DBT involves the teaching and practice of emotion regulation skills, mindfulness, distress tolerance skills, and interpersonal effectiveness skills, all of which are particularly helpful for this population (i.e., individuals with a history of NSSI and suicidal thoughts) (Linehan, 1993; Linehan 2015; Rathus & Miller, 2015). Given that individuals with a history of NSSI and high levels of suicidal ideation endorsed greater self-reported emotion reactivity than individuals with a history of NSSI and low levels of suicidal ideation, and individuals without a history of NSSI, results of this study contribute additional evidence suggesting that DBT may be particularly beneficial for individuals with a history of NSSI and high levels of suicidal ideation.

In addition, Problem Solving Therapy is an evidence-based cognitive behavioral treatment that may also be particularly helpful for individuals with a history of NSSI, and may be helpful for individuals who may be at risk for future suicidal ideation as well (Nezu, Nezu, & D’Zurilla, 2012). Problem Solving Therapy is an intervention that emphasizes teaching individuals adaptive problem-solving skills and decision making skills in order to effectively cope with stressors in one’s life. The findings suggesting differences between individuals with and without a history of NSSI in negative problem orientation, along with results showing a relationship between negative problem orientation and suicidal ideation, suggest that Problem Solving Therapy may be particularly beneficial for individuals with a history of NSSI, and individuals who are thinking about suicide.

This study had many methodological advantages and extended prior research by examining a longitudinal, integrated model using a multi-method approach. First, this
study used a structured clinical interview, the SITBI (Nock et al., 2007) to assess for NSSI by differentiating it from other self-injurious behaviors (Nock et al., 2007). In addition, this study extended prior research by examining an integrated model, investigating the cognitive, emotional, and physiological factors that may impact the relationship between NSSI and suicidal ideation. In addition, while many prior studies in this area are cross-sectional, this study extended prior research with its longitudinal nature by examining the relationship among NSSI, emotion reactivity, negative problem orientation, and suicidal ideation at 6-8 week follow-up. Furthermore, this study employed a multi-method approach, including the use of a measure of physiological reactivity (i.e., skin conductance reactivity) to measure emotion reactivity. Inclusion of a physiological variable allows us to examine whether there may be a different impact of subjective (i.e., self-report) versus objective (i.e., physiological) measures of emotion reactivity. For instance, findings suggest that individuals with a history of NSSI and high levels of suicidal ideation may be differentiated from individuals with a history of NSSI and low levels of suicidal ideation and from individuals without a history of NSSI by self-reported emotion reactivity rather than physiological reactivity. However, findings also show that individuals with a history of NSSI did not differ from individuals without a history of NSSI in mood/affect reactivity (i.e., positive or negative) after Cyberball. In addition, individuals with a history of NSSI and differing levels of suicidal ideation did not differ in mood/affect reactivity after Cyberball either. It is possible that with a different stress task or with a larger sample size, results may have differed. However, these findings may also imply that self-reported general emotion reactivity, rather than
differences in mood and affect after playing Cyberball (Hartgerink et al., 2015), may better capture differences in emotion reactivity in these groups.

This is the first study of which we are aware to examine whether individuals with a history of NSSI and differing levels of suicidal ideation endorse different levels of emotion reactivity or negative problem orientation. Furthermore, to our knowledge, the impact of suicidal ideation on the relationship between NSSI and skin conductance reactivity has not been investigated before either. Finally, findings of this study contribute to knowledge of risk factors for NSSI and suicidal ideation in college students and adults, as well as the factors that contribute to the trajectory from NSSI to suicidal ideation, which is important given the prevalence of NSSI and suicidal thoughts and behaviors in these populations (Liu, Stevens, Wong, Yasui, & Chen, 2019; Serras et al., 2010; Whitlock et al., 2006; WHO, 2020).

**Study Limitations and Future Directions**

There are several limitations of the current study that need to be considered. First, since the sample consisted mostly of heterosexual female Caucasian young adults, findings may not generalize to the general population. In addition, although this sample mainly consisted of young adults, the wide age range (age 18-43) is a limitation which may impact our findings. Five of the participants in our sample were above the age of 30, with three being 40 or older. Given that problem solving abilities generally increase with age (Chen, Hertzog & Park, 2017), having such a wide age range may have impacted our findings. However, it must be noted that one of these participants reported experiencing suicidal ideation which is associated with deficits in problem solving (Schotte & Clum, 1982; 1987). In addition, according to Erikson’s Theory of Psychosocial Development,
young adults and individuals in middle adulthood are experiencing very different psychosocial crises, with young adults facing the psychosocial crisis of intimacy vs. isolation and middle adults experiencing the psychosocial crisis of generativity vs. stagnation (Erikson, 1963). Thus, it is likely that they are approaching very different types of problems in these different stages in life. Regarding gender, while some research has suggested that engaging in NSSI frequently or repeatedly is more prevalent among females than males (Sornberger et al., 2012; Whitlock et al., 2006), other research has not found gender differences (Cipriano et al., 2017; Klonsky, 2011; Muehlenkamp & Gutierrez, 2007). Thus, it is still unknown whether gender differences in NSSI exist. Additionally, given that there were significantly more females in the NSSI group in our study, it is possible that this confounded our results. Thus it is important that the findings of the current study are replicated in a sample that contains an equal amount of males and females in order to examine whether our findings are generalizable to males and females, and to clarify whether gender differences in the prevalence of NSSI exist. In addition, few studies have examined racial/ethnic differences in the prevalence of NSSI, but the results of these studies that have been conducted are mixed as well, with some research finding that minority students report less engagement in NSSI compared to white students (Chesin et al., 2013; Gratz, 2006; Gratz & Roemer, 2008), and other research not finding racial/ethnic differences (Croyle, 2007; Klonsky, 2011; Serras et al., 2010; Wilcox et al., 2012). Thus, replication in more ethnically and racially diverse samples is needed as well. Finally, the sample was predominantly heterosexual, and research has suggested that NSSI may be more prevalent in sexual minorities (Batejan et al., 2015, Ross et al., 2010).
It will be important to replicate this study in samples that are more diverse with regards to sexual orientation.

Another limitation of this study was the small sample size, especially for Session 2, and the high attrition rate, as there was not sufficient power to test the moderated mediation model. According to power analyses using G*power and recommendations from Fritz and MacKinnon’s (2007) research on estimating sample size in mediational models, a sample of 142 participants was needed for an 80% chance of detecting a medium effect. Session 1 consisted of only 106 participants, and there was a considerable amount of attrition as only 35 individuals participated in Session 2. While there was sufficient power for many of the study hypotheses, in order to more adequately test the moderated mediation model it is necessary to replicate this study with a larger sample size. In order to decrease the attrition rate in future studies, it is recommended that more frequent assessments are conducted (i.e., at weekly follow-up as opposed to 6-8 week follow-up or during the same semester of participation), and that each individual is compensated even with a small token (i.e., $5.00, 1 course credit), rather than entering them into a raffle.

In addition, our study took place in two study sessions. According to Cole and Maxwell (2003), in tests of mediation, it is recommended that measures be administered during three study sessions because time needs to elapse between the three variables in order to determine whether they have had an effect on each other. While this study included a measure of suicidal ideation at 6-8 week follow-up, the predictor variable and mediator variables were administered during the same session. This study is considered a half longitudinal design, which may contribute to the effect of the predictor variable on
the mediator variable being biased (Cole & Maxwell, 2003; Maxwell & Cole, 2007). Therefore, it is crucial that the proposed moderated mediation model is examined using a study in which the predictor variable, mediator variable, and dependent variable are assessed during three different study sessions.

Another limitation of this study may have been the use of the Cyberball task as a social stress task. It is possible that differences in skin conductance reactivity in individuals with or without a history of NSSI and a significant mediating effect of skin conductance reactivity were not found because the task was not arousing enough or long enough to elicit differences by group. Although there were significant differences in mood, negative affect, and positive affect in the full study sample after playing Cyberball and significant differences in SCL in the full sample after playing Cyberball, significant differences were not found between individuals with and without a history of NSSI in skin conductance reactivity, or change in mood or affect. Significant differences were also not found between individuals with a history of NSSI and differing levels of suicidal ideation in skin conductance reactivity, change in mood, or change in affect. It is possible that Cyberball was not stressful enough or long enough to elicit a physiological/emotional response comparable to the stress that individuals with a history of NSSI or individuals who are at risk for suicide typically experience. Thus, replication with a different stress task is needed. However, it is also possible that individuals with and without a history of NSSI, and individuals with a history of NSSI and varying levels of suicidal ideation are differentiated by self-reported emotion reactivity, rather than physiological measures of emotion reactivity, or stress mediated mood reactivity in response to ostracism.
A final limitation of this study may be the short follow-up period for measuring future suicidal ideation. This 6-8 week follow-up period is helpful when considering the importance of assessing for short-term risk for suicidal thoughts and behaviors, but this study may not be generalizable to longer-term risk for suicide. Additional research needs to be conducted examining suicidal ideation at a later follow-up period (e.g., 1 year follow-up), or potentially at different follow-up periods to examine how this model may differ at different time points.

Conclusions

This dissertation sought to examine the impact of emotion reactivity and negative problem orientation on the trajectory from NSSI to suicide using a multi-method, longitudinal approach. Results of this study indicate that self-reported emotion reactivity is a factor that may contribute to suicidal ideation among individuals with a history of NSSI, and also indicate that negative problem orientation is a factor that is associated with suicidal ideation. However, it is not clear whether negative problem orientation increases risk for suicidal ideation in individuals with a history of NSSI. Results also suggest that individuals with a history of NSSI do not experience greater skin conductance reactivity or change in mood or affect in response to brief social stressors, compared to individuals without a history of NSSI. Additionally, individuals with a history of NSSI and high levels of suicidal ideation do not experience greater skin conductance reactivity or change in mood or affect in response to brief social stressors compared to individuals with a history of NSSI and low levels of suicidal ideation. Furthermore, results suggest that skin conductance reactivity was not associated with suicidal ideation at baseline or 6-8 week follow-up. However, further research is needed
to examine whether these findings hold with a different or longer stress task. It is also possible that self-reported emotion reactivity, rather than skin conductance reactivity, or stress-mediated mood reactivity in response to social stressors, is a more important factor in differentiating individuals with a history of NSSI with higher levels of suicidal ideation. Finally, findings did not support the hypothesized moderated mediation model. In this future, this study should be replicated with a larger sample in order to examine whether this was due to insufficient power.
REFERENCES


128


APPENDICES

Appendix A: Recruitment Flyer

History of self-harm?

Volunteers with OR without history of self-harm needed

Help the Maine Mood Lab at the University of Maine in Orono learn more about the way people think and physiologically respond to certain tasks by taking part in a compensated ($20) research study.

Who is Eligible?

Take our online survey at tinyurl.com/m2fnz2d if you are 18 or older!

If you qualify, participation may include:

- Session 1: Lab-based session at UMaine including an interview, surveys regarding mood and problem-solving strategies, and physiological recording while you play an online ball game (2 hrs), $20 compensation.
- Session 2: Online questionnaires (10-15 mins); entry into drawing with 1 in 10 chance to win a $25 VISA card.

Have questions or interested in participating?

Scan this QR code, visit tinyurl.com/m2fnz2d, call/text 207.518.8089, or email our lab at mainemoodlab@gmail.com.

National Suicide Prevention Lifeline (toll-free, 24-hour) 1.800.273.TALK (1.800.273.8255)
Appendix B: Screening Consent Form

Informed Consent (Community Prescreen)
Welcome to the Maine Mood Lab Prescreening Questionnaire:

You have chosen to participate in research studies to help us understand more about processes underlying self-harm. This study is being conducted by Victoria Quinones, a graduate student, Liv LiaBraaten, a graduate student, and Dr. Emily Haigh, a faculty member in the department of psychology at the University of Maine. You must be at least 18 years of age to participate.

The purpose of this screening is to find individuals who meet criteria for our study. Based on your responses, you may be contacted via email to participate.

What Will You Be Asked to Do?

If you decide to participate, you will be asked to complete a brief questionnaire about behaviors related to self-harm. It should take no more than 2 minutes.

If you are eligible for the study, you will receive an email inviting you to sign up to complete Session 1 in the lab. During Session 1, you will complete an interview where you will be asked about various forms of self-injurious behaviors, You will be asked questions such as; “Have you ever had thoughts of killing yourself?” or “Have you ever done something to purposely hurt yourself without intending to die?” After the interview, you will be asked to complete several brief questionnaires, including questions about loss of interest in activities, feelings of sadness, and about different ways to manage thoughts and feelings people sometimes have (e.g., “I feel sad much of the time,” “I am less interested in other people or things than before,” “analyze recent events to try to understand why you are depressed”). Then you will be asked to participate in physiological recording (sensors to detect electrical impulses will be attached to your chest and back) while you complete self-report questionnaires, watch a short nature film, complete an online ball game, and watch two more short videos. Session 1 will take about 2 hours.

Participants that complete the first portion of the study will be invited to complete a final portion of the study online within 6-8 weeks of participating in Session 1. For this part of the study, you will receive an email with a link to some questions about your mood and the way you solve problems. Session 2 will take approximately 10-15 minutes.

Risks

It is possible that you may feel uncomfortable when answering questions about yourself. At any point during the study, you have the right to skip questions you do not wish to answer, or stop the session and choose not to participate in the remainder of the study. You will not need to provide a reason for stopping the session. You will receive a list of referrals for counseling services at the end of this questionnaire.
It is important for you to understand that if you tell us about things you’ve done which may have been unsafe or make it possible that you may not be able to keep yourself safe during the lab study session (Session 1), we may encourage you to discuss this with a counselor or other confidant in order to keep you safe in the future.

Compensation:

You will not receive any compensation for completing the prescreening survey. If you are eligible for our study, you will receive $20 for completing Session 1 of the study. If you participate in Session 2, you will also be entered into a drawing to win a $25 VISA gift card (1 in 10 chance of winning).

Confidentiality

We need your name if you wish to be contacted for participation in one of the research projects. This information will not be shared with anyone other than by the principal investigators in the study. Identifying information will be kept separate in a different file (i.e., you will be identified by a participant number). The data file without identifying information will be kept on password protected computers in locked laboratories indefinitely. The keyed file linking your name with your identifier will be stored separately on a password protected drive in a locked laboratory or office, using software that provides additional security. The key will be deleted in December 2020.

Voluntary

Participation is voluntary and you have the right to discontinue at any time.

Contact Information

If you have questions about this screening, please contact Dr. Emily Haigh (207-581-2053), 376 Little Hall, or e-mail: emily.a.haigh@maine.edu). If you have questions about your rights as a research participant, please contact the Office of Research Compliance, at 207-581-2657 (or e-mail umric@maine.edu).

Future Studies

Would you be interested in being contacted for future studies conducted in the lab?

☐ ☐

Yes  No

By clicking "Yes" below, you indicate that you have read and understand the above information and agree to participate.
If you are no longer interested, please click “No” to exit the questionnaire.

Yes  No
Appendix C: Screening Questionnaire

Modified SHBQ

A lot of people do things which are dangerous and might get them hurt. There are many reasons why people take these risks. Often people take risks without thinking about the fact that they might get hurt. Sometimes, however, people hurt themselves on purpose. We are interested in learning more about the ways in which you may have intentionally or unintentionally hurt yourself. We are also interested in trying to understand why people your age may do some of these dangerous things. Please select YES or NO to the following question and answer the follow-up questions.

Things you may have actually done to yourself on purpose.

1. Have you ever hurt yourself on purpose? (e.g., scratched yourself with finger nails or sharp object.) YES NO
If yes, what did you do?
   a. Approximately how many times did you do this?
   b. Approximately when did you first do this to yourself? (write your age)
   c. When was the last time you did this to yourself? (write your age)
   d. Have you ever told any one that you had done these things? YES NO
   If yes, who did you tell? (specify relationship e.g. mother, friend)
   e. Have you ever needed to see a doctor after doing these things? YES NO
Appendix D. Counseling Resources

If you feel upset after having completed the study or find that some questions or aspects of the study triggered distress, talking with a qualified clinician may help. The following represents a list of resources that you may contact. These resources are options and in no way do they reflect an endorsement by the University of Maine.

<table>
<thead>
<tr>
<th>Counseling Services</th>
<th>ON-CAMPUS RESOURCES Available for UMaine Faculty, Staff, and Students</th>
<th>COMMUNITY RESOURCES Available to Anyone</th>
<th>NATIONAL RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counseling Center</td>
<td>207-581-1392&lt;br&gt;<a href="http://www.umaine.edu/counseling/">http://www.umaine.edu/counseling/</a></td>
<td>Community Health &amp; Counseling Services&lt;br&gt;42 Cedar Street&lt;br&gt;Bangor, ME 04401 (Any costs are your responsibility)&lt;br&gt;</td>
<td>Mental Health Services Locator&lt;br&gt;<a href="http://store.samhsa.gov/mhlocator">http://store.samhsa.gov/mhlocator</a></td>
</tr>
<tr>
<td>Cutler Health Building (Gannet Hall side)&lt;br&gt;(FREE to UMaine students)</td>
<td>207-581-1392&lt;br&gt;<a href="http://www.umaine.edu/counseling/">http://www.umaine.edu/counseling/</a></td>
<td>207-947-0366&lt;br&gt;<a href="http://www.chcs-me.org/">http://www.chcs-me.org/</a></td>
<td>National Suicide Prevention Lifeline, Toll-Free, 24-hour Hotline, 1-800-273-TALK (1-800-273-8255)</td>
</tr>
<tr>
<td>Psychological Services Center&lt;br&gt;330 Corbett Hall&lt;br&gt;(Sliding fee scale; costs are your responsibility)</td>
<td>207-581-2034&lt;br&gt;<a href="http://umaine.edu/clinicalpsychology/psychological-services-center/">http://umaine.edu/clinicalpsychology/psychological-services-center/</a></td>
<td>1-866-771-9276&lt;br&gt;<a href="http://www.thecommunityconnector.org/directory/profile/maine-warm-line">http://www.thecommunityconnector.org/directory/profile/maine-warm-line</a></td>
<td>7 days/week 24 hours</td>
</tr>
<tr>
<td></td>
<td>207-581-2034&lt;br&gt;<a href="http://umaine.edu/clinicalpsychology/psychological-services-center/">http://umaine.edu/clinicalpsychology/psychological-services-center/</a></td>
<td>1-888-568-1112&lt;br&gt;<a href="http://www.maine.gov/suicide/youth/index.htm">http://www.maine.gov/suicide/youth/index.htm</a></td>
<td>7 days/week 24 hours</td>
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<tr>
<td>Psychological Services Center&lt;br&gt;330 Corbett Hall&lt;br&gt;(sliding fee scale)</td>
<td>207-581-2034&lt;br&gt;<a href="http://umaine.edu/clinicalpsychology/psychological-services-center/">http://umaine.edu/clinicalpsychology/psychological-services-center/</a></td>
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<tr>
<td>Contact Your Primary Care Provider&lt;br&gt;(Any costs are your responsibility)</td>
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Appendix E. Recruitment Emails: Community Recruitment Email

Hello,

Thank you for completing the prescreen to participate in the Self-Injurious Behaviors Study at the University of Maine. We are contacting you because you are eligible to complete our study and we would like to invite you to sign up to participate. The session can take approximately 2 hours and you will receive $20 for completing the session.

WHAT DOES PARTICIPATION INVOLVE?
The session involves a brief interview where you will be asked about your experiences with self-injurious behaviors. Depending on the interview, you may be asked to continue on with the study. At this point, you will complete several questionnaires about different types of thoughts and feelings people sometimes have as well as a computerized task while physiological recording is taken.

HOW DO I SIGN UP?
1. Go to Sona and sign up for The Self-Injurious Behavior Study.
2. When prompted, enter code: goblue. *NOTE* Please do not share this code with other individuals.

Note: When you log into SONA it will prompt to you to select a course. At the very top of the list there is a "No course- Volunteer only" option. Select that option and continue to the screen where you will change your password.

This study session takes place in Corbett Hall, Room 329 (map).

Please feel free to contact our lab with any non-emergency questions at (207) 518-5087 or mainemoodlab@gmail.com. Additionally, if helpful, mental health resources are included below:

- **UMaine Psychological Services Center**: 330 Corbett Hall, (207) 581-2034
- **Maine Suicide and Crisis Hotline**: 1 (888) 568-1112

Thank you for your participation. We hope to hear from you soon!

--
Best,
Maine Mood Lab
Corbett Hall Room 329
University of Maine
Orono, ME 04469
207.518.8089
Visit us on Facebook!
Subject Pool Email:

Dear Student,

Thank you for completing the prescreen to complete the Self-Injurious Behaviors Study (SIBS) at the University of Maine. We are contacting you because you are eligible to complete our study and we would like to invite you to sign up to participate. The session can take approximately 2 hours and you will receive up to 2 credits for your participation,

WHAT DOES PARTICIPATION INVOLVE?
The session involves a brief interview where you will be asked about your experiences with self-injurious behaviors. After the interview, you will complete several questionnaires about different types of thoughts and feelings people sometimes have as well as a computerized task while physiological recording is taken.

YOU MAY QUALIFY TO COMPLETE SESSION 2
After Session 1, you may qualify to complete Session 2 (an online survey).

HOW DO I SIGN UP?
1. Go to Sona and sign up for The Self-Injurious Behavior Study (SIBS).
2. When prompted, enter code: goblue.

*NOTE* Please do not share this code with other students.

This study session takes place in Corbett Hall, Room 329 (map).

Please feel free to contact our lab with any non-emergency questions at (207) 518-8089 or mainemoodlab@gmail.com. Additionally, if helpful, mental health resources are included below:

- **UMaine Psychological Services Center**: 330 Corbett Hall, (207) 581-2034
- **Maine Suicide and Crisis Hotline**: 1 (888) 568-1112

Thank you for your participation. We hope to hear from you soon!

Best,
Maine Mood Lab
Corbett Hall Room 329
University of Maine
Orono, ME 04469
207.518.8089
Visit us on Facebook!
### Appendix F. Session One Compensation Schedule

#### Community Participants Payment Schedule:

<table>
<thead>
<tr>
<th>Time Duration</th>
<th>Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to ½ hour</td>
<td>$5.00</td>
</tr>
<tr>
<td>½ hour to 1 hour</td>
<td>$10.00</td>
</tr>
<tr>
<td>1 hour to 1 ½ hours</td>
<td>$15.00</td>
</tr>
<tr>
<td>1 ½ hours to 2 hours (or session completion)</td>
<td>$20.00</td>
</tr>
</tbody>
</table>

#### Student Participants Credit Schedule:

<table>
<thead>
<tr>
<th>Time Duration</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to ½ hour</td>
<td>.5 credit</td>
</tr>
<tr>
<td>½ hour to 1 hour</td>
<td>1 credit</td>
</tr>
<tr>
<td>1 hour to 1 ½ hours</td>
<td>1.5 credits</td>
</tr>
<tr>
<td>1 ½ hours to 2 hours (or session completion)</td>
<td>2 credits</td>
</tr>
</tbody>
</table>
Appendix G. Session One Consent Forms

Community- Informed Consent (Session 1)

You are invited to participate in Session 1 of the Self-Injurious Behaviors Study (SIBS), a research project being conducted by Victoria Quinones, a graduate student, Liv LiaBraaten, a graduate student, and Dr. Emily Haigh, a faculty member in the Department of Psychology, at the University of Maine. The purpose of this study is to investigate the relationship between various self-injurious behaviors and the way people think.

You must be 18 or older to participate.

What Will You Be Asked To Do?

If you decide to participate, you will first complete an interview where you will be asked about various forms of self-injurious behaviors. You will be asked questions such as; “Have you ever had thoughts of killing yourself?” or “Have you ever done something to purposely hurt yourself without intending to die?” This interview can take up to 15 minutes.

After completing the interview, a female research assistant will attach sensors to detect electrical impulses on your chest, back, and hand. You will be asked to complete several brief questionnaires, including questions about loss of interest in activities, feelings of sadness, and about different ways to manage thoughts and feelings people sometimes have (e.g., “I feel sad much of the time,” “I am less interested in other people or things than before,” “analyze recent events to try to understand why you are depressed”). You will next watch a short nature film, and complete an online ball game while physiological recording is taken. Following the computerized task, you will watch two more short videos before the sensors are removed from your body. If you complete the entire session it should take approximately 2 hours.

Participants will be asked to take part in Session 2. If you decide to participate in the second part, you will be invited to complete the final portion of the study online within 6-8 weeks. For this part of the study, you will receive an email with a link to some questions about your mood, and the way you solve problems. It will take 10-15 minutes to complete the questionnaires if you decide to participate.

Risks

It is possible that some questions may make you uncomfortable. You may skip any questions that you do not feel comfortable answering, and you may terminate participation at any time. A research assistant will conduct a risk assessment (ask more detailed questions about your safety) if the researchers feel that you may be at risk of current self-harm (i.e., current suicide plan or intent to hurt oneself). You will be provided with a list of community resources at the end of the study.

Benefits

While there are no direct benefits to you from participating in this study, your participation will help enhance our understanding of the relationship between the way people think and self-injurious behaviors.
Compensation
You will receive $20.00 for your participation in this task. If you choose to discontinue the study before it is complete, you will receive a prorated amount.

Voluntary
Participation is voluntary. You may terminate participation at any time and may skip any questions you do not wish to answer.

Confidentiality
An identification number has been assigned to you which means your name will not appear on any documents. The key linking your name to the ID number is stored using software that provides additional security on a password-protected computer in a locked office. Only individuals who have been trained to deal with sensitive material will be permitted to view this file. The key will be deleted in December 2020.

Contact Information
If you have any questions about the study, please feel free to contact Victoria Quinones (victoria.quinones@maine.edu) or Emily Haigh (emily.a.haigh@maine.edu). Additionally, if you have any questions about your rights as a research participant, please contact the Office of Research Compliance, at 207-581-2657 (or e-mail umric@maine.edu).

Future Studies
Would you be interested in being contacted for future studies?

[ ] Yes  [ ] No

Your signature below indicates that you have read and understand the above information and agree to participate. You will receive a copy of this form.

_________________________________________    _______________
Signature        Date
PSY 100- Informed Consent (Session 1)

You are invited to participate in Session 1 of the Self-Injurious Behaviors Study (SIBS), a research project being conducted by Victoria Quinones, a graduate student, Liv LiaBraaten, a graduate student, and Dr. Emily Haigh, a faculty member in the Department of Psychology, at the University of Maine. The purpose of this study is to investigate the relationship between various self-injurious behaviors and the way people think. You must be 18 or older to participate.

What Will You Be Asked To Do?
If you decide to participate, you will first complete an interview where you will be asked about various forms of self-injurious behaviors. You will be asked questions such as; “Have you ever had thoughts of killing yourself?” or “Have you ever done something to purposely hurt yourself without intending to die?” This interview can take up to 15 minutes.

After completing the interview, a female research assistant will attach sensors to detect electrical impulses on your chest, back, and hand. You will be asked to complete several brief questionnaires, including questions about loss of interest in activities, feelings of sadness, and about different ways to manage thoughts and feelings people sometimes have (e.g., “I feel sad much of the time,” “I am less interested in other people or things than before,” “analyze recent events to try to understand why you are depressed”). You will next watch a short nature film, and complete an online ball game while physiological recording is taken. Following the computerized task, you will watch two more short videos before the sensors are removed from your body. If you complete the entire session it should take approximately 2 hours.

Participants will be asked to take part in Session 2. If you decide to participate in the second part, you will be invited to complete the final portion of the study online within 6-8 weeks. For this part of the study, you will receive an email with a link to some questions about your mood, and the way you solve problems. It will take 10-15 minutes to complete the questionnaires if you decide to participate.

Risks
It is possible that some questions may make you uncomfortable. You may skip any questions that you do not feel comfortable answering, and you may terminate participation at any time. A research assistant will conduct a risk assessment (ask more detailed questions about your safety) if the researchers feel that you may be at risk of current self-harm (i.e., current suicide plan or intent to hurt oneself). You will be provided with a list of community resources at the end of the study.

Benefits
While there are no direct benefits to you from participating in this study, your participation will help enhance our understanding of the relationship between the way people think and self-injurious behaviors.
Compensation
You will receive 1 credit per hour of participation, so you will likely earn 2 research credits today. If you choose to discontinue the study before it is complete, you will receive a prorated amount of credits (likely 1 credit).

Voluntary
Participation is voluntary. You may terminate participation at any time and may skip any questions you do not wish to answer.

Confidentiality
An identification number has been assigned to you which means your name will not appear on any documents. The key linking your name to the ID number is stored using software that provides additional security on a password-protected computer in a locked office. Only individuals who have been trained to deal with sensitive material will be permitted to view this file. The key will be deleted in December 2020.

Contact Information
If you have any questions about the study, please feel free to contact Victoria Quinones (victoria.quinones@maine.edu) or Emily Haigh (emily.a.haigh@maine.edu). Additionally, if you have any questions about your rights as a research participant, please contact the Office of Research Compliance, at 207-581-2657 (or e-mail umric@maine.edu).

Future Studies
Would you be interested in being contacted for future studies?

☐ Yes ☐ No

Your signature below indicates that you have read and understand the above information and agree to participate. You will receive a copy of this form.

_________________________                                       _______________
Signature                                                                              Date
Appendix H. Session One Questionnaires

Demographic Information

To start with, we would like to get some background information from you.

1. What is your age? _____ 2. Gender? _______ 3. What is your date of birth?__/__/__

4. What is your current marital situation (please check one)?
   _____ Married  _____ Separated  _____ Never married/Single
   _____ Common law marriage  _____ Divorced  _____ Widowed

5. Do you consider yourself to be Hispanic or Latino (see definition below)? ☐ Yes ☐ No

*Hispanic or Latino.* A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture of origin, regardless of race.

6. Do you consider yourself to be Franco-American? ☐ Yes ☐ No

7. What is your race? (please check one)
   ☐ Native American or Alaska Native
   ☐ Asian
   ☐ Black or African American
   ☐ Native Hawaiian or Other Pacific Islander
   ☐ White
   ☐ Multiple races
   ☐ None of the above

8. What is the highest grade in school you have completed (please check one)?
____ Less than High School (record actual grade)
____ High School
____ 1 year of college or technical school
____ 2 or more years of college but did not graduate

____ 4 years of college with degree
____ Postgraduate, M.D., Ph.D.
____ A.A. or other degree that is not a B.A. or B.S.
Directions: Please carefully read each group of statements below. Circle the one statement in each group that best describes how you have been feeling for the past week, including today. Be sure to read all of the statements in each group before marking a choice.

Part 1

1. 0. I have a moderate to strong wish to live.
   1. I have a weak wish to live.
   2. I have no wish to live

2. 0. I have no wish to die
   1. I have a weak wish to die.
   2. I have a moderate to strong wish to die.

3. 0. My reasons for living outweigh my reasons for dying.
   1. My reasons for living or dying are about equal.
   2. My reasons for dying outweigh my reasons for living.

4. 0. I have no desire to kill myself.
   1. I have a weak desire to kill myself.
   2. I have a moderate to strong desire to kill myself.

5. 0. I would try to save my life if I found myself in a life-threatening situation.
   1. I would take a chance on life or death if I found myself in a life-threatening situation.
   2. I would not take the steps necessary to avoid death if I found myself in a life-threatening situation.

If you have circled the zero statements in both Groups 4 and 5 above, then skip down to Group 20. If you have marked a 1 or 2 in either Group 4 or 5, then go to Group 6.

Part 2

6. 0. I have brief periods of thinking about killing myself which pass quickly.
   1. I have periods of thinking about killing myself which last for moderate amounts of time.
   2. I have long periods of thinking about killing myself.

7. 0. I rarely or only occasionally think about killing myself.
   1. I have frequent thoughts about killing myself.
   2. I continuously think about killing myself.

8. 0. I do not accept the idea of killing myself.
1. I neither accept nor reject the idea of killing myself.
2. I accept the idea of killing myself.

9. 0. I can keep myself from committing suicide.
   1. I am unsure that I can keep myself from committing suicide.
   2. I cannot keep myself from committing suicide.

10. 0. I would not kill myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc.
   1. I am somewhat concerned about killing myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc.
   2. I am not or only a little concerned about killing myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc.

11. 0. My reasons for wanting to commit suicide are primarily aimed at influencing other people, such as getting even with people, making people happier, making people pay attention to me, etc.
   1. My reasons for wanting to commit suicide are not only aimed at influencing other people, but also represent a way of solving my problems.
   2. My reasons for wanting to commit suicide are primarily based upon escaping from my problems.

12. 0. I have no specific plan about how to kill myself.
   1. I have considered ways of killing myself, but have not worked out the details.
   2. I have a specific plan for killing myself.

13. 0. I do not have access to a method or an opportunity to kill myself.
   1. The method that I would use for committing suicide takes time, and I really do not have a good opportunity to use this method.
   2. I have access or anticipate having access to the method that I would choose for killing myself and also have or shall have the opportunity to use it.

14. 0. I do not have the courage or the ability to commit suicide.
   1. I am unsure that I have the courage or the ability to commit suicide
   2. I have the courage and the ability to commit suicide.

15. 0. I do not expect to make a suicide attempt.
   1. I am unsure that I shall make a suicide attempt.
   2. I am sure that I shall make a suicide attempt.

16. 0. I have made no preparations for committing suicide.
   1. I have made some preparations for committing suicide.
   2. I have almost finished or completed my preparations for committing suicide.

17. 0. I have not written a suicide note
1. I have thought about writing a suicide note or have started to write one, but have not completed it.
2. I have completed a suicide note.

18. 0. I have made no arrangements for what will happen after I have committed suicide.
   1. I have thought about making some arrangements for what will happen after I have committed suicide.
   2. I have made definite arrangements for what will happen after I have committed suicide.

19. 0. I have not hidden my desire to kill myself from people.
   1. I have held back telling people about wanting to kill myself.
   2. I have attempted to hide, conceal, or lie about wanting to commit suicide.

Go to Group 20.

20. 0. I have never attempted suicide.
   1. I have attempted suicide once.
   2. I have attempted suicide two or more times.

If you have previously attempted suicide, please continue with the next statement group.

21. 0. My wish to die during the last suicide attempt was low.
   1. My wish to die during the last suicide attempt was moderate.
   2. My wish to die during the last suicide attempt was high.
ERS

Instructions: This questionnaire asks different questions about how you experience emotions on a regular basis. When you are asked about being “emotional,” this may refer to being angry, sad, excited, or some other emotion. Please rate the following statements on a 0 to 4 scale (0 = not at all like me and 4 completely like me).

1. When something happens that upsets me, it's all I can think about it for a long time.
2. My feelings get hurt easily.
3. When I experience emotions, I feel them very strongly/intensely.
4. When I'm emotionally upset, my whole body gets physically upset as well.
5. I tend to get very emotional very easily.
6. I experience emotions very strongly.
7. I often feel extremely anxious.
8. When I feel emotional, it's hard for me to imagine feeling any other way.
9. Even the littlest things make me emotional.
10. If I have a disagreement with someone, it takes a long time for me to get over it.
11. When I am angry/ upset, it takes me much longer than most people to calm down.
12. I get angry at people very easily.
13. I am often bothered by things that other people don't react to.
15. My emotions go from neutral to extreme in an instant.
16. When something bad happens, my mood changes very quickly. People tell me I have a very short fuse.
17. People tell me that my emotions are often too intense for the situation.
18. I am a very sensitive person.
19. My moods are very strong and powerful.
20. I often get so upset it's hard for me to think straight.
21. Other people tell me I'm overreacting.
Instructions: Below are some ways that you might think, feel, and act when faced with PROBLEMS in everyday living. We are not talking about the common hassles and pressures that you handle successfully every day. In this questionnaire, a problem is something important in your life that bothers you a lot but you don't immediately know how to make it better or stop it from bothering you so much. The problem could be something about yourself (such as your thoughts, feelings, behavior, appearance, or health), your relationships with other people (such as your family, friends, teachers, or boss), or your environment and the things that you own (such as your house, car, property, money). Please read each statement carefully and choose one of the numbers below which best shows how much the statement is true of you. See yourself as you usually think, feel, and act when you are faced with important problems in your life these days.

0 = Not at all true of me
1 = Slightly true of me
2 = Moderately true of me
3 = Very true of me
4 = Extremely true of me

1. I spend too much time worrying about my problems instead of trying to solve them.
2. I feel threatened and afraid when I have an important problem to solve.
3. When making decisions, I do not evaluate all my options carefully enough.
4. When I have a decision to make, I fail to consider the effects that each option is likely to have on the well-being of other people.
5. When I am trying to solve a problem, I often think of different solutions and then try to combine some of them to make a better solution.
6. I feel nervous and unsure of myself when I have an important decision to make.
7. When my first efforts to solve a problem fail, I know if I persist and do not give up too easily, I will be able to eventually find a good solution.
8. When I am attempting to solve a problem, I act on the first idea that occurs to me.
9. Whenever I have a problem, I believe that it can be solved.
10. I wait to see if a problem will resolve itself first, before trying to solve it myself.
11. When I have a problem to solve, one of the things I do is analyze the situation and try to identify what obstacles are keeping me from getting what I want.
12. When my first efforts to solve a problem fail, I get very frustrated.
13. When I am faced with a difficult problem, I doubt that I will be able to solve it on my own no matter how hard I try.
14. When a problem occurs in my life, I put off trying to solve it for as long as possible.
15. After carrying out a solution to a problem, I do not take the time to evaluate all of the results carefully.
16. I go out of my way to avoid having to deal with problems in my life.
17. Difficult problems make me very upset.
18. When I have a decision to make, I try to predict the positive and negative consequences of each option.
19. When problems occur in my life, I like to deal with them as soon as possible.
20. When I am attempting to solve a problem, I try to be creative and think of new or original solutions.
21. When I am trying to solve a problem, I go with the first good idea that comes to mind.
22. When I try to think of different possible solutions to a problem, I cannot come up with many ideas.
23. I prefer to avoid thinking about the problems in my life instead of trying to solve them.
24. When making decisions, I consider both the immediate consequences and the long-term consequences of each option.
25. After carrying out my solution to a problem, I analyze what went right and what went wrong.
26. After carrying out my solution to a problem, I examine my feelings and evaluate how much they have changed for the better.
27. Before carrying out my solution to a problem, I practice the solution in order to increase my chances of success.
28. When I am faced with a difficult problem, I believe I will be able to solve it on my own if I try hard enough.
29. When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible.
30. I put off solving problems until it is too late to do anything about them.
31. I spend more time avoiding my problems than solving them.
32. When I am trying to solve a problem, I get so upset that I cannot think clearly.
33. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish.
34. When I have a decision to make, I do not take the time to consider the pros and cons of each option.
35. When the outcome of my solution to a problem is not satisfactory, I try to find out what went wrong and then I try again.
36. I hate having to solve the problems that occur in my life.
37. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better.
38. When I have a problem, I try to see it as a challenge, or opportunity to benefit in some positive way from having the problem.
39. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas.
40. When I have a decision to make, I weigh the consequences of each option and compare them against each other.
41. I become depressed and immobilized when I have an important problem to solve.
42. When I am faced with a difficult problem, I go to someone else for help in solving it.
43. When I have a decision to make, I consider the effects that each option is likely to have on my personal feelings.
44. When I have a problem to solve, I examine what factors or circumstances in my environment might be contributing to the problem.
45. When making decisions, I go with my "gut feeling" without thinking too much about the consequences of each option.
46. When making decisions, I use a systematic method for judging and comparing alternatives.
47. When I am trying to solve a problem, I keep in mind what my goal is at all times.
48. When I am attempting to solve a problem, I approach it from as many different angles as possible.
49. When I am having trouble understanding a problem, I try to get more specific and concrete information about the problem to help clarify it.
50. When my first efforts to solve a problem fail, I get discouraged and depressed.
51. When a solution that I have carried out does not solve my problem satisfactorily, I do not take the time to examine carefully why it did not work.
52. I am too impulsive when it comes to making decisions.
PANAS-X

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way at this time for each descriptor. Use the following scale to record your answers:

<table>
<thead>
<tr>
<th></th>
<th>1 Very Slightly or not at all</th>
<th>2 A Little</th>
<th>3 Moderately</th>
<th>4 Quite of Bit</th>
<th>5 Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>cheerful</td>
<td>sad</td>
<td>active</td>
<td>angry at self</td>
<td></td>
<td></td>
</tr>
<tr>
<td>disgusted</td>
<td>calm</td>
<td>guilty</td>
<td>enthusiastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>attentive</td>
<td>afraid</td>
<td>joyful</td>
<td>downhearted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bashful</td>
<td>tired</td>
<td>nervous</td>
<td>sheepish</td>
<td></td>
<td></td>
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<tr>
<td>sluggish</td>
<td>amazed</td>
<td>lonely</td>
<td>distressed</td>
<td></td>
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</tr>
<tr>
<td>daring</td>
<td>shaky</td>
<td>sleepy</td>
<td>blameworthy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>surprised</td>
<td>happy</td>
<td>excited</td>
<td>determined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>strong</td>
<td>timid</td>
<td>hostile</td>
<td>frightened</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scornful</td>
<td>alone</td>
<td>proud</td>
<td>astonished</td>
<td></td>
<td></td>
</tr>
<tr>
<td>relaxed</td>
<td>alert</td>
<td>jittery</td>
<td>interested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>irritable</td>
<td>upset</td>
<td>lively</td>
<td>loathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>delighted</td>
<td>angry</td>
<td>ashamed</td>
<td>confident</td>
<td></td>
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</tr>
<tr>
<td>inspired</td>
<td>bold</td>
<td>at ease</td>
<td>energetic</td>
<td></td>
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</tr>
<tr>
<td>fearless</td>
<td>blue</td>
<td>scared</td>
<td>concentrating</td>
<td></td>
<td></td>
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<tr>
<td>disgusted</td>
<td>shy</td>
<td>drowsy</td>
<td>dissatisfied</td>
<td></td>
<td></td>
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<tr>
<td>with self</td>
<td>with self</td>
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</tr>
</tbody>
</table>
MOOD RATING FORM

We are interested in knowing about your current mood. Please mark an ‘X’ on the line below to indicate how you feel right now. Use the labels above the line to help you in your judgment.

sad

happy

-----------------------------------------------------------------+-----------------------------------------------------------------
Appendix I. Session One Suicide Risk Assessment

Risk Assessment

Questions to ask if you think someone may be at risk for suicide:

Suicidal Ideation:
Are you currently suicidal?

Intent:
Do you think you would ever harm yourself or attempt suicide?

OR

Have you considered ways of killing yourself?

Plan/Preparations:
Do you have a suicide plan or have you made preparations for committing suicide?

Means:
Do you have means to kill yourself?

Suicide Attempt:
Have you ever attempted suicide?

IF YES, THEN

When was your last suicide attempt?

When Students will need to speak with a clinician:

If student answers “yes” to questions about suicidal ideation, intent, recent plan/preparations, means, or has had a suicide attempt within the past 6 months, call a clinician!

*Use your judgment. If there is any question about whether a student should speak with a clinician, consult with the clinician.

*If Dr. Haigh is unavailable, contact Dr. O’Grady or Dr. Schwartz-Mette. (Contact information on next page).

*If they are unavailable, walk student to the counseling center.

Checking in with students who endorse some of the questions, but DON’T NEED to speak with a clinician (Can use script below but don’t have to say this verbatim):

“I noticed that you endorsed [say what they endorsed]. There are some very effective ways to help with some of the concerns we spoke about during the interview today. I have
a list of referrals you may consider. I would strongly recommend these services to help with the way you have been feeling.”

Regardless of whether the student is at risk for suicide or not, offer them the list of mental health referrals.

Contact Information:

Emily Haigh:
207-581-2038 (office); 215-317-0133 (cell)

April O’Grady:
207-581-2065 (office); 207-478-9742 (cell)

Rebecca Schwartz-Mette:
207-581-2048 (office); 573-239-2202 (cell)

Counseling Services at UMaine:
207-581-1392
5721 Cutler Health Center, Room 125
Orono, Maine 04469

Campus Police:
207-581-4040
Debriefing

Thank you for your participation in our study. Your participation is greatly appreciated.

Purpose of the Study:
The purpose of this study is to examine how the way you think and the way your body physiologically responds (e.g. heart rate, skin conductance) to a social stressor, and how this may contribute to self-injurious behaviors. This study may help us understand how the different ways that people think and feel impact self-injurious thoughts and behaviors.

In this study you completed an interview and several questionnaires about how you think and feel. You also completed an online ball game while sensors were used to measure physiological arousal (e.g. heart rate variability, skin conductance). In reality you were not playing with other participants, rather they were computerized “players” pre-programmed to ignore you for the last two-thirds of the game. The computerized task is designed to induce feelings of ostracism associated with social stress.

We expect to find that individuals who with a history of engaging in non-suicidal self-injury (NSSI) and current or past suicidal ideation will have more difficulties regulating their emotions and solving problems, and will be more emotionally reactive to stress compared to non-suicidal individuals with a history of engaging in NSSI, and controls who have never engaged in NSSI. In addition, we expect that individuals with a history of engaging in NSSI and current or past suicidal ideation will have lower heart rate variability and higher skin conductance compared with non-suicidal individuals who engage in NSSI and controls. Finally, it is expected that all individuals who have a history of engaging in NSSI will have more difficulties regulating emotions, solving problems, and will be more emotionally reactive to stress than controls.

Do you have any questions about the study? When you were doing the study what did you think the study was about? Was there any part of the study that was difficult? How is your mood now?

We realize that some of the questions asked may have provoked an emotional reaction. As researchers, we do not provide mental health services and we will not be following up with you after this session. However, we want to provide every participant in this study with a comprehensive and accurate list of clinical resources that are available, should you decide you need assistance at any time. Please see information pertaining to local resources at the end of this form.

Confidentiality:

You may decide that you do not want your data used in this research. If you would like your data removed from the study and permanently deleted please email your request to Principal Investigator of the Maine Mood Lab, Dr. Emily Haigh @ Emily.a.haigh@maine.edu.
Whether you agree or do not agree to have your data used for this study, you will still receive compensation for your participation.

Final Report:
If you would like to learn about the results of the study, let the researcher know and we will email you a summary of the results at the end of the study.

Useful Contact Information:
If you have any questions or concerns regarding this study, its purpose or procedures, or if you have a research-related problem, please feel free to contact the Principal Investigator of the Maine Mood Lab, Dr. Emily Haigh at 207-581-2053. If you have other concerns about this study or would like to speak with someone not directly involved in the research study, you may contact the Chair of the Department of Psychology (Dr. Thane Fremouw, thane.fremouw@maine.edu)

If you have any questions concerning your rights as a research subject, you may contact the Office of Research Compliance at (207)-581-2657 or umric@maine.edu.
Appendix K: Session Two Invite

Session Two Invite

Dear Participant,

Thank you for completing the first part of the Self-Injurious Behaviors Study (SIBS). We are contacting you because you are eligible to complete Session 2, an online survey, which is the final portion of the study.

WHAT DOES PARTICIPATION INVOLVE?
Participation involves completion of a confidential online survey which asks questions about mood and the way you solve problems (approximately 10-15 minutes). After completion you will be automatically entered into a drawing to win a $25 VISA gift card (1 in 10 chance of winning).

HOW DO I PARTICIPATE?

1. Please click on the following link to access the survey: Session 2 Survey

2. When prompted, enter your participant code (including letters): SIBS

If you have any questions, please contact Maine Mood Lab at (207) 518-8089 or MaineMoodLab@gmail.com.

Thank you for your participation!

Best,
Maine Mood Lab
Corbett Hall Room 329
University of Maine
Orono, ME 04469
207.518.8089
Visit us on Facebook!
Appendix L. Session Two Consent Form

Session 2 Informed Consent Document (All participants)

You are invited to participate in Session 2 of the Self-Injurious Behaviors Study (SIBS), a research project being conducted by Victoria Quinones, a graduate student, Liv LiaBraaten, a graduate student, and Dr. Emily Haigh, a faculty member in the Department of Psychology, at the University of Maine. The purpose of this study is to investigate the relationship between various self-injurious behaviors and the way people think. You must be 18 or older to participate.

What Will You Be Asked to Do?
If you decide to participate, you will be asked to complete some short questionnaires about sensitive topics. As part of the online survey, you will answer questions about how you’re feeling (e.g., “I feel at ease”, “I feel upset”), and different types of thoughts (e.g., “I look forward to the future with hope and enthusiasm”) and life experiences (e.g., personal achievements, major change in sleeping habits) people sometimes have. Completing these should not take more than 10-15 minutes of your time.

Risks

- It is possible that some questions may make you uncomfortable.
- You may skip any questions that you do not feel comfortable answering, and you may terminate participation at any time.
- You will be provided with a list of community resources at the end of the study.
- This online study session will not be monitored in real-time by a clinician. If you are feeling depressed, you will need to contact a physician or mental health professional, and if you are experiencing thoughts of harming yourself, you will need to call 911, go to the nearest emergency room, or call a suicide hotline (National Hopeline Network at 1-800-SUICIDE/1-800-784-2433 or Suicide Prevention Lifeline at 1-800-273-8255).
- If you endorse suicide intent a clinician will follow-up with you via email.

Benefits
While there are no direct benefits to you from participating in this study, your participation will help enhance our understanding of the relationship between the way people think and self-injurious behaviors.

Compensation
For your participation in this task, you will be entered in a raffle for a 1 in 10 chance to win a $25.00 VISA gift card.
Voluntary
Participation is voluntary. You may terminate participation at any time and may skip any questions you do not wish to answer.

Confidentiality
The code number you have been assigned during Session 1 will again be used to protect your identity. This code is stored on a file with software designed to provide additional security. All data will be kept in the investigator’s locked office and will only be accessible by Dr. Emily Haigh and Maine Mood Lab graduate students and research assistants who have completed training in order to deal with sensitive material. Your name or other identifying information will not be reported in any publications. As previously described, the key linking your name to the data will be destroyed in December 2020. All data will be kept indefinitely by the investigators. The key and the data files will be stored on separate computers.

Contact Information
If you have any questions about this study, please contact Victoria Quinones at victoria.quinones@maine.edu or Emily Haigh at Emily.a.haigh@maine.edu. If you have any questions about your rights as a research participant, please contact the Office of Research Compliance, at 207-581-2657 (or e-mail umric@maine.edu).

By clicking "Yes" below, you indicate that you have read and understand the above information and agree to participate.

If you are no longer interested, please click “No” to exit the questionnaire.

☐ Yes  ☐ No
Appendix M. Session Two Measure of Suicidal Ideation

BSS

Directions: Please carefully read each group of statements below. Circle the one statement in each group that best describes how you have been feeling for the past week, including today. Be sure to read all of the statements in each group before marking a choice.

Part 1

1. 0. I have a moderate to strong wish to live.
   1. I have a weak wish to live.
   2. I have no wish to live

2. 0. I have no wish to die
   1. I have a weak wish to die.
   2. I have a moderate to strong wish to die.

3. 0. My reasons for living outweigh my reasons for dying.
   1. My reasons for living or dying are about equal.
   2. My reasons for dying outweigh my reasons for living.

4. 0. I have no desire to kill myself.
   1. I have a weak desire to kill myself.
   2. I have a moderate to strong desire to kill myself.

5. 0. I would try to save my life if I found myself in a life-threatening situation.
   1. I would take a chance on life or death if I found myself in a life-threatening situation.
   2. I would not take the steps necessary to avoid death if I found myself in a life-threatening situation.

If you have circled the zero statements in both Groups 4 and 5 above, then skip down to Group 20. If you have marked a 1 or 2 in either Group 4 or 5, then go to Group 6.

Part 2

6. 0. I have brief periods of thinking about killing myself which pass quickly.
   1. I have periods of thinking about killing myself which last for moderate amounts of time.
   2. I have long periods of thinking about killing myself.

7. 0. I rarely or only occasionally think about killing myself.
   1. I have frequent thoughts about killing myself.
   2. I continuously think about killing myself.
8. 0. I do not accept the idea of killing myself.
    1. I neither accept nor reject the idea of killing myself.
    2. I accept the idea of killing myself.

9. 0. I can keep myself from committing suicide.
    1. I am unsure that I can keep myself from committing suicide.
    2. I cannot keep myself from committing suicide.

10. 0. I would not kill myself because of my family, friends, religion, possible injury
    from an unsuccessful attempt, etc.
    1. I am somewhat concerned about killing myself because of my family, friends,
       religion, possible injury from an unsuccessful attempt, etc.
    2. I am not or only a little concerned about killing myself because of my family,
       friends, religion, possible injury from an unsuccessful attempt, etc.

11. 0. My reasons for wanting to commit suicide are primarily aimed at influencing
    other people, such as getting even with people, making people happier, making
    people pay attention to me, etc.
    1. My reasons for wanting to commit suicide are not only aimed at influencing
       other people, but also represent a way of solving my problems.
    2. My reasons for wanting to commit suicide are primarily based upon escaping
       from my problems.

12. 0. I have no specific plan about how to kill myself.
    1. I have considered ways of killing myself, but have not worked out the details.
    2. I have a specific plan for killing myself.

13. 0. I do not have access to a method or an opportunity to kill myself.
    1. The method that I would use for committing suicide takes time, and I really do
       not have a good opportunity to use this method.
    2. I have access or anticipate having access to the method that I would choose for
       killing myself and also have or shall have the opportunity to use it.

14. 0. I do not have the courage or the ability to commit suicide.
    1. I am unsure that I have the courage or the ability to commit suicide
    2. I have the courage and the ability to commit suicide.

15. 0. I do not expect to make a suicide attempt.
    1. I am unsure that I shall make a suicide attempt.
    2. I am sure that I shall make a suicide attempt.

16. 0. I have made no preparations for committing suicide.
    1. I have made some preparations for committing suicide.
    2. I have almost finished or completed my preparations for committing suicide.
17. 0. I have not written a suicide note  
1. I have thought about writing a suicide note or have started to write one, but have not completed it. 
2. I have completed a suicide note.

18. 0. I have made no arrangements for what will happen after I have committed suicide.  
1. I have thought about making some arrangements for what will happen after I have committed suicide.  
2. I have made definite arrangements for what will happen after I have committed suicide.

19. 0. I have not hidden my desire to kill myself from people.  
1. I have held back telling people about wanting to kill myself.  
2. I have attempted to hide, conceal, or lie about wanting to commit suicide.

Go to Group 20.

20. 0. I have never attempted suicide.  
1. I have attempted suicide once.  
2. I have attempted suicide two or more times.

If you have previously attempted suicide, please continue with the next statement group.

21. 0. My wish to die during the last suicide attempt was low.  
1. My wish to die during the last suicide attempt was moderate.  
2. My wish to die during the last suicide attempt was high.
Appendix N. End of Study Message for Participants

If you are having thoughts of harming yourself please call 911, go to the nearest emergency room or call the National Hopeline Network at (1-800-SUICIDE/1-800-784-2433) or Suicide Prevention Lifeline at 1-800-273-8255. If you are experiencing severe depressive symptoms please contact a physician or mental health professional.
Appendix O. Post-Session 2 Emails

Email to all participants who complete Session 2:

Hello,

Recently, you completed a set of online questionnaires in Qualtrics dealing with sensitive topics (i.e., depression, anxiety, hopelessness). We are reaching out to everyone who completed this study to see if you are in need of services. Please respond to this email and we will get back to you shortly. If you do not have any questions, concerns, or already have access to services, there is no need to respond to this email.

I have also attached a list of local resources.

Best,
Emily
Email to participants who endorse “1” or “2” on any items on the BSS in Session 1 or Session 2:

Hello,

I am clinical psychology faculty member in the department of psychology and I am reaching out to see if I might be able to provide you with some support. Recently, you completed a set of online questionnaires in Qualtrics dealing with sensitive topics (i.e., depression, anxiety, hopelessness). In response to a question about suicide, you answered [Insert response here].

This is a concerning statement and if you were willing, I would like to talk with you to make sure you’re safe and to see if there is anything I can do to help.

I have also attached a list of local resources.

Best,
Emily
BIOGRAPHY OF THE AUTHOR

Victoria E. Quiñones was born in Valley Stream, New York on April 15, 1991. She graduated from Valley Stream Central High School in 2009. She attended CUNY Hunter College in New York, New York and received her Bachelor of Arts degree in Psychology, with honors, in January 2014. During this time, she worked at the Experimental Psychopathology Lab at Hunter College, as part of the MBRS-RISE Program, a fellowship program for students who have shown academic excellence and productivity in research, and also completed a summer research assistantship at the Laboratory for Clinical and Developmental Research at Harvard University in the Summer of 2013. After undergraduate, she also assisted in research at the New York State Psychiatric Institute at Columbia University. During her time at CUNY Hunter College, she was first- or co-author on 10 research presentations at local and national conferences, and co-authored two peer-reviewed articles. During this time, Victoria also received an award from the New York League of Puerto Rican Women, for academic excellence, received the Livingston Welch Research award for productivity in research, received a Psi Chi Research award for a poster presentation at the Eastern Psychological Association, and received various additional honors for academic excellence.

Victoria entered the Clinical Psychology Doctoral Program at the University of Maine in 2014 and was awarded her Masters of Arts degree in Psychology in 2016. During her time at the University of Maine, Victoria was first- or co-author on 12 research presentations at local and national conferences, and co-authored one book chapter and one peer-reviewed article. Victoria was instrumental in establishing Dr. Emily Haigh’s Maine Mood Lab, and was the principal investigator for three studies, and
participated in two studies (including her dissertation study). During this time, Victoria also served as the instructor for courses in Abnormal Psychology and Theories of Personality and was awarded the Susan J. Hunter Teaching Fellowship for excellence in teaching. She also received an honorable mention from the Ford Foundation for her Ford Dissertation Grant. Throughout graduate school, Victoria was also a student member of the Psi Chi National Honor Society in Psychology, and a student affiliate of the Association for Behavioral and Cognitive Therapies (ABCT) and the Maine Psychological Association.

Victoria recently completed her predoctoral internship at Rutgers University Behavioral Health Care in the Adult Outpatient Track and also received specialized training at the Acute Psychiatric Services Center. After receiving her PhD, Victoria will begin a one-year APA-Accredited Postdoctoral Fellowship in Primary Care Behavioral Health at Brown University in Providence, Rhode Island. Victoria is a candidate for the Doctor of Philosophy degree in Clinical Psychology from The University of Maine in August 2020.