

Summer 2018

# Poor Sleep as a Predictor of NSSI and Suicide Ideation in Adolescents

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POOR SLEEP AS A PREDICTOR OF NSSI AND SUICIDE IDEATION IN  
ADOLESCENTS

A Thesis  
Presented to  
The Faculty of the Department of Psychological Science  
Western Kentucky University  
Bowling Green, Kentucky

In Partial Fulfillment  
Of the Requirements for the Degree  
Masters of Science

By  
Shelby LeeAnn Bandel

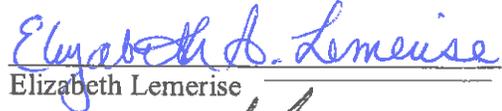
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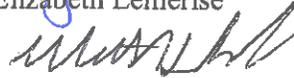
Date Recommended 7/10/18



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## ACKNOWLEDGEMENTS

To my supportive husband who continues to move around the country with me as I pursue my dreams; to my amazing parents who support me and provide guidance as I continue through my educational and life journeys; to Dr. Amy Brausch for helping me to grow in unmeasurable ways, develop my research interests, and who has provided me invaluable support throughout this program; to Dr. Elizabeth Lemerise for your support and willingness to be involved in this process; to Dr. Matthew Woodward for your willingness to jump in and support me in this project; to Jeff, Natalie, Sherry, Mike, and the rest of the Risk Behaviors Lab for welcoming me and supporting me through the past two years; to Megan, Marie and Sara for the countless conversations and support; to Dr. Carolyn Pepper for introducing me to the field of suicidology: Thank you.

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## POOR SLEEP AS A PREDICTOR OF NSSI AND SUICIDE IDEATION IN ADOLESCENTS

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August 2018

71 pages

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Despite becoming a greater public health concern, the suicide rate among adolescents has not decreased significantly in recent years (Center for Disease Control and Prevention [CDC], 2015). In fact, suicide is the second leading cause of death for individuals between 12-18 years (CDC, 2015). Nonsuicidal self-injury (NSSI), the deliberate destruction of one's own body tissue without suicidal intent and for reasons not socially sanctioned (Nock, 2009), has been identified as a robust predictor of suicide, above and beyond other risk factors such as depression and hopelessness (Asarnow et al., 2011; Guan, Fox, & Prinstein, 2012). Therefore, understanding risk factors for NSSI is an important area of research not only for prevention of NSSI, but also suicide. Recently, an association between poor sleep and suicide ideation in adolescents has been highlighted (Francic, Kralj, Marcinko, Knez, & Kardum, 2014; Park, Yoo, & Kim, 2013). However, very little attention, both globally and within the United States, has been given to understanding the impact sleep may have on NSSI. Given the strong role that emotion regulation has been identified as having in both poor sleep and NSSI separately, it is important to look at the interaction of these two factors in the prediction of NSSI. Data were collected from 154 adolescents in high school. Results indicated that poor sleep was a significant predictor of both NSSI engagement and self-reported suicide ideation. Additionally, emotion regulation successfully moderated the relationship between poor

sleep quality and suicide ideation severity. Results support that sleep is an important risk factor for NSSI engagement and suicide ideation and that emotion regulation may play an important role in strengthening the relationship for between sleep and suicide ideation only. These findings suggest that clinicians should be aware of and work with their clients on both emotion regulation and sleep quality to reduce risk of NSSI engagement and suicide ideation.

## **Introduction**

### **Suicide and NSSI**

Suicide is among the leading causes of death, with over 44,000 suicides in the United States each year (Suicide Statistics, 2015) and approximately one million deaths worldwide each year (World Health Organization [WHO], n.d.). Unfortunately, the rate of suicide is not decreasing. A recent investigation by the Center for Disease Control (CDC) found that from 1999 to 2014, age-adjusted suicide rates have increased by 24% (Curtin, Warner, & Hedegaard, 2016). Regarding youth, suicide has risen to be the second leading cause of death for individuals ages 10-14 and also is the second leading cause of death for individuals ages 15-24 (CDC, 2015). Therefore, it is apparent that identifying risk factors for suicide is important to develop better suicide prevention strategies.

One of the most robust predictors of suicide is nonsuicidal self-injury (NSSI), which predicts future suicide attempts above and beyond previous suicide attempts, suicide ideation, depression, hopelessness, and prior psychiatric hospitalization (Asarnow et al., 2011; Franklin et al., 2017; Guan, et al., 2012). Specifically, a recent meta-analysis found that prior NSSI was the strongest predictor for a suicide attempt; the odds of making a suicide attempt were four times greater for those with a history of NSSI compared to those without a history of NSSI (Franklin et al., 2017). NSSI often begins in adolescence (Nock, 2009; Tatnell, Kelada, Hasking, & Martin, 2014) with prevalence rates in non-clinical samples averaging around 20%, but estimates have ranged from 14%-45% (Cloutier, Martin, Kennedy, Nixon, & Muehlenkamp, 2010; Glenn,

Blumenthal, Klonsky, & Hajcak, 2011; Swannell, Martin, Page, Hasking, & St. John, 2014). The most commonly reported methods of NSSI are cutting, banging/hitting oneself, severe scratching and burning (Klonsky & Muehlenkamp, 2007), and the primary reason given for engagement in NSSI is emotion regulation purposes (Buckholdt et al., 2015). Therefore, based on the increase in suicide rates and relation between NSSI and suicide, it is important for current research to identify what risk factors are important for both NSSI and suicide to inform the development of suicide prevention efforts. A recently identified risk factor for both NSSI and suicide is poor sleep; however, it has yet to be studied extensively.

## **Sleep**

The long-term effects of sleep loss and sleep disorders have been associated with numerous physical health consequences including increased risk for hypertension, diabetes, obesity, depression, heart attack, and stroke (Colten & Altevogt, 2006). Previous research on mental health and sleep has long established a link between poor sleep and increased experiences of negative emotions (Baum et al., 2014). However, researchers are beginning to examine how sleep specifically impacts an individual's emotion regulation abilities. Per one study, poorer sleep was found to be related to difficulty in both accepting one's own emotions and engagement in goal directed behavior (Sandru & Voinescu, 2014). Further, the researchers found that those experiencing poorer sleep had greater difficulties controlling impulses when experiencing negative emotions (Sandru & Voinescu, 2014). Similarly, another study found that when sleep deprived adolescents were given a frustrating task, they were more likely to become angry or aggressive (Dahl, 1999). Further, Dahl explained that other emotions such as

sadness and silliness may also be heightened when adolescents are experiencing poor sleep, suggesting that sleep deprivation decreases an adolescent's ability to control, inhibit, and modify emotional responses (Dahl, 1999). Likewise, Mauss and colleagues found that poor sleep quality was related to poorer abilities in regulating negative emotions (Mauss, Troy, & LeBourgeois, 2013). An overview of sleep disturbances and emotion regulation found that sleep disturbances were related to decreased positive affect and increased negative affect (Fairholme & Manber, 2015). Finally, negative emotions prior to sleep increased sleep latency and impacted sleep duration and sleep quality, suggesting that the relationship between sleep quality and emotion regulation may not be unidirectional (Fairholm & Manber, 2015).

Poor sleep is also a common occurrence in adolescence, particularly due to the contradiction between the biological requirements of puberty and early school start times (Carskadon, Acebo, & Jenni, 2004). Beginning in puberty there is a shift in the biological clock causing adolescents to get sleepy approximately two hours later than before (meaning they should also sleep at least two hours later in the morning) (Nationwide Children's Hospital, n.d.). However, in many school districts the start times for schools do not accommodate the biological needs of adolescents, creating a situation where poor sleep is all too common. Specifically, 70% of adolescents report getting insufficient sleep on the average school night (McKnight-Eily, et al., 2011), and nearly 10% of adolescents report experiencing insomnia symptoms (Roane & Taylor, 2008). Previous research has found poor sleep in adolescents was associated with a variety of problematic outcomes including substance use, increased feelings of hopelessness, increased diagnosis of

depression, and increased risk for suicide (Lundh, Bjarehed, & Wangby-Lundh, 2013; McKnight-Eily et al., 2011; Roane & Taylor, 2008).

### **Sleep and Suicide Risk**

In adolescent samples, sleep (measured by non-restorative sleep, sleep duration, and sleep problems) has been identified as an important risk factor for suicide ideation, in particular. Suicide ideation is defined broadly as having thoughts of killing oneself (Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007). Suicide ideation is important in the study of suicide because it has been identified as an important risk factor for suicide attempts and deaths by suicide (Brown, Beck, Steer, & Grisham, 2000). Therefore, the identification of risk factors for suicide ideation is important for the development of suicide prevention strategies.

Non-restorative sleep is the feeling that one's sleep has not been sufficiently refreshing despite the fact the sleep may appear normal (Park et al., 2013). Park and colleagues (2013) found that non-restorative sleep was related to increased suicide ideation in a nonclinical adolescent sample. In addition, shorter sleep duration was related to increased suicide ideation (Park et al., 2013). An additional study examining sleep duration and suicide ideation (dichotomous) found that adolescents who slept only 5-6 hours per night were 1.35 times more likely to report suicide ideation compared to those who slept more than nine hours per night (Kim, Kim, Kwon, & Kim, 2016). Further, adolescents who slept less than four hours a night were 2.12 times more likely to report suicide ideation (Kim et al., 2016). Using monozygotic adolescent twins, Matamura and colleagues (2014) found that shorter sleep duration predicted suicide ideation even after controlling for genetic factors. However, assessment of suicide ideation in this study was

limited as suicide ideation severity was assessed with a single item, four-point Likert scale. Further, studies also have found that sleep problems (assessed with three, 3 three-point Likert scales that were later dichotomized) at 12-14 years old predicted suicidal thoughts (assessed with a single item, 3-point Likert scale) at age 15-17 (Wong, Brower, & Zucker, 2010). Finally, when considering suicide ideation and general sleep problems in adolescence, overwhelming research has established a positive relationship between the two (Choquet & Menke, 1989; Franic et al., 2014). Therefore, data on adolescents regarding sleep and suicide ideation shows a consistent positive relationship between overall poor sleep and suicide ideation.

However, there are still numerous gaps in this literature that need to be filled. First, the measurement of sleep and suicide needs to be improved. Many studies assessed suicide ideation via a yes/no question (Franic et al., 2014; Kim et al., 2016, Matamura et al., 2014; Park et al., 2013), and sleep constructs were not assessed using validated measures (Kim et al., 2016; Park et al., 2013). Rather, these studies used either only sleep duration (Kim et al., 2014; Matamura et al., 2014) or used Likert scale questions from a nonspecific/unvalidated sleep measure (Wong et al., 2010). Further assessment of suicide ideation and sleep in adolescent samples needs to be replicated using validated sleep and suicide ideation measurement to get a better idea of the relationship. In particular the use of a suicide ideation measure that results in a continuous score and sleep measures assessing multiple constructs are important to add to the literature. By using a continuous measure of suicide ideation not only allows greater variance of the scores can be extracted for analyses, but also better captures the true nature of suicide ideation. Using a more thorough sleep assessment is also important because sleep quality includes

numerous factors including subjective sleep quality, day to day disruption from sleep deprivation, sleep onset latency, hours slept, and many more. Additionally, all the studies discussed rely on self-report data and due to the sensitive nature of this topic, response bias may impact responses on suicide ideation questionnaires. Therefore, the use of behavioral measures such as the death/suicide IAT (Nock & Banaji, 2007) could be beneficial in achieving responses less subjectively. The IAT is a computer-based task assessing one's reaction time; the more quickly one can associate varying constructs represents the strength of the automatic associations one holds. The death/suicide IAT is an adaptation of the IAT assessing one's automatic associations between the self and suicide/death. This version of the IAT has been shown to be an accurate predictor of suicide ideation in adolescents, both concurrently and prospectively (Glenn et al., 2017; Nock & Banaji, 2007).

### **Sleep and NSSI**

Given the strong relationship between poor sleep and suicide, and the association between suicide and NSSI, one would expect a relationship between NSSI and sleep as well. However, there are a limited number of existing studies that have examined this association, particularly in adolescents, and most studies are lacking in comprehensive assessment of either NSSI, sleep, or both. In a population-based study of Norwegian adolescents, those reporting a history of deliberate self-harm had poorer sleep quality than those with no self-harm history. However, assessment of deliberate self-harm included intentional overdose and did not make a distinction about intent to die. Therefore, it is impossible to determine whether people were referring to NSSI or a suicide attempt (Hysing, Sivertsen, Stormark, & O'Connor, 2015). In a sample of non-

clinical Chinese adolescents, several poor sleep markers were associated with a greater likelihood of NSSI engagement, but NSSI was assessed as a dichotomous variable and NSSI severity was not examined (Liu, Chen, Bo, Fan, & Jia, 2016). A longitudinal study using a sample of Swedish adolescent girls found that poor sleep at an earlier time point predicted later engagement in NSSI (Lundh et al., 2013), but assessment of sleep was limited to one dichotomous item that asked adolescents if they slept well. Regarding samples from the United States, only two studies, to our knowledge, have examined the connection between NSSI and sleep. One study found that nightmares, but not insomnia symptoms, were significantly associated with NSSI in both a clinical and university sample of adults (Ennis et al., 2017). The other study found that adolescents presenting to an outpatient clinic with more severe sleep complaints reported greater NSSI frequency compared to those without sleep complaints (McGlinchey, Courtney-Seidler, German, & Miller, 2017).

### **Emotion Regulation**

A possible link between sleep and both NSSI and suicide ideation may be emotion regulation difficulties. Emotion regulation is defined as the events that occur when one initiates a goal to influence one's emotions (Gross & Jazaieri, 2014). Within emotion regulation there are three important factors; awareness, goals, and strategies (Gross & Jazaieri, 2014). Emotional awareness refers to the level of cognizance one has regarding one's emotional state as well as the factors surrounding the emotional state (Gross & Jazaieri, 2014). The emotion regulation goal refers to the overall goal one wishes to achieve with an emotion regulation strategy, this includes the desire to increase or decrease the intensity of a specific emotion (Gross & Jazaieri, 2014). Finally, emotion

regulation strategies refer to the actions one undertakes to achieve the emotion regulation goal (Gross & Jazaieri, 2014).

Emotion regulation strategies can be broken into a variety of categories; however, for the purpose of this project unhealthy/healthy and ineffective/effective strategies will be highlighted. Healthy emotion regulation strategies include talking with friends, exercising, writing in a journal, meditation, and therapy whereas unhealthy emotion regulation strategies include substance use, withdrawing from situations, aggression, and NSSI (Rolston & Lloyd-Richardson, n.d.). Effective emotion regulation strategies work to influence one's emotions successfully compared to ineffective emotion regulation strategies that are not successful in influencing one's emotions (Rolston & Lloyd-Richardson, n.d.). When a person can no longer implement healthy and effective emotion regulation strategies regularly to influence their emotional state (i.e. defuse negative emotions or intensify positive emotions), they experience emotion dysregulation (Rolston & Lloyd-Richardson, n.d.). After an individual's emotions become dysregulated, they likely will try to find a new emotion regulation strategy to improve their ability to modulate their emotional state (Rolston & Lloyd-Richardson, n.d.). This search for a new effective strategy of emotion regulation may lead to them trying unhealthy strategies such as engaging in NSSI (Rolston & Lloyd-Richardson, n.d.).

Emotion dysregulation plays an important role in psychopathology as estimates of psychiatric disorders characterized by difficulty with emotions or emotion regulation range from 40% to over 75% (Gross & Jazaieri, 2014). Though typically thought of more often with depression, emotion regulation difficulties also underlie disorders such as

Attention Deficit Hyperactivity Disorder, Anxiety related disorders, Intermittent Explosive Disorder, and Borderline Personality Disorder (Gross & Jazaieri, 2014).

### **Emotion Regulation & NSSI**

Those engaging in NSSI endorse a variety of reasons for their engagement; however, a large majority (91%) of those engaging in NSSI reported emotional motivations as one of the reasons for NSSI engagement (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009). There are many studies examining emotion regulation difficulties as a risk factor for NSSI engagement. Multiple studies have found that adolescents who self-injure experience higher levels of negative emotions more often than individuals who do not self-injure (Voon, Hasking, & Martin, 2014). Overall, in the literature examining NSSI to date, there is a general consensus that the primary reason for NSSI engagement is emotion regulation purposes (Heath et al., 2009; Voon et al., 2014).

Other researchers have examined emotion regulation and NSSI using different facets of emotion regulation. In a study examining differences in distress tolerance of self-injurers and non-self-injurers, self-injurers had poorer ability to tolerate distress (Nock & Mendes, 2008). In a study by Kranzler and colleagues, emotion regulation was examined using the UPPS-P Impulsive Behavior Scale (a measure of both negative and positive urgency), the Difficulty in Emotion Regulation Scale (DERS) (used for impulsivity and goals), and the Distress Tolerance Scale (Kranzler, Fehling, Anestis, & Selby, 2016). Results indicated that emotion dysregulation had a significant indirect effect on NSSI via internalizing symptoms, suggesting that the relationship between emotion regulation and NSSI may not be a simple one (Kranzler et al., 2016). However, all studies discussed used a self-report measure of emotion regulation when the inclusion

of a behavioral measure to assess this construct would also be quite valuable. Using a measure like the emotional Stroop (Williams, Mathews, & Macleod, 1996) is particularly valuable because it may reduce the potential response bias from participants.

Another example of emotion regulation and NSSI risk comes from a study comparing self-injurers who have stopped engaging and those who have continued engagement. Results indicated that current and past self-injurers reported more intense emotional experiences, more difficulty identifying their own feelings, less access to emotion regulation strategies and greater avoidance compared to those without a history of NSSI (Anderson & Crowther, 2012). These findings are consistent with the studies previously discussed and further support emotion regulation as a risk factor for NSSI. However, this study also found individuals with past NSSI (but not current), reported greater acceptance of emotional responses and greater impulse control compared to those currently engaging in NSSI (Anderson & Crowther, 2012). These data suggest that better ability to handle and regulate emotions may be an important factor for stopping NSSI, further reinforcing the importance of emotion regulation (Anderson & Crowther, 2012).

NSSI also may be reinforced by emotion regulation via intrapersonal-negative reinforcement (Nock, 2009). This form of reinforcement suggests that NSSI behaviors occur and continue to happen because they decrease or distract the individual from adverse thoughts or feelings (Nock, 2009). Another possible emotion regulation-related reinforcement strategy is intrapersonal-positive reinforcement. This form of reinforcement posits that engagement in NSSI creates desired feelings, or increased positive affect (Nock, 2009). Further, studies of self-injurers have found these emotion regulation functions are often given as reasons for NSSI engagement. Finally, these

factors are not given not only as reasons for NSSI engagement but also are risk factors for the continuation of NSSI.

Recent advancements in technology have brought more innovative research techniques, and one of these is the use of ecological momentary assessment (EMA). EMA studies involve repeated sampling of participants' current behaviors, often using a cell phone. This approach allows researchers to get information in real time and helps reduce recall bias and maximize ecological validity. These features are particularly helpful for studying NSSI because researchers can get a closer look at the events and emotions directly preceding and following NSSI engagement. One of the first studies on NSSI using EMA found that the most frequent reason given for NSSI engagement was escaping adverse mood states (64.7% of episodes) (Nock, Prinstein, & Sterba, 2009). More specifically, 34.8% reported escaping anxiety, 24.2% escaping sadness and 19.7% escaping anger (Nock et al., 2009). In a more recent study Arney and colleagues, found that negative affect increased prior to NSSI engagement, peaked during the NSSI episode, and gradually decreased over the following hours (Arney, Crowther, & Miller, 2011). Another study using EMA and a population with both NSSI and bulimia nervosa examined both negative and positive affect in relation to NSSI engagement (Muehlenkamp, et al., 2009). The results showed negative affect significantly increased and positive affect decreased prior to NSSI engagement (Muehlenkamp, et al., 2009). Interestingly, following NSSI engagement, positive affect significantly increased; however, negative affect remained unchanged (Muehlenkamp, et al., 2009). EMA studies overall support the continuation of NSSI due to reinforcement strategies. Although Muehlenkamp and colleagues did not find a significant decrease in negative affect, and

Arney and colleagues did, this difference may be in part due to the use of different samples. Additionally, Arney and colleagues only assessed negative affect, so the inclusion of positive affect may be important. From the data available, NSSI appears to increase positive affect and either maintain or decrease negative affect, further supporting the notion that the continuation of NSSI may be driven by emotion regulation.

### **Emotion Regulation & Suicide**

Though negative emotionality is thought to be a key component of suicide, there are few studies to date examining the role of emotion regulation in suicide. In a study examining young adults, results indicated that nonacceptance of emotional responses and perceived lack of emotion regulation significantly differentiated individuals who previously had made an attempt from those with no previous ideation or attempt (Rajappa, Gallagher, & Miranda, 2012). Further, limited access to emotion regulation strategies significantly predicted current suicide ideation (Rajappa et al., 2012). Using a sample of children with Major Depressive Disorder, Tamas et al., (2007) found that high maladaptive and low adaptive coping strategies increased the odds of suicidal behavior (beyond depression severity). However, other studies have found no significant direct relationship between emotion regulation and suicide attempts. One study of young adults found that emotion regulation impacted internalizing symptoms (e.g. depression and anxiety) which then impacted NSSI frequency, which then predicted suicide attempts (Kranzler et al., 2016). In a similar study, researchers used two nonclinical samples and one clinical sample to examine the relationship between emotion dysregulation and suicide attempts and found significant indirect effects of emotion regulation on suicide through both NSSI frequency and engagement (Anestis, Kleiman, Lavender, Tull, &

Gratz, 2014). Therefore, based on the literature to date, there appears to be a relationship between emotion regulation difficulties and suicide; however, the relationship may not be direct but may be indirect through NSSI.

### **Sleep, Emotion Regulation, & Suicide Risk**

Two studies to date have examined how sleep and emotion regulation interact to predict general suicide risk and both found that emotion regulation strategies may partially account for the association between suicide and sleep (Littlewood, Gooding, Kyle, Pratt, & Peters, 2016; Weis, Rothenberg, Moshe, Brent, & Hamdan; 2015). However, one study was cross sectional (Weis et al., 2015), and the other used qualitative interviewing, with both studies using adult samples (Littlewood et al., 2016). Only one study to date has examined sleep and emotion regulation in relation to NSSI. This cross-sectional study included both a nonclinical and clinical sample of young adults and findings indicated that the relationship between sleep difficulties (assessed by examining nightmares) and NSSI was fully mediated by emotion dysregulation (Ennis et al., 2017). However, the sleep measure was not specifically designed to assess sleep; rather the sleep questions came from a depression assessment, and the measure of NSSI was not comprehensive (Ennis et al., 2017). Therefore, the current study will examine NSSI, suicide, sleep, and emotion regulation together, using both self-report and behavioral measures, in a community sample of adolescents to further our understanding of these relationships.

### **Rationale**

The goal of this study was to fill a gap in the literature by examining the interaction between sleep and emotion regulation in the predicting of NSSI and suicide

ideation in an adolescent sample. Additionally, all the studies previously discussed used self-report measurement and may have been impacted by response bias. This study used both self-report and behavioral measures to address this potential problem.

This research is important for many reasons aside from filling the gap in the literature that exists currently. Gaining a greater understanding of these relationships will be beneficial to the advancement of the current understanding of risk factors for NSSI. Literature to date has shown a relationship between suicide ideation and poor sleep in adolescents (Choquet & Menke, 1989; Franic et al., 2014; Park et al., 2013), and this project aimed to provide further evidence for this relation. However, the current study is one of the first to examine this relationship while examining emotion regulation as well. Additionally, current literature supports a relationship between emotion regulation and NSSI; therefore, this study expanded upon this relationship to examine how sleep, emotion regulation, and NSSI interact help to broaden our understanding of NSSI risk factors.

This study aimed to increase our ability to predict NSSI engagement by understanding the role of sleep in the progression and onset of NSSI. This information also may be beneficial in the treatment of those individuals who do engage in NSSI if sleep is found to be an important factor. Additionally, this study aimed to provide valuable information regarding suicide prevention by examining suicide ideation and NSSI, both of which are associated with suicide attempts and death by suicide.

## **Hypotheses**

**Hypothesis One: Poor sleep predicts NSSI engagement.** First, it was hypothesized that poor sleep quality would predict NSSI. It also was expected that

emotion regulation would be a moderator in the relationship between sleep and NSSI, such that poorer emotion regulation would strengthen the relationship between poor sleep and NSSI. Emotion regulation was assessed both objectively and subjectively, using a self-report measure and behavioral task.

**Hypothesis Two: Poor sleep predicts suicide ideation.** Second, it was hypothesized that poor sleep quality would be a significant predictor of greater suicide ideation, with suicide ideation measured both objectively and subjectively using the death/suicide IAT and the SITBI. It was also expected that emotion regulation will be a moderator in the relationship between sleep and suicide ideation, such that poorer emotion regulation would strengthen the relationship between poor sleep and suicide ideation severity. Again, emotion regulation was assessed objectively and subjectively, using a self-report measure and behavioral task.

## **Method**

### **Recruitment**

This project used data from an ongoing longitudinal study examining NSSI and suicide in adolescents. Participants were recruited from three local high schools that agreed to collaborate with the researchers for data collection.

### **Participants & Procedure**

Data for this project were collected between spring 2017 and spring 2018. Consent forms were sent home with all sophomore, juniors, and seniors and only individuals whose parents gave consent were eligible to participate. Members of the research team traveled to the participating schools and administered the self-report questionnaires and behavioral tasks, which took approximately 30 minutes, and data were

collected in small groups. The self-report measures were completed on paper and the behavioral measures were completed on iPads. Participants were each paid \$5 as compensation for completing the study, and researchers were present during data collection to answer any questions participants had. Participants were free to withdraw from the study at any point without consequences.

### **Risk Assessment**

Due to the potential implications of information collected, risk screenings of measures were completed at the schools following data collection. If individuals were identified as at risk based on responses to questions about suicide ideation and recent suicidal behavior, researchers determined the level of risk (mild, moderate, severe) and relayed that information to the school counselors. Each school district had policies and procedures in place for assessing adolescents in crisis. School counselors were the first point of contact. The counselors conducted a risk assessment, wherein students at increased risk were referred to school psychologists trained in crisis intervention who could contact parents and provide referrals as needed.

### **Measures**

**Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007).** The SITBI originally was designed be to a structured interview but was adapted into a self-report questionnaire. It was used to gather information regarding history of NSSI, suicide ideation, and suicide behaviors. The SITBI has strong interrater reliability ( $\kappa = .99$ ), test-retest reliability ( $\kappa = .70$ ), and concurrent validity demonstrated with strong relationships between the SITBI and other measures of suicide ideation ( $\kappa = .54$ ), suicide attempts ( $\kappa = .65$ ) and NSSI ( $\kappa = .87$ )

(Nock et al., 2007). For the purposes of this study, the SITBI was used to assess NSSI engagement using a single yes/no question asking “Have you ever actually engaged in NSSI?” (see appendix A).

**Difficulties in Emotion Regulation Scale (DERS; Grantz & Roemer, 2004).**

The DERS is a 36-item, self-report questionnaire designed to assess multiple aspects of emotion regulation difficulties. The measure yields a total score and 6 subscale scores including nonacceptance of emotional response, difficulties engaging in goal directed behavior, impulse control difficulties, limited access to emotion regulation strategies and lack of emotional clarity. Responses are scored on a 5-point Likert scale (0 = *almost never* to 5 = *almost always*). Total scores range from 36 to 180 and higher scores indicate greater problems with emotion regulation (Grantz & Roemer, 2004). The DERS has been found to have strong test-retest reliability (intraclass correlation coefficient=.74) and internal consistency ( $\alpha=.86$ ) (Grantz & Roemer, 2004). Within this sample, the DERS total score showed high internal consistency reliability ( $\alpha=.95$ ). Sample questions include “When I’m upset, I feel out of control,” “When I’m upset, I have difficulty getting work done,” and “When I’m upset, I believe that there is nothing I can do to make myself feel better” (see appendix B).

**Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, &**

**Kupfer, 1989).** The PSQI is a 19-item self-report questionnaire assessing overall sleep quality. There are seven component scores including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction due to sleepiness. The seven component scores are summed to create a global PSQI score. Total scores range from 0 to 21 and a global PSQI

score above 5 indicates poor sleep quality. The PSQI has exhibited acceptable measures of internal consistency (test-retest reliability) and validity (Buysse et al., 1989). Within this sample, the internal consistency reliability across component scores was acceptable ( $\alpha=.76$ ). Some sample questions include “During the past month, when have you usually gone to bed at night?” and “During the past month, how would you rate your overall sleep quality?” (see appendix C).

**Death/Suicide Implicit Association Test (d/s IAT; Nock & Banaji, 2007).** The IAT is a computer-based task that measures reaction time, which reflects the strength of automatic associations that an individual holds in his/her memory. The IAT has been adapted for various uses, and the current study used the death/suicide IAT (d/s IAT; Nock et al., 2010), which assesses an individual’s automatic associations with life relative to death. The d/s IAT was scored using the IAT algorithm which involves calculating the difference in average response latency between the sorting conditions. First, the life and me pairing latency is subtracted from the death/suicide and me pairing latency. Next the score is divided by the standard deviation of all latencies. Negative scores indicate a stronger association with life and the self, whereas positive scores indicate a stronger association between death/suicide and the self. The d/s IAT has been found to be a strong predictor of future suicide risk (Nock et al., 2010). The d/s IAT was used as an implicit measure of suicide ideation for this study.

**Emotional Stroop Task (EST; Williams, Mathews, & MacLeod, 1996).** The EST is an adaptation of the original Stroop task where participants are asked to name the color written on the screen, although the ink color of the word displayed is different from the written word (e.g., the word blue written in yellow ink) (Stroop, 1992). The Stroop

effect occurs when an individual takes more time to read the word when the text color conflicts with the color written in text (Stroop, 1992). The EST is an expansion of the original Stroop task and also measures response time. However, the EST uses positive and negative emotion words, as well as neutral words. The EST response reflects the emotional relevance of the emotion for the individual. Emotion words that produce significant interference with the color identification are thought to reflect an attentional bias toward either positive or negative emotions (Williams et al., 1996). Though the EST does not ask explicitly about emotion regulation, previous research has found it to be a valid measurement of emotion regulation in validation (Kappes & Bermeitinger, 2016) and brain imaging studies (Whalen, Bush, Shin, & Rauch, 2006). A recent brain imaging study found that the EST activates parts of the brain associated with both cognition and emotion, suggesting that though the EST does not ask directly about emotion regulation, it may be activating areas of the brain related to emotion regulation processes (Rashle et al., 2017). Examples of negative emotion words include “Abandoned” and “Afraid,” examples of positive emotion words include “Devotion” and “Euphoric,” and examples of neutral words include “Door” and “Milk.” The EST is scored such that a higher latency when sorting either positive or negative emotion words relative to neutral words indicates a higher attentional bias toward either emotion category. Scoring the EST results in positive and negative bias scores. The EST has high test-retest reliability across all emotions examined (Strauss, Allen, Jorgensen, & Cramer, 2005). The EST was used as a behavioral measure of emotion regulation for this study.

**Suicide Ideation Questionnaire Jr (SIQ-JR; Reynolds, 1987).** The SIQ-JR (Reynolds, 1987) is a 15-item self-report measure assessing suicide ideation severity in

adolescents. Questions are answered using a 7-point Likert scale assessing frequency of thoughts (0 = *I never had this thought* to 6 = *Almost everyday*) (Reynolds, 1987). Scores range from 0 to 90 with higher scores indicating greater suicide ideation, and the recommended clinical cut-off is 31 (Reynolds, 1987). The SIQ-JR has demonstrated good reliability in adolescent samples ( $\alpha = .93-.94$ ). Within this sample, the SIQ displayed good internal consistency reliability ( $\alpha = .94$ ). Sample questions include “I thought about killing myself,” “I thought about death,” and “I wish I were dead” (see appendix D).

## **Results**

### **Data Management**

Of the total sample, up to 43 individuals were removed from analyses due to either missing or excluded data, resulting in a final sample size ranging from 111 to 135. In compliance with traditional EST scoring recommendations, individuals who did not meet or exceed a correct response rate of 80% were removed from analyses. Of the 43 removed, four were removed for not meeting the EST cut-off. An additional five individuals were removed based on their IAT performance which included those who missed all trials from a block, had greater than 10% of trial response times faster than 300 ms overall, had greater than 25% of trial response times faster than 300 ms in any critical block, had greater than 30% of trial errors overall and/or had greater than 40% trial errors in any critical block. Finally, individuals who gave insufficient or unusable data for scoring self-report measures were also removed from analysis. One individual was removed for missing data on the SIQ, two individuals were removed for missing data on

the DERS, 10 individuals were removed for missing data on the PSQI and 21 individuals were removed for having missing data on more than one of the measures (either self-report or behavioral).

### **Data Analysis Plan**

Descriptive statistics were used to assess general demographic characteristics of the sample including age, year in school, gender, race, and ethnicity. Additionally, correlations were conducted on all study variables. All moderation analyses were conducted using the PROCESS macro for SPSS 23 (Hayes, 2017). The PROCESS macro mean-centered all predictor variables and only reports unstandardized coefficients. If significant interactions were found, they were probed using simple slope analyses to determine the directionality of the relationship. Three regression models were used to predict NSSI engagement using sleep as the independent variable and emotion regulation (behavioral or self-report) as the moderating variable. Therefore, the first model for NSSI had sleep as the independent variable, NSSI engagement (yes/no) as the dependent variable, and difficulties in emotion regulation (self-report emotion regulation total score) as the moderator. The second NSSI model also used sleep as the independent variable, emotion regulation as the moderator, and NSSI engagement (yes/no) as the dependent variable; however, emotion regulation was assessed via the positive bias score on the Emotion Stroop Task. The final NSSI model also used sleep as the independent variable, emotion regulation as the moderator, and NSSI engagement (yes/no) as the dependent variable with emotion regulation assessed via the negative bias score on the Emotion Stroop Task.

To assess the relationship between sleep, emotion regulation, and suicide ideation severity, six regression models were conducted. The first model for suicide ideation used sleep as the independent variable, difficulties in emotion regulation (self-reported emotion regulation total score) as the moderator, and self-reported suicide ideation severity as the dependent variable. The second model used sleep as the independent variable, positive emotional bias from the Emotion Stroop Task as the moderator, and self-reported suicide ideation severity as the dependent variable. The third model used sleep as the independent variable, negative emotional bias from the Emotion Stroop Task as the moderator, and self-reported suicide ideation severity as the dependent variable. The fourth model used sleep as the independent variable, difficulties in emotion regulation (self-report emotion regulation total score) as the moderator, and implicit suicide ideation (d/s IAT) scores as the dependent variable. The fifth model used sleep as the independent variable, positive emotion bias from the Emotional Stroop Task as the moderator, and implicit suicide ideation (d/s IAT) scores as the dependent variable. The final model of suicide ideation used sleep as the independent variable, negative emotional bias from the Emotional Stroop Task as the moderator, and implicit suicide ideation (d/s IAT) as the dependent variable.

### **Descriptive Statistics and Sample Characteristics**

The final sample included 154 adolescents with a mean age of 15.9 ( $SD= 1.65$ ), was primarily female (60.4%), and primarily white (91.4%) and non-Hispanic (92.7%). The sample included sophomores (64.4%), juniors (26.7%), and seniors (8.9%) (Table 1). Of the sample 15.8% ( $n=24$ ) had lifetime NSSI engagement (Table 2).

Table 1

*Demographics and Sample Characteristics (n=154)*

Measure	
Age (Mean; SD)	15.88 (1.65)
Sex (% Female)	60.4
Race (%)	
White/Caucasian	91.4
Black/African American	2.6
More than one race	4.0
Do not know	2.0
Ethnicity (%)	
Hispanic/Latino	7.3
Non-Hispanic/Latino	92.7
Year in School (%)	
Sophomore	64.4
Junior	26.7
Senior	8.9

Table 2

*Descriptive Statistics for Study Variables*

Measure	<i>M(SD)</i>	<i>n</i>
NSSI Any (%)	15.8	154
Self-Reported Suicide Ideation	5.02 (26.77)	152
Implicit Suicide Ideation		139
D Score	-0.47 (0.39)	
% Correct	90.04 (7.59)	
Self-Reported Emotion Regulation	75.01 (26.8)	151
Emotion Regulation Bias		
Positive Bias	-23.22 (148.1)	135
% Correct Positive Bias	94.25 (9.08)	
Negative Bias	4.76 (162.4)	135
% Correct Negative Bias	94.55 (7.86)	
Sleep Quality	5.17 (3.5)	119

Note: Self-Reported Suicide Ideation=Suicide Ideation Questionnaire total score, Implicit Suicide Ideation=Death/Suicide IAT, Self-Reported Emotion Regulation= Difficulties in Emotion Regulation total score, Emotion Regulation Bias= Emotional Stroop Task, Sleep Quality= Pittsburgh Sleep Quality Index total score.

## Results from Moderation Analyses

**NSSI, Sleep, & Emotion Regulation.** To test the hypothesis that sleep quality would be a significant predictor of NSSI engagement and that this relationship would be moderated by emotion regulation, three moderation analyses were conducted. The first model used the self-reported emotion regulation total score (DERS total) as the moderating variable. Results indicated that the overall model was significant ( $\chi^2 = 16.78$ ,  $p < .01$ , Nagelkerke  $R^2 = .20$ ) and that poor sleep quality was not a significant predictor of NSSI engagement; however, difficulties in emotion regulation was a significant predictor ( $B = .023$ ,  $p < .05$ ). Finally, the interaction was not significant, indicating that difficulties in emotion regulation did not moderate the relationship between sleep quality and NSSI (Table 3).

The second model of NSSI used the positive emotional bias score (EST Positive) as the moderating variable. Results indicated the overall model was significant ( $\chi^2 = 10.55$ ,  $p < .05$ , Nagelkerke  $R^2 = .15$ ) and that positive bias was not a significant predictor of NSSI engagement; however, sleep quality was significant ( $B = .222$ ,  $p < .01$ ). Finally, the interaction was not significant, indicating that positive emotional bias did not moderate the relationship between sleep quality and NSSI (Table 3).

The final model for NSSI used the negative emotional bias score (EST Negative) as the moderating variable. Results indicated that the overall model was significant ( $\chi^2 = 10.54$ ,  $p < .05$ , Nagelkerke  $R^2 = .15$ ) and that negative bias was not a significant predictor of NSSI engagement; however, sleep quality was significant ( $B = .238$ ,  $p < .01$ ). Finally,

the interaction was not significant, indicating that negative emotional bias did not moderate the relationship between sleep quality and NSSI engagement (Table 3).

Table 3

*Logistic regression results for measures of emotion regulation as a moderator between sleep and NSSI*

Outcome	Moderator	<i>B</i>	<i>SE (B)</i>	<i>df</i>	$\chi^2$	Nagelkerke <i>R</i> <sup>2</sup>
NSSI	DERS					
1. <i>n</i> =134				3	16.78**	.199
	DERS	.02*	.01			
	Sleep	.14	.09			
	DERS X Sleep	-.005	.002			
NSSI	Pos Bias					
2. <i>n</i> =112				3	10.55*	.153
	Pos Bias	.002	.002			
	Sleep	.22**	.08			
	Pos Bias X Sleep	-.0001	.0006			
NSSI	Neg Bias					
3. <i>n</i> =112				3	10.54*	.153
	Neg Bias	.002	.002			
	Sleep	.24**	.077			
	Neg Bias X Sleep	-.0006	.0006			

Note: \*  $p < .05$ , \*\*  $p < .01$ . DERS= Difficulties in Emotion Regulation, Pos Bias= Emotional Stroop Task Positive Emotional Bias, Neg Bias= Emotional Stroop Task Negative Emotional Bias.

**Suicide Ideation, Sleep, & Emotion Regulation.** To test the hypothesis that sleep quality would predict suicide ideation, and that emotion regulation would moderate this relationship, six moderation analyses were conducted. The first examined self-reported difficulties in emotion regulation (DERS Total) as the moderator between sleep quality and self-reported suicide ideation severity (SIQ Total). Results indicated that the overall model was significant ( $F = 58.31, p < .001, R^2 = .572$ ), and that sleep quality was not a significant predictor of self-reported suicide ideation severity; however, difficulties in emotion regulation was significant ( $B = .152, p < .001$ ). Finally, the interaction was

significant, indicating that difficulties in emotion regulation did moderate the relationship between sleep quality and self-reported suicide ideation severity ( $B = .03, p < .001$ ) (Table 4). Simple slope analyses found this interaction to be significant at one standard deviation above the mean such that the relationship between sleep quality and suicide ideation was stronger at higher levels of difficulties in emotion regulation relative to lower levels of difficulties in emotion regulation (see Figure 1).

The second model for suicide ideation examined positive emotional bias (EST Positive) as the moderator between sleep quality and self-reported suicide ideation severity (SIQ Total). Results indicated that the overall model was significant ( $F = 16.45, p < .001, R^2 = 3.15$ ), and that positive emotional bias was not a significant predictor of self-reported suicide ideation severity; however, sleep quality was significant ( $B = 1.43, p < .001$ ). Finally, the interaction between sleep quality and self-reported suicide ideation severity was significant, indicating that positive emotional bias moderated the relationship between sleep quality and self-reported suicide ideation severity ( $B = .004, p < .05$ ) (Table 4). Simple slope analyses found this interaction to be significant at one standard deviation above and below the mean such that the relationship between sleep quality and suicide ideation was stronger at lower levels of positive bias relative to higher levels of positive bias (see Figure 2).

The third model of suicide ideation examined negative emotional bias (EST Negative) as the moderator between sleep quality and self-reported suicide ideation severity (SIQ Total). Results indicated that the overall model was significant ( $F = 14.19, p < .001, R^2 = .283$ ) and that negative emotional bias was not a significant predictor of

self-reported suicide ideation severity; however, sleep quality was significant ( $B = 1.54, p < .001$ ). Finally, the interaction between sleep quality and self-reported suicide ideation severity was not significant, indicating that negative emotional bias did not moderate the relationship between sleep quality and self-reported suicide ideation severity (Table 4).

The fourth model of suicide ideation examined self-reported difficulties in emotion regulation (DERS Total) as the moderator between sleep quality and implicit suicide ideation severity (d/s IAT). Results indicated that the overall model was not significant ( $F = .63, p = .60, R^2 = .015$ ) and that neither difficulties in emotion regulation nor sleep quality significantly predicted implicit suicide ideation. Finally, the interaction between sleep quality and implicit suicide ideation severity was not significant, indicating that difficulties in emotion regulation did not moderate the relationship between sleep quality and implicit suicide ideation (Table 4).

The fifth model of suicide ideation examined positive emotional bias (EST Positive) as the moderator between sleep quality and implicit suicide ideation severity (d/s IAT). Results indicated that the overall model was not significant ( $F = .97, p = .412, R^2 = .026$ ) and that neither positive emotional bias nor sleep quality were significant predictors of implicit suicide ideation. Finally, the interaction between sleep quality and implicit suicide ideation severity was not significant, indicating that the relationship between sleep quality and implicit suicide ideation was not moderated by positive emotional bias (Table 4).

The final model of suicide ideation examined negative emotional bias (EST Negative) as the moderator between sleep quality and implicit suicide ideation (d/s IAT).

Results indicated that the overall model was not significant ( $F = 1.23, p = .303, R^2 = .003$ ) and that neither sleep quality nor negative emotional bias were significant predictors of implicit suicide ideation. Finally, the interaction between sleep quality and implicit suicide ideation severity was not significant, indicating that relationship between sleep quality and implicit suicide ideation was not moderated by positive emotional bias (Table 4).

### **Exploratory Analyses**

**Emotion Regulation as a Mediator.** Results from the moderation analyses indicated a consistent pattern where models that included the DERS indicated that the DERS was a significant predictor of explicit suicide ideation and NSSI engagement, but sleep quality was not. Conversely, in models that included EST, sleep quality was a significant predictor; however, EST scores were not. This finding suggested that there may be a different type of relationship between the DERS and sleep quality when predicting NSSI and suicide ideation. In an attempt to discover alternate relationships between these variables, exploratory mediation analyses were conducted to determine if mediation models were a better fit to the data. The first mediation model examined the DERS as the mediator between sleep quality and NSSI engagement. Results indicated that there was a significant indirect effect of sleep quality on NSSI engagement through the pathway of difficulties in emotion regulation ( $B = .10, SE = .05, 95\% CI: .005, .22$ ; Figure 3). The second mediation model examined the DERS as the mediator between sleep quality and self-reported suicide ideation severity. Results indicated that there was a significant indirect effect of sleep quality on self-reported suicide ideation through the

pathway of difficulties in emotion regulation ( $B = .86, SE = .28, 95\% CI: .38, 1.51$ ;

Figure 4).

Table 4

*Linear regression results for measures of emotion regulation as a moderator between sleep and suicide ideation*

Outcome	Moderator	<i>B</i>	<i>SE (B)</i>	<i>df</i>	<i>F</i>	<i>R</i> <sup>2</sup>
SIQ	DERS					
1. <i>n</i> =135				3	58.31**	.572
	DERS	.15**	.03			
	Sleep	.30	.2			
	DERS X Sleep	.025**	.004			
SIQ	Pos Bias					
2. <i>n</i> =112				3	16.54**	.315
	Pos Bias	.008	.006			
	Sleep	1.43**	.23			
	Pos Bias X Sleep	.004*	.002			
SIQ	Neg Bias					
3. <i>n</i> =112				3	14.191**	.283
	Neg Bias	.0001	.0002			
	Sleep	.0127**	.0087			
	Neg Bias X Sleep	.0001	.0001			
IAT	DERS					
4. <i>n</i> =125				3	.625	.015
	DERS	-.001	.002			
	Sleep	.016	.012			
	DERS X Sleep	-.0001	.0003			
IAT	Pos Bias					
5. <i>n</i> =111				3	.965	.026
	Pos Bias	-.0001	.0002			
	Sleep	.015	.009			
	Pos Bias X Sleep	.006	.0001			
IAT	Neg Bias					
6. <i>n</i> =111				3	.965	.026
	Neg Bias	.0001	.031			
	Sleep	.013	.009			
	Neg Bias X Sleep	.0001	.0001			

Note: \*  $p < .05$ , \*\*  $p < .001$ . SIQ= Suicide Ideation Severity (SIQ Total), IAT= Implicit Suicide Ideation (d/s IAT), DERS= Difficulties in Emotion Regulation, Pos Bias= Positive Emotional Bias (Positive EST), Neg Bias= Negative Emotional Bias (Negative EST).

Table 5  
Zero order study variable correlations

Measure	1.	2.	3.	4.	5.	6.
1. NSSI	-					
2. SIQ	.561**	-				
3. IAT	.125	.026	-			
4. DERS	.303**	.578**	.016	-		
5. Positive Bias	.091	.000	-.027	.005	-	
6. Negative Bias	-.012	-.012	.017	-.03	.435**	-
7. Sleep Quality	.274*	.399**	.127	.516**	.134	.085

Note: \*  $p < .01$ , \*\*  $p < .001$ . SIQ=Suicide Ideation Questionnaire Total Score, IAT= d/s IAT d score, DERS= Difficulties in Emotion Regulation, Pos Bias= Emotional Stroop Task Positive Emotional Bias, Neg Bias= Emotional Stroop Task Negative Emotional Bias, Sleep Quality= Pittsburgh Sleep Quality Index.

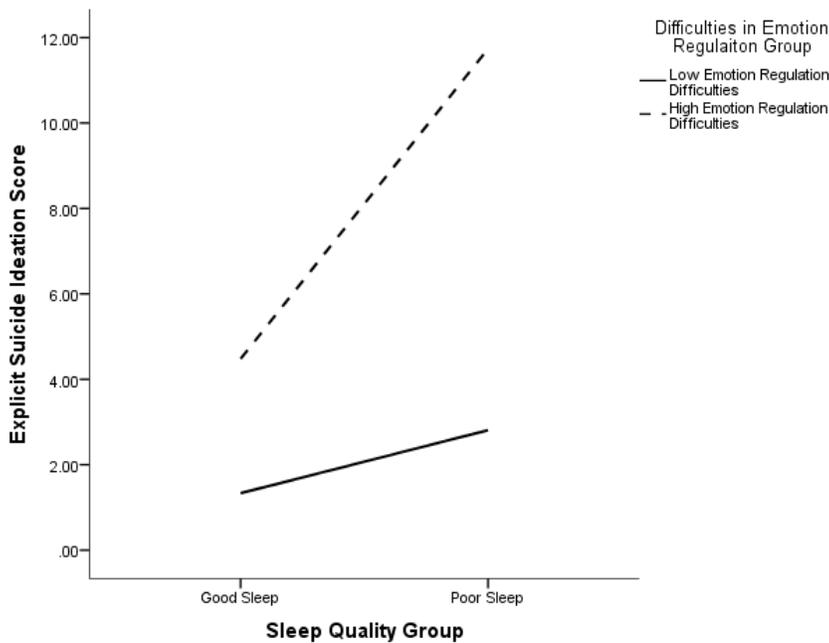


Figure 1. Difficulties in emotion regulation strengthen the relationship between sleep and suicide ideation

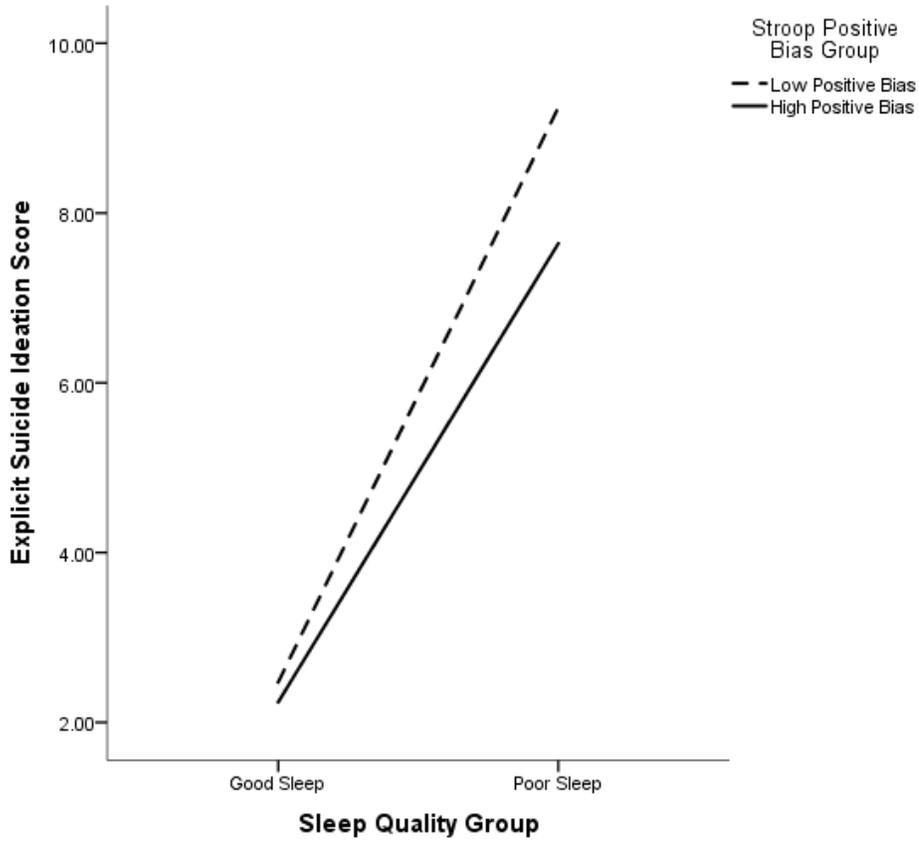


Figure 2. Low positive bias strengthens the relationship between sleep and suicide ideation

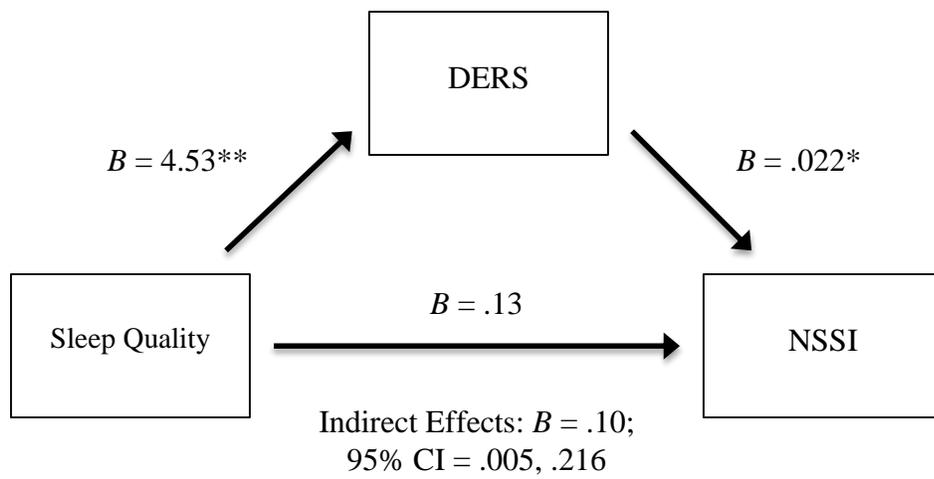


Figure 3. Indirect effects of sleep quality on NSSI engagement;  $*p < .05$   $**p < .01$

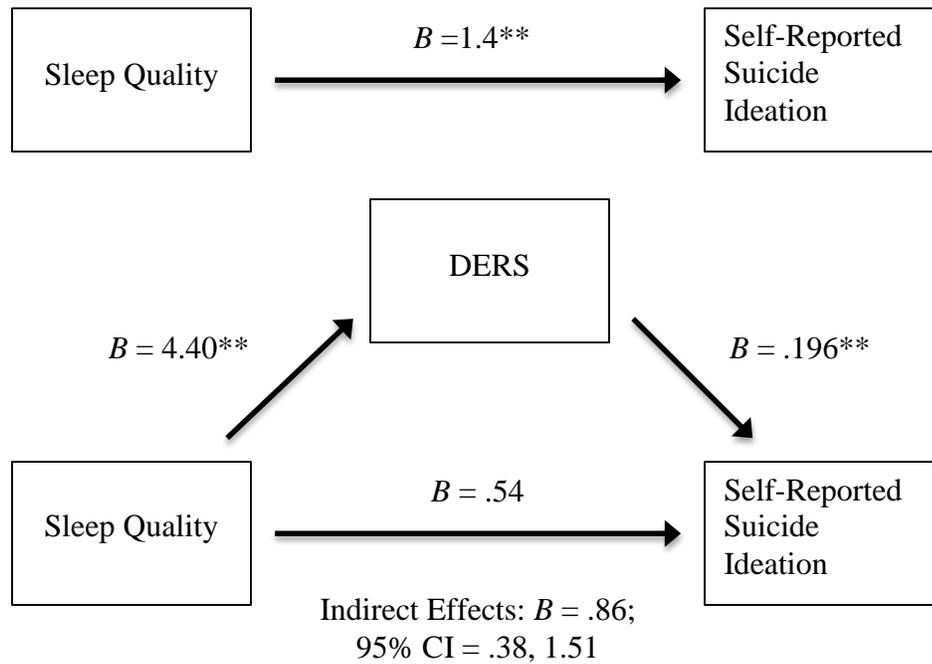


Figure 4. Indirect effects of sleep quality on self-reported suicide ideation;  $**p < .01$

## Discussion

The present study sought to evaluate the extent to which emotion regulation moderates the relationship between sleep quality and both NSSI and suicide ideation. It was hypothesized that emotion regulation would moderate the relationship such that greater difficulties in emotion regulation would strengthen the relationship between poor sleep and NSSI and suicide ideation. Results indicated that difficulties in emotion regulation and sleep quality were significant predictors of both NSSI engagement and explicit (self-reported) suicide ideation. Interestingly, emotion regulation did not moderate the relationships between sleep and NSSI in any of the models. Regarding suicide ideation, emotion regulation did not moderate the relationship between sleep

quality and implicit ideation; however, emotion regulation did moderate this relationship in explicit (self-reported) suicide ideation.

### **Poor sleep quality predicts NSSI engagement and suicide ideation**

As expected, poor sleep quality was a significant predictor of both NSSI engagement and explicit suicide ideation; however, this result was only found in analyses using the emotion Stroop (EST). In the analyses with the self-report emotion regulation measure (DERS; Grantz & Roemer, 2004), sleep was not a significant predictor of NSSI engagement or suicide ideation severity (though the DERS was a significant predictor). A potential reason for the differences in the findings may be due to the EST and the DERS assessing slightly different constructs. The DERS is an assessment of difficulties in emotion regulation which have been connected repeatedly to poor sleep quality in past research (Baum et al., 2014; Dahl, 1999; Fairholme & Manber, 2015; Mauss et al., 2013; Sandru & Voinescu, 2014). In contrast, the EST has been shown to activate emotional and cognitive control areas in the brain (Rashle et al., 2017), and likely assesses the exposure an individual has to a particular set of emotional experiences (either positive or negative), and thus how they regulate those emotions. Therefore, it is possible that sleep difficulties are more closely associated with difficulties in emotion regulation compared to either positive or negative emotion regulation experience exposure. It also may be that poor sleep quality is related to greater difficulties in emotion regulation; however, sleep quality may not have as much of an influence over one's exposure to and regulation of positive and negative emotions. Therefore, when putting sleep quality and the DERS into a model together, sleep quality becomes nonsignificant as its influence on NSSI and

suicide ideation is accounted for by difficulties in emotion regulation (Figures 3 & 4). Conversely, when put into a model with the EST, sleep remains a significant predictor of NSSI and suicide ideation because its influence is not accounted for by either positive or negative EST scores.

Despite the inconsistencies found with sleep predicting NSSI engagement and suicide ideation, this study still provided more evidence that sleep is an important risk factor for both NSSI engagement and suicide ideation severity among adolescents. The importance of sleep in risk for NSSI and suicide ideation has garnered much attention in the recent years, with many publications linking poor sleep quality to suicide ideation (e.g., Choquet & Menke, 1989; Park et al., 2013; Wong et al., 2010) and NSSI (Hysing et al., 2015; Lundh et al., 2012; McGlinchey et al., 2017) in adolescent samples. The finding from the current study supports the previous literature and builds upon it by examining this relationship while utilizing validated measures for sleep quality, NSSI engagement, and suicide ideation severity. Taken together, these findings suggest that individuals working with adolescents may want to pay particular attention to their sleep habits and consider implementing treatments designed to assess sleep problems for individuals with NSSI engagement or suicide ideation.

Finally, this finding highlights the importance of sleep quality during adolescence and adds to evidence suggesting delayed school start times especially considering that the mean sleep quality score ( $M= 5.17$ ) was above the cutoff for what is considered to be poor sleep by the PSQI guidelines. Later start times have been associated with greater sleep duration, better behavior, greater achievement in school, and greater academic

effort (Paksarian, Rudolph, He, & Merikanges, 2015; Thacher & Onyper, 2016).

Importantly, delayed school start times also have been shown to benefit adolescents by increasing total time slept per night and increasing the number of students who report getting at least 8 hours of sleep a night (Wheaton, Chapman, & Croft, 2016). Therefore, delayed start times may provide, at least in part, a solution to the adolescent sleep problem.

### **Emotion regulation and NSSI/suicide ideation**

Importantly, results showed that self-reported difficulties in emotion regulation were a significant predictor of both NSSI engagement and explicit suicide ideation severity. This finding is consistent with the previous literature that has linked difficulties in emotion regulation to both NSSI engagement (Heath et al., 2009; Kranzler et al., 2016; Nock, 2009) and explicit suicide ideation severity (Anestis et al., 2014; Rajappa et al., 2012). The present findings continue to suggest that difficulties in emotion regulation may be an important risk factor for both NSSI engagement and suicide ideation. Additionally, this finding suggests that it is important for clinicians working with these populations to assess and address any problems their clients may be experiencing regarding emotion regulation. The utilization of validated assessments of emotion regulation as well as validated treatments to help address emotion regulation difficulties may play an important role in reducing risk for both NSSI and suicide ideation.

Conversely, neither positive nor negative emotional bias scores on the Emotional Stroop task were significant predictors of NSSI engagement or self-reported suicide ideation severity. No study to date has examined the Emotional Stroop Task within the

context of either NSSI engagement or suicide ideation; thus, making these findings novel. It may be possible that these biases are not important predictors for either NSSI engagement or suicide ideation severity. Interestingly, regarding NSSI engagement, previous studies have found those with NSSI engagement experience negative emotions more frequently compared to those without NSSI engagement (Voon et al., 2014). Therefore, it would be reasonable to expect that they would show an increased negative emotional Stroop score compared to those without a history of NSSI. One possible explanation for the EST not predicting NSSI engagement may be that lifetime NSSI engagement rather than current NSSI engagement was assessed, and therefore some individuals who reported NSSI may not have recent NSSI. Those individuals with a history of NSSI but not current engagement may have not been experiencing higher frequency of negative emotional experiences any longer. Therefore, their emotional bias scores may not be representative of individuals with current NSSI engagement.

Additionally, it is possible that individuals who either engage in NSSI or experience greater levels of suicide ideation have the same level of experience with both positive and negative emotional control and regulation compared to their counterparts without NSSI engagement and with lower suicide ideation severity. Though previous research has found those with NSSI engagement report experiencing these mood states more frequently, it may be that these individuals are experiencing them at the same frequency as others; however, they perceive these experiences as happening more frequently. Therefore, emotional Stroop scores may not be predictive of NSSI engagement and suicide ideation severity because these differences simply may not exist. Future research should continue to examine emotional experiences in the context of NSSI

engagement and consider utilizing methods like ecological momentary assessment to determine the frequency of emotional experiences to examine if those with NSSI report more frequent negative emotions compared to those without NSSI.

Another possible reason for the emotional Stroop biases not predicting NSSI or suicide ideation is that this measure may not capture emotion regulation abilities accurately. No studies to date have used the Emotional Stroop in the way that it was used for this study. Even though brain imagining studies have found that the EST activated areas in the brain related to emotional and cognitive control (Raschle et al., 2017), it is possible that the task may not be capturing emotion regulation accurately. Further research is needed utilizing the EST to determine if it can accurately capture emotion regulation abilities as well as to determine whether there are differences in emotional Stroop scores between individuals with and without NSSI as well as individuals at varying levels of suicide ideation severity.

### **Emotion regulation does not moderate the relationship between sleep quality and NSSI**

Another important finding was that all models for NSSI yielded nonsignificant interactions between sleep quality and emotion regulation, suggesting that emotion regulation may not play an important role in strengthening the relationship between sleep quality and NSSI engagement. Additionally, the lack of a significant interaction between sleep quality and emotion regulation within the context of NSSI engagement may be due to the small sample size. Of the 152 adolescents who completed the survey, only 24 (15.8%) had engaged in NSSI making the power for these analyses limited. It is

important that future replications of this study use a larger sample size to determine whether these results are due to limited power or if emotion regulation actually does not moderate the relationship between sleep quality and NSSI engagement.

The nonsignificant interaction between sleep quality and emotion regulation may also be related to differences in the time frame being assessed. For this study any lifetime NSSI engagement was the outcome variable; however, the emotion regulation and sleep assessment captured current experiences. This discrepancy in time frame may create a problem because current behavior may be predicting past behavior for some individuals. Future studies should consider examining this relationship again but utilize a similar time frame for all behaviors to determine if there may be significant interactions. Additionally, the utilization of a longitudinal design to examine this relationship in the future would also help eliminate problems with the time frame of assessments as well as provide insight into the sequence of these experiences.

Although this is the first study to examine emotion regulation as a moderator in the relationship between sleep quality and NSSI, a recent study found that emotion regulation mediated the relationship between nightmares and NSSI engagement in adults (Ennis et al., 2017). Interestingly, the study by Ennis and colleagues found that emotion regulation mediated this relationship for nightmares but not insomnia symptoms. Based on the results from the previous study it is possible that emotion regulation acts as a mediator in the relationship between sleep quality and NSSI but does not act as a moderator. Additionally, it is possible that this study should have examined the moderation relationship with nightmares rather than general sleep quality. The Ennis et

al. study found emotion regulation did not mediate the relationship for insomnia symptoms but did so with nightmares. Therefore, it may be possible that this relationship only exists for certain facets of sleep quality. Future studies should examine if emotion regulation moderates the relationship between nightmares and NSSI to determine if this relationship exists for different sleep facets.

## **Emotion Regulation Moderates the Relationship Between Sleep and Suicide**

### **Ideation**

Two moderation analyses found that emotion regulation moderated the relationship between sleep quality and suicide ideation severity (one using difficulties in emotion regulation and the other using positive bias). These findings suggest that emotion regulation may play an important role in strengthening the relationship between sleep quality and suicide ideation severity.

Regarding the model using positive bias, individuals who experienced both poor sleep and lower positive emotional bias scores had a significantly elevated suicide ideation severity compared to individuals experiencing poor sleep but high positive emotional bias. These findings align with expectations as it would be anticipated that a suicidal individual likely would experience less positive emotional states compared to someone who is not suicidal. This lack of exposure to positive emotional experiences creates less interference when sorting the words, resulting in lower bias scores. Although the EST is not assessing emotion regulation directly, based on previous brain imaging research, it may be possible that the low positive bias group not only has less exposure to

the experience of positive emotions, but also has less experience regulating and controlling positive emotional experiences.

The moderation analysis utilizing self-reported difficulties in emotion regulation also found that the interaction between sleep quality and difficulties in emotion regulation was a significant predictor of suicide ideation severity. This model showed that individuals who had more emotion regulation difficulties had greater suicide ideation severity when experiencing poor sleep quality than those with fewer emotion regulation difficulties.

Based on these findings, it appears that emotion regulation may strengthen the relationship between poor sleep quality and suicide ideation. Difficulties in emotion regulation may strengthen this relationship because poor sleep is not an uncommon experience for adolescents. As previously mentioned, adolescents often report poor sleep habits such as insufficient sleep and insomnia symptoms (Carskadon et al., 2004; McKnight-Eily et al., 2011; Roane & Taylor, 2008). Therefore, poor sleep likely is perceived as a normal experience for adolescents. The normative nature of poor sleep within this age group may create a situation where poor sleep alone may have a marginal influence on suicide ideation severity; however, if an individual also is experiencing problems in emotion regulation, suicide ideation scores become elevated significantly more. Conversely, if an individual is experiencing poor sleep quality (as is common among adolescents), but has access to healthy emotion regulation strategies, their suicide risk will not be as elevated as those without access to these strategies.

Further, the increase in suicide ideation severity for individuals with both poor sleep quality and emotion regulation may be simply due to the addition of another risk factor. Previous research has demonstrated that suicide (like many other facets of mental health) is not the result of a single risk factor (Franklin et al., 2017). Additionally, previous research has demonstrated that sleep (e.g. Choquet & Menke, 1989; Park et al., 2013; Wong et al., 2010) and emotion regulation (e.g. Anestis et al., 2014; Heath et al., 2009; Kranzler et al., 2016; Voon et al., 2014) are important risk factors for NSSI engagement and suicide ideation severity. Therefore, it is possible that the increase in suicide ideation severity when poor sleep is coupled with poor emotion regulation may just be due to the addition of another significant risk factor.

Findings regarding emotion regulation moderating the relationship between poor sleep and suicide ideation suggest that assessment of both emotion regulation and sleep when working with suicidal clients may be important to clinicians. Further, it may be beneficial to implement treatments designed to target both sleep habits as well as emotion regulation. As this is the first study to date examining this relationship, it is important for future studies to replicate these findings to ensure they are consistent. It is important to mention that these findings are preliminary and exploratory; therefore, further examination of this relationship is needed with a larger and more diverse sample.

#### **d/s IAT nonsignificant results**

The implicit suicide ideation results found that poor emotion regulation did not moderate the relationship between sleep quality and implicit suicide ideation. Additionally, sleep quality and emotion regulation difficulties were not significant

predictors of implicit suicide ideation scores in any of the models. These findings suggest that sleep quality and emotion regulation may not be important factors that contribute to one's implicit suicide ideation. Importantly, no study to date has examined implicit suicide ideation as an outcome. Rather, research to date has examined it as a predictor variable (Glenn et al., 2016, 2017; Nock et al., 2010). It may be that the factors contributing to increased implicit suicide ideation are different from those contributing to explicit (self-reported) suicide ideation severity. Interestingly, the implicit suicide ideation scores did not correlate significantly with the self-reported suicide ideation scores (see Table 5), adding further evidence that these constructs may be different and thus have different factors influencing their severity.

Results regarding the implicit suicide ideation models and correlations between explicit and implicit suicide ideation may also suggest that the d/s IAT is not the best assessment of current suicide ideation in community adolescent samples. Interestingly, a recent study using an inpatient adolescent sample found that the d/s IAT is a prospective predictor of suicide ideation (Glenn et al., 2017). Therefore, it may be that the d/s IAT is a better predictor of suicide ideation among individuals with more severe suicide ideation but lacks effectiveness when used within community samples.

Another potential reason for the lack of significant findings while using the d/s IAT may be due to participants not having the vocabulary skills necessary for this task. Numerous participants asked the researchers how to correctly categorize words during the assessment. In the future, studies assessing implicit suicide ideation in adolescent samples may consider utilizing the self-injurious IAT which utilizes images of self-harm

instead of words, which eliminates the need for sophisticated vocabulary skills.

Interestingly, other studies have used the self-injurious IAT within a community sample of adolescents and found that the self-injurious IAT was related to both current suicide ideation and previous suicide attempts (Nock & Banaji, 2007). It is possible that for adolescents it is easier to categorize pictures opposed to words and the utilization of self-injurious IAT may yield more valid results related to current suicide ideation opposed to the d/s IAT.

Finally, it is possible that the school setting in which the study was carried out is not the optimal place for such measures to be used. During the assessment there were often distracting external stimuli (both auditory and visual) as researchers typically ran numerous participants at a time. These stimuli may have been distracting to participants, therefore impacting the latencies in responses during the task. Future studies should continue to evaluate the effectiveness of the d/s IAT in community adolescent samples and consider the possibility of using different versions of the self-harm/suicide related IATs instead while also trying to administer the assessment in a less distracting environment.

### **Exploratory results**

Due to the inconsistency of findings regarding sleep as a predictor of both NSSI and suicide ideation, exploratory mediation analyses were conducted. Regarding NSSI engagement, the indirect effects trended significant ( $p = .051$ ), which may, in part, be due to the small sample size. Regarding self-reported suicide ideation, the indirect effects were significant ( $p = .001$ ). These findings provide valuable insight into a potential

reason sleep was not a significant predictor of NSSI and suicide ideation in moderation models with the DERS but was a significant predictor in models with the EST. Based on the mediation results, it appears that the way in which sleep influences both NSSI engagement and suicide ideation is via difficulties in emotion regulation. Previous research has linked sleep to difficulties in emotion regulation (Baum et al., 2014; Mauss et al., 2013; Pickett, Barbaro & Mello, 2015; Sandru & Voinescu, 2014) and emotion regulation to NSSI (Heath et al., 2009; Kranzler et al., 2016; Nock, 2009) and suicide ideation (Anestis et al., 2014; Rajappa et al., 2012); therefore, the mediating role of emotion regulation between sleep quality and both NSSI and suicide ideation is fitting. Adolescents who are experiencing poor sleep are likely experiencing difficulties in emotion regulation as a product of their poor sleep habits and thus are at an increased risk for NSSI engagement and greater suicide ideation severity. Though these findings are exploratory in nature, they may help to understand some of the inconsistencies in results.

In the future, it may be beneficial for a study to examine this relationship again utilizing a longitudinal design to determine the temporal relationships among these variables and to determine whether poor sleep precedes difficulties in emotion regulation or vice versa. Additionally, the replication of these findings with a larger sample may result in the NSSI mediation model becoming significant as previous research has found emotion regulation difficulties to be a mediator between sleep difficulties and NSSI engagement (Ennis et al., 2017).

## **Limitations**

A major limitation of this study is the use of a cross-sectional design rather than a longitudinal design. The cross-sectional design does not allow the determination of the order in which behaviors emerge. It may be that sleep and emotion regulation difficulties emerge and interact prior to NSSI engagement and suicide ideation. If this were the case, it could provide clinicians a potential way to identify at-risk clients before their NSSI engagement or suicide ideation begins. Additionally, it may be that poor sleep quality and suicide ideation/NSSI engagement begin simultaneously or that suicide ideation/NSSI precedes problems in emotion regulation and sleep. Gaining a better understanding of the time frame in which these behaviors occur would benefit clinicians working with adolescents.

The characteristics of the sample in this study are also an important limitation to discuss. First, this was a small sample (ranging from 111 to 135) which is particularly problematic for power in analyses. The lack of significant interactions for most models may be due to actual nonexistent interactions between sleep quality and emotion regulation or may be due to low power. Another limitation with this sample is its homogenous nature. Though this sample is typical for Kentucky (being predominantly White and Non-Hispanic), the generalizability of these findings is limited. It would be beneficial in the future for this study to be replicated using a larger and more diverse sample.

As previously mentioned regarding the IAT, many of the students struggled with knowing how to properly categorize words, suggesting they might not have had the vocabulary skills necessary. During data collection, vocabulary ability was not assessed,

therefore it is impossible to control for this potential confound. Future studies using the d/s IAT in adolescents should consider giving a vocabulary test to control for individual's vocabulary ability or utilize the self-injurious IAT which may be understood more easily by adolescents.

Finally, an important limitation was the use of lifetime NSSI engagement as an outcome variable for NSSI models. The measures of emotion regulation and sleep quality both assessed current behaviors, which was in contrast with the NSSI measure that assessed any lifetime engagement in the behavior. This inconsistency in the time frame being assessed could be particularly problematic. An individual who engaged in NSSI three years ago was treated the same as someone with current NSSI engagement in our analyses due to using lifetime engagement. It would be beneficial to replicate this study in the future and look at this relationship with individuals currently engaging in NSSI.

## **Conclusion**

Overall, this study adds to the growing body of literature suggesting sleep may be an important risk factor for both NSSI engagement and suicide ideation. Additionally, this study furthers evidence supporting the importance of difficulties in emotion regulation in both NSSI engagement and suicide ideation. Emotion regulation difficulties did not appear to have the ability to strengthen the relationship between sleep quality and NSSI therefore, having no influence on risk of engagement. Interestingly regarding the relationship between sleep quality and explicit suicide ideation, emotion regulation difficulties may strengthen this relationship resulting in an increase in one's suicide ideation severity when experiencing both poor sleep and greater emotion regulation

difficulties. Finally, the lack of significant IAT results as well as the lack of a significant correlation between the d/s IAT score and explicit suicide ideation scores suggest that this version of the d/s IAT may not be capturing suicide ideation accurately within this sample. Overall, individuals working with adolescents (both in clinical and academic setting) should pay particular attention to adolescents' sleep habits and emotion regulation abilities as these factors are important for risk of NSSI engagement and suicide ideation severity.

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40) How many suicide attempts have you made in your lifetime?

40) \_\_\_\_\_

41) How many have you made in the past year?

41) \_\_\_\_\_

42) How many have you made in the past month?

42) \_\_\_\_\_

43) How many have you made in the past week?

43) \_\_\_\_\_

44) What method did you use for your most recent attempt?

44) \_\_\_\_\_

- |                           |                           |                       |
|---------------------------|---------------------------|-----------------------|
| 1) own prescription drugs | 2) illicit drugs (not rx) | 3) over-counter drugs |
| 4) poison hanging         | 5) Firearms               | 6) immolation         |
| 7) hanging                | 8) sharp object           | 9) auto exhaust       |
| 10) other gases           | 11) train/car             | 12) jump from height  |
| 13) drowning              | 14) suffocation           | 15) other rx drugs    |
| 16) other                 | 17) multiple              | 88) not applicable    |
| 88) unknown               |                           |                       |

45) What were the circumstances that contributed most to your most recent attempt?

(Put in order of importance)

45a) \_\_\_\_\_

45b) \_\_\_\_\_

45c) \_\_\_\_\_

- |   |                                   |
|---|-----------------------------------|
| 1) job loss/ job stress/ academic failure | 2) dispute with family or friends |
| 3) dispute with spouse/lover              | 4) financial problems             |
| 5) eviction                               | 6) health problems                |
| 7) death of another person                | 8) psychiatric symptoms           |
| 9) humiliating event                      | 10) other: _____                  |
| 11) refuses to answer                     | 88) not applicable                |
| 99) unknown                               |                                   |

46) What kind of injuries did you have as a result of this attempt?

46) \_\_\_\_\_

Regarding the **most lethal** attempt:

47) When did it occur?

47) \_\_\_/\_\_\_/\_\_\_

48) What kind of injuries did you have as a result of this attempt?

48)\_\_\_\_\_

49) How long have you usually thought about suicide before making an attempt?

49)\_\_\_\_\_

0) 0 seconds

1) 1-60 seconds

2) 2-15 minutes

3) 16-60 minutes

4) less than one day

5) 1-2 days

6) more than 2 days

7) wide range (spans > 2 responses)

88) not applicable

99) unknown

50) On the scale of 0 to 4, what do you think the likelihood is that you will make a suicide attempt in the future?

50)\_\_\_\_\_

### **Thoughts of Non-Suicidal Self-Injury**

51) Have you ever had thoughts of purposely hurting yourself without wanting to die? (for example, cutting or burning)?

51)\_\_\_\_\_

0) no

1) yes

**We will refer to this as non-suicidal self-injury.**

52) How old were you the first time you thought about engaging in NSSI? (*age*)

52)\_\_\_\_\_

53) How old were you the last time? (*age*)

53)\_\_\_\_\_

54) During how many separate times in your life have you thought about engaging in NSSI?

60)\_\_\_\_\_

55) How many separate times in the past year?

55)\_\_\_\_\_

56) How many separate times in the past month?

56)\_\_\_\_\_

57) How many separate times in the past week?

57)\_\_\_\_\_

58) On the scale of 0 to 4, at the worst point, how intense were your thoughts about engaging in NSSI?

58)\_\_\_\_\_



- 1) cut or carved skin
- 2) hit yourself on purpose
- 3) pulled your hair out
- 4) gave yourself a tattoo
- 5) picked at a wounds
- 6) burned your skin
- 7) inserted objects under your nails or skin
- 8) bit yourself (e.g., your mouth or lip)
- 9) picked areas of your body to the point of drawing blood
- 10) scraped your skin
- 11) “erased” your skin to the point of drawing blood
- 12) other (specify): \_\_\_\_\_
- 88) not applicable
- 99) unknown

70) Have you ever received medical treatment for harm caused by NSSI?

- 70) \_\_\_\_\_
- 0) no
  - 1) yes
  - 88) not applicable
  - 99) unknown

71) On average, for how long have you thought about NSSI before engaging in it?

- 71) \_\_\_\_\_
- 0) 0 seconds
  - 1) 1-60 seconds
  - 2) 2-15 minutes
  - 3) 16-60 minutes
  - 4) less than one day
  - 5) 1-2 days
  - 6) more than 2 days
  - 7) wide range (spans > 2 responses)
  - 88) not applicable
  - 99) unknown

72) On the scale of 0 to 4, what do you think the likelihood is that you will engage in NSSI in the future?

72) \_\_\_\_\_

**0            1            2            3            4**

*Low/little*

*Very much/  
Severe*

Appendix B

**Difficulties in Emotion Regulation Scale (DERS)**

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1-----2-----3-----4-----  
-----5

almost never sometimes about half the time most of the time almost always  
(0-10%) (11-35%) (36-65%) (66-90%) (91-100%)

- \_\_\_\_\_ 1) I am clear about my feelings.
- \_\_\_\_\_ 2) I pay attention to how I feel.
- \_\_\_\_\_ 3) I experience my emotions as overwhelming and out of control.
- \_\_\_\_\_ 4) I have no idea how I am feeling.
- \_\_\_\_\_ 5) I have difficulty making sense out of my feelings.
- \_\_\_\_\_ 6) I am attentive to my feelings.
- \_\_\_\_\_ 7) I know exactly how I am feeling.
- \_\_\_\_\_ 8) I care about what I am feeling.
- \_\_\_\_\_ 9) I am confused about how I feel.
- \_\_\_\_\_ 10) When I'm upset, I acknowledge my emotions.
- \_\_\_\_\_ 11) When I'm upset, I become angry with myself for feeling that way.
- \_\_\_\_\_ 12) When I'm upset, I become embarrassed for feeling that way.
- \_\_\_\_\_ 13) When I'm upset, I have difficulty getting work done.
- \_\_\_\_\_ 14) When I'm upset, I become out of control.
- \_\_\_\_\_ 15) When I'm upset, I believe that I will remain that way for a long time.
- \_\_\_\_\_ 16) When I'm upset, I believe that I will end up feeling very depressed.
- \_\_\_\_\_ 17) When I'm upset, I believe that my feelings are valid and important.
- \_\_\_\_\_ 18) When I'm upset, I have difficulty focusing on other things.
- \_\_\_\_\_ 19) When I'm upset, I feel out of control.
- \_\_\_\_\_ 20) When I'm upset, I can still get things done.
- \_\_\_\_\_ 21) When I'm upset, I feel ashamed at myself for feeling that way.
- \_\_\_\_\_ 22) When I'm upset, I know that I can find a way to eventually feel better.
- \_\_\_\_\_ 23) When I'm upset, I feel like I am weak.
- \_\_\_\_\_ 24) When I'm upset, I feel like I can remain in control of my behaviors.
- \_\_\_\_\_ 25) When I'm upset, I feel guilty for feeling that way.
- \_\_\_\_\_ 26) When I'm upset, I have difficulty concentrating.
- \_\_\_\_\_ 27) When I'm upset, I have difficulty controlling my behaviors.
- \_\_\_\_\_ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.
- \_\_\_\_\_ 29) When I'm upset, I become irritated at myself for feeling that way.
- \_\_\_\_\_ 30) When I'm upset, I start to feel very bad about myself.
- \_\_\_\_\_ 31) When I'm upset, I believe that wallowing in it is all I can do.
- \_\_\_\_\_ 32) When I'm upset, I lose control over my behavior.
- \_\_\_\_\_ 33) When I'm upset, I have difficulty thinking about anything else.
- \_\_\_\_\_ 34) When I'm upset I take time to figure out what I'm really feeling.
- \_\_\_\_\_ 35) When I'm upset, it takes me a long time to feel better.
- \_\_\_\_\_ 36) When I'm upset, my emotions feel overwhelming.

Appendix C  
**PSQI**

**INSTRUCTIONS:**

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

BED TIME \_\_\_\_\_

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

NUMBER OF MINUTES \_\_\_\_\_

3. During the past month, what time have you usually gotten up in the morning?

GETTING UP TIME \_\_\_\_\_

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

HOURS OF SLEEP PER NIGHT \_\_\_\_\_

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

b) Wake up in the middle of the night or early morning

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

c) Have to get up to use the bathroom

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

d) Cannot breathe comfortably

- Not during the past month
- Less than once a week
- Once or twice a week

- Three or more times a week
- e) Cough or snore loudly
  - Not during the past month
  - Less than once a week
  - Once or twice a week
  - Three or more times a week
- f) Feel too cold
  - Not during the past month
  - Less than once a week
  - Once or twice a week
  - Three or more times a week
- g) Feel too hot
  - Not during the past month
  - Less than once a week
  - Once or twice a week
  - Three or more times a week
- h) Had bad dreams
  - Not during the past month
  - Less than once a week
  - Once or twice a week
  - Three or more times a week
- i) Have pain
  - Not during the past month
  - Less than once a week
  - Once or twice a week
  - Three or more times a week
- j) Other reason(s), please describe \_\_\_\_\_

---

How often during the past month have you had trouble sleeping because of this?

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

6. During the past month, how would you rate your sleep quality overall?

- Very good
- Fairly good
- Fairly bad
- Very bad

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

- Not during the past month
- Less than once a week

- Once or twice a week
- Three or more times a week

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- No problem at all
- Only a very slight problem
- Somewhat of a problem
- A very big problem

## Appendix D SIQ-JR

### *Side Two Directions*

Listed below are a number of sentences about thoughts that people sometimes have. Please *indicate which of these thoughts you have had in the past month*. Fill in the circle under the answer that best describes your own thoughts. Be sure to fill in a circle for each sentence. Remember, *there are no right or wrong answers*.

This thought was in my mind:	Almost every day.	Couple of times a week.	About once a week.	Couple of times a month.	About once a month.	I had this thought before but not in the past month.	I never had this thought.
1. I thought it would be better if I was not alive . . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I thought about killing myself. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I thought about how I would kill myself. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I thought about when I would kill myself. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I thought about people dying. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I thought about death. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I thought about what to write in a suicide note. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I thought about writing a will . . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I thought about telling people I plan to kill myself. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I thought about how people would feel if I killed myself. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I wished I were dead . . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I thought that killing myself would solve my problems. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I thought that others would be happier if I was dead . . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I wished that I had never been born . . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I thought that no one cared if I lived or died. . . . .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>