Nonsuicidal Self-Injury in Adolescents: An Explanatory Model of Contextual Factors

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Abstract

Empirical studies have demonstrated that adolescents experience heightened and prolonged negative emotion prior to and during the act of nonsuicidal self injury (NSSI), and that self-injurers use NSSI as a strategy to regulate emotion. The influence of social contexts that elicit emotional reactivity and influence adolescent NSSI have seldom been investigated. The purpose of this dissertation research was to present and examine a contextual explanation of adolescent NSSI. The specific study aims were as follows: **Aim 1**: To test the posited mediating influence of emotional reactivity on non-suicidal self- injurious behavior as specified in the proposed theoretical model by examining direct and indirect associations with identified contextual factors – specifically childhood abuse, peer relationship quality, and family functioning; **Aim 2**: To test for moderating effects of contextual factors (family functioning and peer relationship quality) on the association between childhood abuse and emotional reactivity; **Aim 3**: To explore the influence of contextual experiences (childhood abuse, family functioning, peer relationship quality), and individual characteristics (emotion reactivity and depression) on case classification relative to non-suicidal self injury and/or suicidal behaviors. Using a cross-sectional correlational design and a sample of 799 students, ages 17 - 22 years were recruited from a university located in northern Taiwan. The proposed model (Aim 1) was tested using structural equation modeling, and moderating effects (Aim 2) were tested using multiple regression. The results for Aim 1 showed that the influence of

childhood abuse on NSSI was partially mediated by emotional reactivity. Poor peer relationship quality uniquely predicted NSSI, however, low family functioning did not. There was no clear evidence that either family functioning or peer relationship quality served to moderate the effects of childhood abuse on emotional reactivity (Aim 2). Using latent class analysis (Aim 3), four distinct profiles of NSSI and suicidal behavior were identified. Individual characteristics (emotional reactivity, depression) and contextual experiences (childhood abuse, family function, peer relationship quality) were most strongly associated with the combined experience of NSSI and suicidal behavior. This dissertation research was designed to complement psychological models of self-injurious behavior with detailed attention to contextual factors. The findings will provide guidance for health professionals and researchers in understanding the pathways to self-injurious behavior among Taiwanese adolescents.

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CHAPTER 1.

INTRODUCTION

Statement of the Problem

Self-injurious behavior (SIB), or nonsuicidal self-injury (NSSI), refers to a variety of behaviors in which an individual purposefully harms his or her body (e.g., cutting, burning, stabbing, hitting) without suicidal intent (Favazza, 1996). Nonsuicidal self-injury is a universal phenomenon and is pervasive among adolescents. The lifetime prevalence of NSSI in adolescents in community samples ranges from 5% to 42% across countries (Jacobson & Gould, 2007; Muehlenkamp et al., 2012), from 40% to 82.4% in psychiatric inpatients (Darche, 1990; DiClemente, Ponton, & Hartley, 1991; Nock & Prinstein, 2004), and about 17% in college students (Whitlock, Eckenrode, & Silverman, 2006). The prevalence of NSSI in adolescents is dramatically higher than in the general adult population with a rate of 1% to 4% (Briere & Gil, 1998; Klonsky, Oltmanns, & Turkheimer, 2003). Most initial incidents of NSSI occur between the ages of 12 and 15 (Muehlenkamp, 2005; Kumer, Pepe, & Steer, 2005; Nock & Prinstein, 2004), and most self-injurers tend to harm themselves repetitively. For students who have engaged in NSSI, over 60% of participants reported harming themselves repeatedly in the past year with the majority ranging from two to ten incidents (Muehlenkamp & Gutierrez, 2007; Laye-Gindhu & Schonert-Reichl, 2005). Most self-injurers never attempt suicide, but suicide ideation and suicide attempts are more prevalent in

adolescents who engage in NSSI than in those without NSSI incidents (Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007). Emerging research reveals that NSSI is a strong predictor of future suicide attempts (Klonsky, May, & Glenn, 2013; Guan, Fox, & Prinstein, 2012; Asarnow et al. 2011). Studies suggest that a wide range of psychiatric disorders are highly associated with NSSI, despite that the presence of self-injury does not imply the presence of a particular psychiatric disorders (Garrison et al., 1993; Nock et al., 2006). Although clinical observations suggest that self-injurious behavior might occur more frequently among females than males, community studies raise questions about this presumption. Some studies report no gender differences in the rates of self-injurious behavior in adolescents (Garrison, Cherry & McKeown, 1993; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007; Zoroglu et al., 2003); other studies report that engagement in self-injurious behavior is significantly more common in females than males (Laye-Gindhu & Schonert-Reichl, 2005; Ross & Health, 2003). Thus, results are mixed regarding gender differences associated with NSSI. Overall, the research findings indicate that NSSI is a severe and specific mental health problem in adolescence.

In the past decade, interest in understanding the phenomenon of NSSI has grown. The problem, however, remains unclear as to why adolescents harm themselves. Recently, nonsuicidal self-injury was identified as a condition requiring further study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric

Association, 2013). Existing studies indicate that lack of emotional regulation is the most common reason for NSSI as adolescents have consistently reported harming themselves to alleviate negative feelings (e.g., anxiety, anger, or depression), or to relieve tension (Laye-Gindhu & Schonert-Reichl, 2005; Ross & Health, 2003, Kumer, Pepe, & Steer, 2005; Nock & Prinstein, 2004, 2005; Klonsky, 2007, 2009). These studies mainly focused on psychological correlates and/or intrapersonal distress in examining what specific negative emotions participants experienced before their hurting themselves. Rarely have investigators explored the social contexts surrounding individuals that tend to elicit heightened negative emotion or tension prior to acts of NSSI used for emotion regulation. Studies both with psychiatric inpatients (Nock & Prinstein, 2004, 2005) and community participants (Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Hilt, Cha, & Nolen-Hoeksema, 2008) report that social reinforcements, which refers to attention-seeking or escaping from other people, were common reasons for NSSI; self-injury served an interpersonal function for adolescents to connect with others (e.g., family, friend) or to avoid interpersonal demands. These studies, however, did not clarify which interpersonal environments were related to adolescent self harm. Previous research reveals that social contexts are important in the explanation of NSSI, however additional investigations are needed to identify the specific contexts in which adolescents feel the need to use NSSI to regulate heightened emotions and social demands,

whereby NSSI is developed and is maintained, and to begin to unravel the complex associations among contextual factors, emotional reactivity and NSSI.

Heightened negative emotional reactivity and poor emotion regulation are highlighted as central risk factors for NSSI (Linehan, Bohus, & Lynch, 2007; Nock, 2009). Emotional reactivity is commonly defined as a dimension of temperament, and refers to an individual's characteristic threshold, intensity and duration of affective arousal (Rothbart & Derryberry, 1981). Heightened negative emotional reactivity is an intense negative emotional response to a situation (either in magnitude or duration; Linehan et al., 2007). Emotional regulation refers to attempts that individuals make to influence which emotions they have, when they have them, and how they experience or express these emotions (Gross, 1998). Theory-based, empirical modeling studies have demonstrated that adolescents experience heightened and prolonged negative emotion prior to and during the act of NSSI, and that self-injurers use NSSI as a strategy to regulate emotion, to alleviate negative emotions and to dampen overwhelming emotional arousal, and/or to cope with intolerable stress states (e.g., Klonsky, 2007; Nock, 2009). Klonsky (2007), in a review of empirical research, reported results from 18 self-report and laboratory studies that provided converging evidence to indicate that acute negative affect precedes NSSI, that decreased negative affect and relief are present after NSSI, and that NSSI is most often performed with an intent to alleviate negative affect. Armey, Crowther, & Miller (2011) examined emotional reactivity in natural settings in a

sample of 36 college students with a NSSI history. Using Ecological Momentary Assessment (EMA) to assess affect changes before, during, and following an NSSI event, the investigators found that individuals experienced increases in negative affect prior to an episode of NSSI, that the affect peaked during the episode and faded gradually following the episode, and that the pattern of change in affect approximated a quadratic curve (Armey, Crowther, & Miller, 2011). Recently, Kleiman, Ammerman, Look, Berman, and McCloskey (2014) demonstrated a direct effect of emotional reactivity on NSSI in a sample of 1,914 undergraduates (61.4% female, M age = 21.02). The context-specific factors were crucial to to heightened negative emotional reactivity. According to Gross (2014), emotional regulation occurs when "(1) an emotional response itself is subjected to valuation as good or bad, and (2) this valuation leads to the activation of a goal to change that particular emotion response trajectory" (p.12), and which emotion regulatory strategy(s) is selected to achieve. The particular emotion regulatory goal may depend on context-specific factors, such as the type and intensity of emotion that need to be regulated. This may explain why some laboratory studies of negative emotional reactivity found no differences between a NSSI group and a control group when reactivity was indexed with electrodermal responding (Crowell et al., 2012), startle response (Glenn et al., 2011) and amygdala activation (Davis et al., 2014), because these studies used a sad video clip or images that might not be the appropriate context to generate negative emotional reactivity. Thus, it is important to identify context-

specific factors that contribute to heightened negative emotional reactivity in adolescents with NSSI.

Accumulating evidence supports the hypothesis that childhood abuse history may contribute to deficits in emotion regulation. For example, it has been shown that most abused and neglected children are unable to modulate emotions, and that child maltreatment affects their biologically-based capacity (e.g., callosum and amygdala functions) to regulate the intensity of affective responses. Abused children often fail to develop the capacity to express specific and differentiated emotions (van der Kolk & Fisher, 1994; Braquehais et al., 2010). More recently, theorists have stressed the importance of emotional reactivity in the pathway of child maltreatment and adolescent NSSI. Linehan's (1993) theory of self-injury suggests that an invalidating environment during childhood, characterized by inadequate parenting and family functioning, can lead to emotion dysregulation. Consequently, self-injurious behaviors develop to manage emotional distress. Yates (2009) proposed a developmental process model of child maltreatment and NSSI, arguing that the adverse experience of maltreatment influences the structure, organization, and function of stress response system. Yates (2009) hypothesized that the influence of maltreatment on physiological reactivity is a potentially salient process underlying self-injurious pathways. Few studies, however, have addressed this hypothesis.

Child maltreatment (abuse and neglect) is the most salient contextual risk factor for NSSI identified to date (Lang & Sharma-Patel, 2011). Empirical findings are inconsistent when considering the relations between specific forms of childhood abuse and NSSI. For example, Glassman et al. (2007) reported that history of childhood emotional and sexual abuse had strong associations with adolescent NSSI. Similarly, Weierich and Nock (2008) revealed a significant association between childhood sexual abuse and the presence and frequency of NSSI, whereas nonsexual abuse, including physical and/or emotional abuse, was not associated. Martin et al. (2011) showed that university students engaging in NSSI were more likely to report physical abuse than those without NSSI. In a meta-analysis of 45 studies, Klonsky and Moyer (2008) indicated that the relationship between childhood sexual abuse and NSSI is relatively small, explaining little unique variance when other psychiatric factors were controlled. Yet, in another systematic review of 21 published studies, all but one study showed a relationship between childhood sexual abuse and NSSI (Fliege, Lee, Grimm, & Klapp, 2009).

Child maltreatment may interact with current environmental adversity to develop and maintain, via emotion regulation, NSSI. According to the biological sensitivity to context theory (Ellis & Boyce, 2008), an individual develops heightened stress reactivity as the result of the interaction between genetic and early environmental experiences. Heightened stress reactivity is not necessarily a vulnerability, because health outcomes depend on the contexts

the individuals experience; adolescents who have high reactivity are very sensitive to context, with potential for negative health effects under conditions of adversity and positive effects under conditions of support and protection. This theory points to the importance of joint influences of early adverse experiences and current environmental adversity on emotional reactivity and negative health outcomes, which may explain why some studies did not find significant differences in early adverse experience between NSSI and non-NSSI individuals. For instance, Heath, Toste, Nedecheva, and Charlebois (2008) tested risk factors of emotion regulation, attachment, and childhood trauma (abuse and neglect) by comparing a group of college students who engaged in NSSI with a comparison group who reported no past NSSI. A significant difference was found between the NSSI and the comparison group in ratings of emotion regulation difficulties, but no differences for early attachment or childhood trauma and abuse. Thus, one logical next step in research is to examine the combined effects of early adverse child abuse and current environmental adversity to understand adolescent emotional reactivity in a contextual model of adolescent NSSI.

Peers and family constitute contextual factors of significant developmental importance in adolescence (Prinstein, et al., 2000). Family factors are central contextual correlates among adolescents who self-injure, consistently reported in both clinical and community studies (e.g., Chen, 2000; Huang & Lin, 2005; Cheng, 2004; Zoroglu et al., 2003; Lipschitz et al., 1999; Nixon, Cloutier, & Aggarwal, 2002). Several family contextual variables have been

examined. Some studies demonstrate a relationship exists between family structure and NSSI (e.g., Laye-Gindhu & Schonert-Reichl, 2005; Nixon, Cloutier, & Jansson, 2008; Sourander et al., 2006), but other studies indicate no significant relationship (e.g., Garrison, Cherry, & McKeown, 1993; Baetens et al., 2014). Family socioeconomic status has been associated with NSSI (e.g., Bureau et al., 2010; Nixon et al., 2008; Baetens et al., 2014). Higher levels of family cohesion are associated with less frequent occurrences of self-damaging acts (Garrison et al., 1993). Low parental relationship quality, characterized by poor trust and communication, and high levels of alienation, are associated with NSSI (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008). Individuals with NSSI report perceive more parental control than non-NSSI individuals (Bureau et al., 2010; Baetens et al., 2014). Perceived parental criticism predicted occurrence of self-injurious behavior (Yates, Tracy, & Luthar, 2008). Perceived family invalidation, that is parent invalidation of a youth's emotional experience, is positively associated with NSSI (You & Leung, 2012). Individuals with repetitive NSSI report significantly lower social support from family members (Muehlenkamp, Brausch, Quigley, & Whitlock, 2013). This evidence indicates that family functioning, which refers to family relationships and family interaction or communication, is a key factor associated with adolescent NSSI.

Several theories suggest that peer relationships during adolescence also play a critical role in the etiology, maintenance and exacerbation of NSSI (Prinstein et al., 2009). Recent

evidence suggests that poor peer relationships may be especially relevant for NSSI. For example, Hilt, Cha and Nolen-Hoeksema (2008) reported that peer victimization was associated with NSSI, and the quality of peer communication moderated this relationship. Adrian et al. (2011) reported that peer relational problems, characterized by peer victimization and negative friendship interactions, were indirectly related to NSSI through emotional dysregulation.

In addition, a growing body of research suggests that peer 'contagion' factors may contribute to the development and maintenance of NSSI among adolescents. Prinstein et al. (2010) found in a community sample, that best-friend reports of NSSI prospectively predicted increases in adolescent NSSI behavior 11 months later, but only among younger (sixth grade) adolescent girls. Similarly, in a community sample of 5,787 Chinese adolescents, You et al. (2013) reported that best friend engagement in NSSI and the status of NSSI in a youth's friendship groups predicted the adolescent's NSSI status. Peer relationships have been identified as a major stressor capable of eliciting emotional arousal in adolescents. Intimate relationships explained 25%-34% of the intense emotion that high school students experienced, and of the intense emotions about 42% were negative feelings, such as anxiety, anger, jealousy and depression (Larson, Clore, & Wood, 1999). Whitesell and Harter (1996) examined the reactions of adolescents to hypothetical anger-provoking actions by best friends and classmates, with a sample of 96 students ages 11-15 years. Results indicated that the

interpersonal context elicited negative emotion, including anger, sadness and fear, and that best friends elicited more intense and prolonged negative emotions than did classmates. Taken together, the empirical literature shows that adolescents who are victimized by peers and those who have negative peer relationships display higher rates of negative feelings than other adolescents.

NSSI among Taiwanese Adolescents

In Taiwan, studies that focus on adolescent NSSI are scarce. To my knowledge, three published studies and several masters' theses have investigated adolescent NSSI in Taiwan. Two published studies reported the prevalence of NSSI among Taiwanese adolescents. One cross-sectional study stratified by geographical districts, surveyed 2,054 students aged 13-18 to examine self-harm behaviors. The findings revealed that 23% of the adolescents engaged in NSSI, and of those 75.2% engaged in NSSI more than once (Chen & Cheng, 2001). This study used a single yes/no item, "Have you had cut or injured your own body but without the intention of suicide," to measure NSSI. Because the study focused on adolescent self-harm behavior, including suicide ideas, suicide attempts, and NSSI, factors specifically related to NSSI were not differentiated.

The second prevalence study of self-injurious behavior surveyed 401 junior high school students aged 13-15; 15.9% of the students reported having ever engaged in self-injurious behavior (Lin, 2001). The investigator designed six questions to investigate self-injurious

behavior, in which one item, “Have you ever harmed your own body,” was used to directly identify participants who might engage in NSSI. Construct validity and content validity of the scale were not established, obscuring interpretation of the results. The findings, however, are consistent with current Western studies showing that the lifetime prevalence of adolescent NSSI varies from 13.0% to 23.2% (Jacobson & Gould, 2007) of the general population.

The third study investigated the prevalence and environmental correlates of self-mutilation in a community sample of 1,975 adolescents, aged 13-18 (m=15.8, 58% female). The findings revealed that 22.4% of the respondents had self-mutilating behaviors, and of those 75.6% had harmed themselves deliberately at least twice. The most commonly reported self-mutilating behavior was carving/cutting on skin (48.6%), followed by burning skin (26.5%). Multivariate logistic analyses indicated that the probability of self-mutilation is higher for adolescents who experienced more parental conflict, had poorer parent-child relationships, had poorer relationships with teachers, and had someone at home engaged in self-mutilation. The authors also found gender difference in self-mutilation behavior that proportionately more girls had self-mutilation behavior than boys (Chen, 2006). Review of Taiwan’s NSSI studies show that the initial incidents of NSSI occurred among youth 10 to 15 years of age, with most occurring between 13 and 15 years (Chen, 2000; Cheng, 2004; Hsu, 2004; Huang & Lin, 2005), which is consistent with recent Western studies.

The few other existing studies suggest that NSSI is prevalent among Taiwanese adolescents. The social context in Taiwan, however, is different from Western society. Family continues to be the most significant community organization in Taiwan. Most children live with their parents until they are married. Approximately 96% of high school graduates enter college to continue their education (Department of Education, 2014), depending mostly on their parents for economical support. Although there is no current research on child abuse, some data point to the severity of child abuse. One correlational survey study used of 208 families who had reported incidents of family violence to official agencies. Results showed that marital violence and child maltreatment were significantly related. The co-occurrence rate was 65.2% for the past year, and approximately one-fourth of the families had experienced severe physical violence, both between spouses and between parents and children. The "ever" co-occurrence rate was 84.1%, and approximately one-half of the families had at some time experienced severe physical violence (Shen, 2006). In sum, the empirical evidence as well as theoretical models point to the of importance of examining the effects of these identified risk factors for Taiwanese youths.

Purpose of the Study

It is unclear why adolescents injure themselves purposely *without* the intent of suicide. Contextual factors of childhood maltreatment, family functioning, and peer relationships associated with NSSI have been consistently reported as contributing factors in both clinical

and community studies (Favazza, 1996; Jacobson & Gould, 2007). Empirical modeling research has theorized and demonstrated that adolescents experience heightened and prolonged negative emotion prior to and during the act of NSSI, and that self-injurers use NSSI as a strategy to regulate emotion (e.g., Klonsky, 2007; Nock, 2009), although the contexts that elicit emotional reactivity and influence adolescent NSSI are seldom examined. Moreover, research in this area with Taiwanese samples is rare, yet the social context in Taiwan is vastly different than in Western societies. To address gaps in the research literature, this study examined the effects of specific contextual factors and emotional reactivity in a sample of Taiwanese NSSI youths.

The purpose of this dissertation research was to present a contextual explanation of adolescent NSSI by examining mediating effects of emotional reactivity on NSSI behaviors, by examining the moderating effects of contextual factors—childhood maltreatment, peer relationship quality and family functioning—on emotional reactivity, and by understanding interpersonal and social factors that differentiate subgroups of individuals with NSSI. The proposed theoretical model (Figure 1) integrates findings from several disciplines. The model assumes (a) that NSSI functions serve as a means to regulate heightened negative emotion, (b) that heightened negative emotion is generated by context-specific factors of dysfunctional family and poor peer relationship quality, (c) that heightened negative emotion and context-specific factors interact to develop and maintain NSSI, and (d) that childhood maltreatment, a

more distal contextual factor, predicts the lifetime frequency and severity (the ability to control, and the experience of physical pain during the act) of NSSI. It is posited that this early adverse environmental factor contributes to deficits in emotional reactivity, leading abused individuals to become particularly sensitive to the socioemotional context.

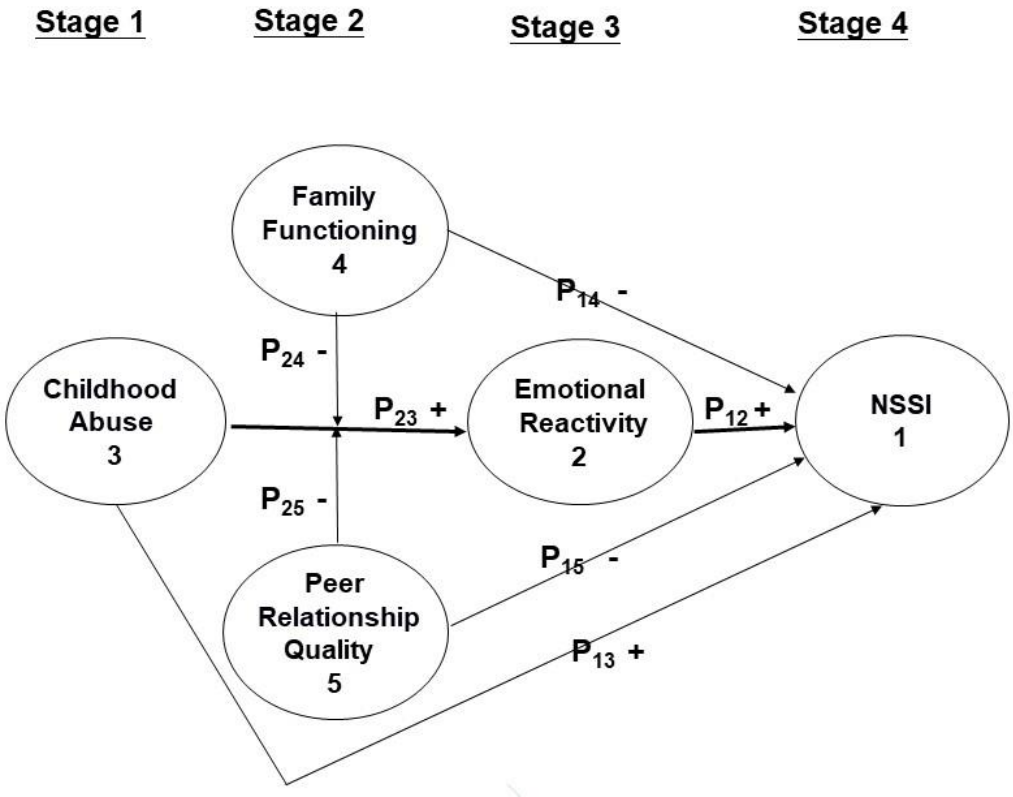

Figure 1. Heuristic model of adolescent non-suicidal self-injury (NSSI), demonstrating the contextual effects of childhood abuse moderated by current environmental factors (family and peer relations), and mediated by emotional reactivity. The effects of current depression is controlled. Selected adolescent demographic characteristics may be linked to NSSI, which is examined in the preliminary analyses. Variables associated with NSSI, e.g. age, sex, ethnic group, family composition, are not illustrated, but is controlled in the analyses as well.

Definition of Terms

Nonsuicidal self-injury (NSSI) is a purposeful act to self, lacking suicidal intent, which causes damage to body tissue.

Emotional reactivity refers to the extent to which an individual experiences strong and intense emotions (emotion intensity) in response to a wide array of stimuli (emotion sensitivity), and for a prolonged period of time prior to returning to baseline arousal (emotion persistence) (Nock, Wedig, Holmberg, & Hooley, 2008).

Peer relationship quality refers to the degree of reciprocal social and emotional transactions between an adolescent and his/her peers, including classmates, friends and intimate friends.

Family functioning captures how family members communicate, relate, and maintain relationships, and how they make decisions and solve problems (Zubrick, Williams, Silburn, & Vimpani, 2000).

Adolescents. For this dissertation research, adolescence is defined as youth between the ages of 17 and 21 years. Adolescence is most often defined as the interval between the onset of puberty and the transition into adult roles (e.g., married, having children) (Steinberg et al., 2006). In Taiwan, the average age of menarche, one of the final steps in pubertal maturation, is about 10-12 years, and for most youth full entry to adult roles is not completed until graduation from college.

Specific Study Aims

The specific dissertation research aims were as follows:

Aim 1: To test the posited mediating influence of emotional reactivity on non-suicidal self-injurious behavior as specified in the theoretical model (Figure 1), by examining the direct and indirect associations of the identified contextual factors – childhood abuse, peer relationship quality, and family functioning – on non-suicidal self injury mediated by emotional reactivity.

Hypotheses for Specific Aim 1

Taken together the following associations are posited as specified in the theoretic model (Figure 1):

1. Childhood abuse has a direct positive effect on emotional reactivity ($Path_{23}$); the experience of childhood abuse is associated with increased emotional reactivity.
2. Childhood abuse has a direct positive effect on non-suicidal self-injurious behavior ($Path_{13}$); the experience of childhood abuse is associated with increased non-suicidal self-injurious behavior.
3. The peer relationship quality has a direct negative effect on non-suicidal self-injurious behavior ($Path_{15}$).
4. Family functioning has a direct negative effect on non-suicidal self-injurious behavior ($Path_{14}$).
5. The hypothesized effects of childhood abuse on non-suicidal self-injurious behavior is partially mediated by emotional reactivity ($Path_{13}$ and $Path_{23}$).

Aim 2: To test for the moderating effects of contextual factors (family functioning and peer relationship quality, Figure 1) on the association between childhood abuse and emotional reactivity.

Hypotheses for Specific Aim 2

1. The influence of childhood abuse on emotional reactivity is moderated by family functioning, such that the influence of childhood abuse is greater for youth with low family functioning.
2. The influence of childhood abuse on emotional reactivity is moderated by the quality of peer relations, such that the influence of childhood abuse is greater for youth reporting low quality peer relations.

Results from Aim 1 and Aim 2 were used to inform model refinement by determining the direct and indirect influences of contextual factors on NSSI, and elucidating potential interaction effects of family function and/or the peer relationship quality with childhood abuse.

Aim 3, an exploratory aim, was designed to extend model building by incorporating suicidal behavior, and by examining whether or not there were distinct subgroupings of youth with NSSI presenting with and without suicidal behaviors.

Aim 3. To explore the influence of contextual risk factors (childhood abuse, family functioning, peer relationship quality), emotion reactivity and depression on case classification relative to non-suicidal self injury and/or suicidal behaviors.

Four classes of youth were anticipated based on youth reporting of: (1) low NSSI and low suicidal behavior (thoughts, attempts, intent); (2) low NSSI and high suicidal behavior/intent; (3) high NSSI and high suicidal behavior/intent; and (4) high NSSI, low suicidal behavior/intent.

Hypotheses for Specific Aim 3

1. Childhood abuse, family functioning, peer relationship quality, and emotion reactivity is most strongly associated with Class 3 (high NSSI and high suicidal behavior/intent) compared to Class 1, 2 or 4.
2. Depression is most strongly associated with Class 3 (high NSSI and high suicidal behavior/intent).

Significance of the Study

The risk and severity of adolescent NSSI are evident, however, theories and empirical studies focused on this problem are few and typically limited to psychological perspectives, without differentiation of adolescent explanatory models. Limited understanding contributes to inadequate and possibly inappropriate treatment approaches. For example, a leading explanation of NSSI is based on behavior theory which argues that NSSI is a behavior of

"attention seeking" and "manipulation," reinforced by attention (Simpson, 2006). For years, punishment and/or extinction (neglect/ignore the behavior) interventions have been used by some health professionals to manage self-injurious behavior, and the associated pain and psychological distress. The behavioral theory of NSSI is weakened by the fact that an adolescent typically engages in self-injurious behavior in a solitary environment and typically keeps the behavior secret (Evans, Hawton, & Rodham, 2005; Puskar, et al., 2006). In addition, the notions of "attention seeking" and "manipulation" contribute to negative attitudes towards individuals who self injure (Holdsworth, Belshaw, & Murray, 2001). On the other hand, family problems, peer relationships and childhood maltreatment have been consistently identified as risk factors in clinical and community studies. Thus, to test the direct, joint and indirect effects of contextual factors in the context of the proposed theoretical model is a logical and major next step in the study of self-injurious behavior.

This study seeks to understand the associations among contextual factors, emotional reactivity and non-suicidal self-injurious behavior in adolescents, which should allow earlier identification of self-injurers and development of appropriate interventions to prevent and/or treat related sufferings. The study was designed to complement psychological models of self-injurious behavior with a detailed focus on contextual factors, and to help health professionals understand pathways to self-injurious behavior among Taiwanese adolescents. A fuller perspective is also expected to help reduce nurses' and other health professionals'

negative attitudes toward self-injurers. Understanding pathways related to adolescent NSSI will contribute to the design and delivery of appropriate preventive interventions. For example, the identification of a significant pathway would indicate that early intervention should focus on improving family function, preventing child abuse, improving children's social relationships as well as improving emotion regulation skills to prevent self-injurious behavior during adolescence.

CHAPTER 2.

LITERATURE REVIEW

This chapter describes comprehensive scientific reviews of the concepts depicted in the theoretical model (Figure 1), including nonsuicidal self-injury (NSSI), emotional reactivity, adolescent social relationships, family functioning, and childhood abuse. A more detailed description of the theorized model of adolescent NSSI is included.

Nonsuicidal Self-injury

Definition of Nonsuicidal Self-injury (NSSI)

The type of definition used is crucial to the understanding of NSSI, however, the definition of NSSI is not clearly conceptualized as reflected in the different terms used in relation to NSSI, including self-injurious behavior, self-harm, para-suicide, self-inflicted behavior, self-mutilation, and cutting. Although these terms are used interchangeably in studies and clinical settings, their meanings are not equivalent (Arabella & Alexandra, 2001; Ross & Health, 2002). For example, para-suicide refers to any self-injurious behavior with or without suicide intent (Linehan, 1987); the definition of self harm often includes both NSSI and overdose. Until the late 1980s, most clinical professionals regarded NSSI as a behavior linked with suicide. Available evidence suggests that NSSI is distinct from suicidal behavior in intent, bodily harm, frequency, and methods. In 1983, Pattison and Kahan analyzed 56 published case reports of self-harm and reported a typical pattern of “deliberate self-harm

syndrome" separate from suicide, featured by onset in late adolescence, multiple recurrent episodes, low lethality, harm deliberately inflicted on the body, and the extension of behavior over many years. Psychiatrist Armando Favazza (1989) described a similar pattern of "deliberate self-harm syndrome" called "self-mutilation," defining it as "complex group of behaviors in which there is a deliberate, direct destruction or alternation of body tissue without conscious suicidal intent" (Favazza, 1989, p. 13). In 2001, the American Psychiatric Association published the book *Self-Injurious Behavior: Assessment and Treatment* edited by Simeon and Hollander, where NSSI is represented as a heterogeneous class of responses related to a broad range of psychiatric disorders or mental health problems. In the book, Simeon and Favazza defined NSSI as "all behaviors involving the deliberate infliction of direct physical harm to one's own body without any intent to die as a consequence of the behavior" (p. 1). The authors justify using the term self-injurious behavior, "because it is purely descriptive, suggests that diversity of such behaviors exists, makes no allusion to motivation, and is not sensationalistic or derogatory" (Simeon & Favazza, 2001). In 2009, Nock and Favazza defined NSSI as "the direct, deliberate destruction of one's own body tissue in the absence of suicide intent" (p. 9), in addition, they propose use of the term NSSI instead of other terms to solve the significant variability in the terms and definition used by researchers and clinicians, because they believed "term NSSI is more accurate and more appropriate" (Nock & Favazza, 2009).

The attributes of "nonsuicidal self-injury" that appear consistently in the literature are: (1) a purposeful or deliberate act to self, (2) lack of suicidal intent, and (3) damage to one's own body tissue. Incorporating these three attributes, the investigator offers the definition of NSSI as: nonsuicidal self-injury is a purposeful or deliberate act to self, with lack of suicide intent, causing damage to one's body tissue. Based on these attributes, behaviors such as overdosing or swallowing objects are excluded from the definition of self-injurious behavior. Body decoration (e.g., body piercing, tattooing), body modification, and body art are also excluded.

Phenomenology of Adolescent NSSI

To date, there is no consensus regarding the meaningful categorization of NSSI or about what meets criteria of a repetitive pattern or severity of the self-injurious behavior. The most widely used system for classifying NSSI was proposed by Favazza (1996) based on four types: major, stereotypic, compulsive, and impulsive. Each type was classified based on phenomenology of NSSI including methods, frequency, pattern, degree of tissue damage, and the tendency to occur more commonly with certain mental disorders (Simeon & Favazza, 2001). The classification scheme is difficult to apply to community research of adolescent NSSI, because it is based on clinical studies of individuals with diagnosed mental disorders and the classification is descriptive. Therefore, it is difficult to differentiate a highly repetitive

pattern from a repetitive pattern in NSSI, or to distinguish differences between mild tissue damage and moderate tissue damage.

The most commonly reported method adolescents use to engage in NSSI is cutting (about 50%); other methods included hitting, biting or punching, scratching, burning, and banging (Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp & Gutierrez, 2007; Zoroglu et al., 2003). About three-fourths of self-injurers harmed themselves using a single method, with the remaining one-fourth using multiple methods (Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007). However, whether acts such as scratching oneself or hair pulling represent an "abnormal" behavior of self-injury is debatable. The research is inconclusive regarding gender differences related to method of adolescent NSSI. Only one study reported method used by gender, demonstrating that cutting was the most common method reported by girls, whereas hitting, biting, or punching was the more common method reported by boys (Laye-Gindhu & Schonert-Reichl, 2005). In Taiwanese qualitative studies, cutting was also reported as the major method of self-injury. Study participants provide some explanation as to the reason for using cutting as a method; they reported that cutting had a rapid effect in gaining emotion relief and access to methods—knives or blades—was relatively easy. Some participants carried a knife with them every day (Chen, 2000; Cheng, 2004; Hsu, 2004; Huang & Lin, 2005).

Most of self-injurers harm themselves repetitively, but there is no consensus regarding the meaning of a repetitive pattern of self-injurious behavior. For example, Laye-Gindhu and Schonert-Reichl (2005) reported that a majority (75%) of participants harmed themselves repeatedly in the past year, with 52% endorsing 2-10 times, 12% 11-20 times, and 12% over 20 times. Muehlenkamp and Gutierrez (2007) reported that the life-time prevalence of self-injurious behavior was 25.6% for one incident, 34.4% for 2-3 incidents, and 21.6% for 4 or more incidents; the rate of at least one incident in the past year was 59.2%. Adolescents commonly engage in self-injurious behavior in a solitary environment and keep self-injurious behavior as a secret (Evans, Hawton, & Rodham, 2005; Puskar, et al., 2006). Research has showed that approximately 36% of self-injurers never told others about their self-injurious behavior ((Whitlock, Eckenrode, & Silverman, 2006). In Taiwanese qualitative studies, participants reported that they typically injured themselves in a private setting at home or school, such as in their bedroom, bathroom, or classroom. Most participants tried to hide their NSSI, but a few reported that they openly self-harmed in the classroom (Chen, 2000; Cheng, 2004; Hsu, 2004; Huang & Lin, 2005).

Theories of Nonsuicidal Self-injury

The combination of biological, psychological and social characteristics may lead to some adolescents to become involved in nonsuicidal self-injurious behaviors. Classical psychological theories regard self-injury, like other neurotic symptoms, as a direct expression

of either aggressive or sexual drives or the fusion of both (Favazza, 1989). The most common interpretations of NSSI have focused on immediate antecedents, consequences and psychological functions of self-injurious behavior (Suyemoto, 1998; Klonsky, 2007; Messer & Fremouw, 2008). A typical experience of NSSI can be summarized as such: before the act of self-injury adolescents experienced negative feeling or strong tension, such as anxiety, anger, depression, or hopeless; they experienced little or no pain, numbness or dissociation during the act; following an act of self-injury, they experienced feelings of gratification, relief and comfort or combination of shame, guilt and regret (Simeon & Favazza 2001; Jacobson & Gould, 2007). Thus, self-injury is theorized to be a function to regulate heightened emotion or to cope with intolerable states. Behavioral theories focus on self-injurious behavior, maintained by automatic negative reinforcement to avoid aversive stimuli (e.g., tension or other negative affective states) or by positive social reinforcement (e.g., gaining attention) (Favazza, 1989). A recent behavioral approach includes that NSSI is also reinforced by automatic positive reinforcement (e.g., prompting feelings), and by social negative reinforcement (e.g., escaping from interpersonal task demands) (Nock & Prinstein, 2004; Nock & Prinstein, 2005).

Biological explanations for NSSI have been linked with decreased serotonin function and the endogenous opioid system (Grossman & Siever, 2001). Reduced serotonin function has been associated with negative affect in individuals with NSSI (Crowell et al., 2008). Two

prominent hypotheses linked with the endogenous opioid system are the addition hypothesis and the pain hypothesis. The addition hypothesis suggests that individuals engage in NSSI to reduce dysphoria. That is, the individual with frequent NSSI develops a tolerance to the normal endogenous opioid system and suffers a withdrawal reaction, thus a cycle is formed in which self-injurers hurt themselves to feel better. The pain hypothesis suggests a constitutional abnormality in the endogenous opioid system that is unmasked by the environment such that pain sensitivity is diminished. Thus, individuals may hurt themselves in an attempt to supply sensory stimulation to increase pain sensitivity again (Grossman & Siever, 2001).

Diagnosis of Nonsuicidal Self-injury

Nonsuicidal self-injury is included as a condition requiring further study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, pp. 803-806, 2013). The DSM-5 NSSI diagnostic criteria are described below.

DSM- NSSI Diagnostic Criteria

A. In the last year, the individual has, on 5 or more days, engaged in intentional self-inflicted damage to the surface of his or her body of a sort likely to induce bleeding, bruising, or pain (e.g., cutting, burning, stabbing, hitting, and excessive rubbing), with the expectation that the injury will lead to only minor or moderate physical harm (i.e., there is no suicidal intent). Note: The absence of suicidal intent has either been stated by the individual or can be inferred by the individual's repeated engagement in a behavior that the individual knows, or has learned, is not likely to result in death.

B. The individual engages in the self-injurious behavior with one or more of the following expectations to:

(1) obtain relief from a negative feeling or cognitive state,

(2) resolve an interpersonal difficulty,

(3) induce a positive feeling state.

Note: The desired relief or response is experienced during or shortly after the self-injury, and the individual may display patterns of behavior suggesting a dependence on repeatedly engaging in it.

DSM- NSSI Diagnostic Criteria (continued)

C. The intentional self-injury is associated with at least one of the following:

(1) interpersonal difficulties or negative feelings or thoughts, such as depression, anxiety, tension, anger, generalized distress, or self-criticism, occurring in the period immediately prior to the self-injurious act,

(2) prior to engaging in the act, a period of preoccupation with the intended behavior that is difficult to control,

(3) thinking about self-injury that occurs frequently, even when it is not acted upon.

D. The behavior is not socially sanctioned (e.g., body piercing, tattooing, part of a religious or cultural ritual) and is not restricted to picking a scab or nail biting.

E. The behavior or its consequences cause clinically significant distress or interference in interpersonal, academic, or other important areas of functioning.

F. The behavior does *not* occur exclusively during psychotic episodes, delirium, substance intoxication, or substance withdrawal. In individuals with a neurodevelopmental disorder, the behavior is not part of a pattern of repetitive stereotypies. The behavior is not better explained by another mental disorder or medical condition (e.g., psychotic disorder, autism spectrum disorder, intellectual disability, Lesch-Nyhan syndrome, stereotyped movement disorder with self-injury, trichotillomania [hair pulling disorder], and excoriation [skin picking disorder]).

NSSI Measurement Issues

Currently, few valid measures exist to assess self-injurious behavior, and such measures are especially scarce for the assessment of adolescent NSSI. Available measures focus on aspects of the onset, duration, method, and frequency of self-injurious behavior (e.g., Gratz, 2001; Lloyd, Kelley, & Hope, 1997); some also include aspects of functions, severity, or alcohol/drug use (e.g., Lloyd et al., 1997). A comparison of currently used measures is shown in Table 1. Although severity of self-injurious behavior has been assessed, the severity has been indicated in the measurement of different facets of self injury, including severity of physical injury, severity of thoughts, and severity of forms. Severity is most often assessed based on whether or not physical damages caused by self-injurious behavior require medical treatment (e.g., Lloyd et al., 1997; Gratz, 2001), typically measured by a single yes/no response. Problems in centering the assessment of severity on physical damages include: (1) the majority of self-injurers who intend to keep the behavior as a secret, hide physical

damage, curbing the ability to accurately assess damage severity; (2) receiving medical treatment might not reflect the severity of injury, but rather the fact that someone (e.g., parent or a teacher) ensured that the youth's self-injury was treated. Severity of thoughts has been assessed by the intensity of thoughts about engaging in non-suicidal self-injury (NSSI) rated on a 0-4 point scale in the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007). The severity of types of NSSI has been assessed on whether or not the methods were clinically determined to be severe threats, as captured in the Functional Assessment of Self-Mutilation (FASM; Lloyd et al., 1997). Cutting/carving, burning, self-tattooing, scarping, and erasing skin have been denoted as moderate/severe forms of NSSI; hitting or biting self, pulling hair, inserting objects under nails or skin, picking at a wound and picking areas to draw blood were denoted as minor forms.

A more definitive way to assess severity, used in the Suicide Attempt Self-Injury Interview (SASII; Linehan et al., 2006), requires a trained professional to assess lethality of the method by evaluating both the forms of self-injury and the degree of physical damage (i.e., scares, bruise, swelling, stitches). Although these measures indicate specific facets of severity related to self-injury, none indicates the overall severity of the behavior. While most self-injurers engaged in self-injurious behaviors repetitively, it is important to assess overall severity to characterize a prolonged, repetitive pattern of the behavior. For assessment of self-injurious behavior, Simeon and Favazza (2001) suggest that the chronicity, frequency, and

medical sequalae be considered together to create a summary assessment of overall severity of an individual's self-injury. They also emphasized the importance of assessment of individual's subjective experience of the behavior, their intent to engage in the behavior, effort to resist it, ability to control it, and the physical pain experienced during the act.

Table 1. Comparison of Five Self-Injurious Measures

Measure	Functional Assessment of Self-mutilation (FASM)	Deliberate Self-harm Inventory (DSHI)	Self-Injurious Thoughts and Behaviors (SITBI)	Suicide Attempt Self-Injury Interview (SASII)	Self-Injurious Behaviors Questionnaire (SIBQ)
Description	Self-report questionnaire to measure methods, frequency, & function of self-mutilative behaviors.	Behaviorally based, self-report questionnaire to measure deliberate self-harm frequency, severity, duration, & type of self-harm behavior.	Structured clinical interview (total 169 items, 5 domains) to assess presence, frequency & characteristics of: suicide ideation, plans, gestures, attempts & nonsuicidal self-injury.	Structured clinical interview to assess factors associated with suicide attempts & intentional self-injury: timing, frequency, methods, lethality & impulsivity of the act, suicide intent, rescue likelihood & consequences.	A self-report questionnaire to assess types & frequency of intentional non-lethal self-injury.
Measure Domains Related to NSSI					
Onset	Yes	Yes	Yes	Yes	N/A
Duration	Yes	Yes	Yes	Yes	N/A
Method	11 items with yes/no format	17 items with yes/no format	11 items	4 items	6 items
Frequency	12-month incidents of each method. Response options 5-point frequency scale: 1=0 times; to 5=≧11 times	Life time frequency=sum frequency each item (method) for total DSH frequency	Life-time, past year, and past month frequency	Life-time, past year, and past month frequency	Lifetime frequency: cutting, burning, head banging, scratching, punching, hair pulling. 4-point Likert-type scale (0=Never to 3=often/many times)
Severity	Have you gotten medical treatment?	Has this behavior ever resulted in hospitalization or injury severe enough to require medical treatment?	Have you ever received medical treatment for harm caused by NSSI? Thoughts of NSSI? Response: average (0-4 scale) worst point (0-4 scale)	Lethality of method: How many stitches? A) 1=scratch; 2=cuts, no tendon, artery, nerve damage; 3=tendon, artery, nerve damage) Scars/ bruise/swelling?	N/A
Pain experienced	0-4 scale	N/A	0-4 scale	1-5 scale: 1=little to 5=extreme	N/A
Dissociation	N/A	N/A	N/A	Yes	N/A
Alcohol/drug use	Yes (1 yes/no item)	N/A	Yes (% of time)	Yes (2 yes/no items)	N/A
Functions	Reported reasons (22 items (0=never, 3=often)	N/A	0-4 scale	Motives & reasons, 28 items (1= mentioned)	N/A
Reliability & Validity	N = 368 adolescents from psychiatric inpatients & community. Cronbach alpha =0.84-0.91 (9^{th} - 12^{th} graders); alpha=0.67-0.85 (12^{th} graders)	N=150 students, 18-64 yrs. (M =23.2).; Cronbach alpha =0.82; Test-retest: 0.92, $p <$ 0.001. Adequate construct, convergent, & discriminant validity.	N=94 adolescents/young adults (M =17.1 yrs.) from psychiatric clinic & community. Interrater-reliability: k=0.99, r= 1.0; Test-retest: k=0.70, r=1.0, ICC=0.44; Construct validity: average k=0.54-0.87.	5 cohorts, clinical adult patients (N=75, 75, 44, 117, 27). Interrater-reliability: 0.87-0.98; adequate validity	N=100 female undergraduate students. Cronbach alpha=0.84.

Emotional Reactivity and NSSI

"Emotion reactivity refers to the extent to which an individual experiences emotions (a) in response to a wide array of stimuli (i.e., emotion sensitivity), (b) strong or intensely(i.e., emotion intensity) , and (c) for a prolonged period of time before returning to baseline level of arousal (i.e., emotion persistence)" (Nock et al., 2008. p. 107). The most commonly proposed explanation of NSSI is that NSSI is a means of affect regulation; self-injurers experience extreme and intolerable emotional arousal in response to stressful events, which curbs the emotional tension and arousal, negatively reinforcing NSSI (Bennum, 1984; Suyemoto, 1998; Klonsky, 2007; Messer, & Fremouw, 2008). Klonsky (2007), in an empirical research review, reported that results from 18 studies provided converging evidence for affect-regulation with NSSI being associated with reductions in emotional arousal. In a recent objective physiological and behavioral research, findings support the relationships among stressful events, heightened physiological arousal, and NSSI. Nock and Mendes (2008) compared adolescent self-injurers (N=62) with noninjurers (N=30) and found that self-injurers showed higher physical reactivity (skin conductance) during a stress task and a poorer ability to tolerate this distress. So far, there is no consensus regarding the specific emotions in the emotional regulation model (Klonsky, 2007). Ross and Health (2003), using self-report from 440 high school students, assessed whether NSSI in adolescence was characterized by greater feelings of anxiety and hostility. The authors reported that students

with NSSI reported significantly more anxiety and more intropunitive and extrapunitive hostility. A semi-structured interview was also conducted to understand the feelings of self-injurers *prior to* NSSI. Results indicated that, of adolescents who self-injured, 8.2% (N=5) endorsed only feelings of anxiety prior to NSSI, 26.2% (N=16) endorsed only feelings of hostility prior to NSSI, and 54.1% (N=33) endorsed feelings of both anxiety and hostility, with another 11.5% endorsing feelings of sadness and loneliness prior to NSSI. Although the authors concluded that the study evidenced greater support for a hostility model of NSSI due to components of hostility found in all cases. However, much of information was drawn from the semi-structured questionnaire for which there was no reliability or validity, thus their conclusions remain questionable.

Peer Relationships and NSSI

Adolescent peer relationships refer to reciprocal social and emotional interactions between the adolescent and his/her peers, including classmates, friends, and intimate friends. Both clinical and community studies provide evidence that adolescents use NSSI to escape from interpersonal task demands or to gain attention from others (Nock & Prinstein, 2004; Lloyd-Richardson et al., 2007). In another study, Laye-Gindhu and Schonert-Reichl (2005) reported that 15% of boys but no girls endorsed “help me join a group” as a reason for NSSI. In a community study that recruited only girls (ages 10-14 years), Hilt, Cha, and Nolen-Hoeksema (2008) reported that peer victimization-associated NSSI was used to avoid being

with other people or to gain attention/access to other people. The quality of peer communication moderated this relationship; girls who experienced peer victimization and poor quality peer communication were more likely to engage in NSSI for social reinforcement and avoidance reasons. Muehlenkamp and Gutierrez (2007) examined peer acceptance/support between individuals with and without NSSI, reporting no significant group differences on peer acceptance and support. The findings contradicted findings from Taiwan, that reported significant differences between self-injurers and non-self-injurers on peer support and interpersonal relationships with classmates/friends (Lin, 2001). Qualitative studies in Taiwan have also indicated that peer relationships are very important to self-injurers; problems with classmates, friends, and boy/girlfriend were major reasons given for involvement in NSSI; moreover, most felt isolated from their classmates/friends. The results point to the fact that NSSI adolescents experience difficulty in their peer relationships, and that quality of adolescent peer relationships may be a key risk factor in association with NSSI.

Peer relationships and emotional reactivity. Emotion regulation in stressful situations is a central developmental task in adolescence. Peer relationships have been identified as a major stressor to elicit emotional arousal in adolescents. For example, intimate relationships explained 25%-34% of the intense emotions that high school students experienced; of these intense emotions, about 42% were negative feelings, such as anxiety, anger, jealousy, and

depression (Larson et al., 1999). Whitesell and Harter (1996) examined the reactions of adolescents to hypothetical anger-provoking actions by best friends and classmates, with a sample of 96 students ages 11-15. Results indicated that interpersonal context elicited negative emotion, including anger, sadness, and fear, and that best friends elicited more intense and prolonged negative emotions than classmates. Adolescents who are victimized by peers and those who have negative peer relationships tend to display higher rates of negative feelings than other adolescents. La Greca and Harrison (2005) examined peer relations, friendships, and romantic relationships and their association with social anxiety and depression in a sample of 421 adolescents. Results indicated that relational victimization and negative interactions in best friendships predicted high social anxiety, and that relational victimization and negative qualities of best friendships and romantic relationships predicted depressive symptoms.

Family Functioning and NSSI

Family functioning encompasses how family members communicate, relate, and maintain relationships, and how they make decisions and solve problems (Zubrick et al., 2000). According to Steinberg and Silk (2002), the single most consistent predictor of adolescent mental health and well-being is the quality of the relationship the young people have with their parents. Qualitative studies in Taiwan indicated that poor parental marital relationships and parent-child relationships were among the primary factors related to

adolescent NSSI. “Family problems” was the most common type of life stress event endorsed by self-injurious adolescents. Adolescents with NSSI reported being usually ignored by members of their family, that violence was used as a means of child discipline by the primary caregiver, and that very reserved or non-communicative interaction was common within the family (Chen, 2000; Huang & Lin, 2005; Cheng, 2004). Crowell et al. (2008) explored the relation between mother-child interaction patterns among typical (n = 21) and self-injuring (n = 20) adolescents, by administering a task of “mother-child discussion” questionnaire to elicit areas of conflict between parents and teenagers. Findings revealed that families of self-injuring participants had higher levels of negative affect, and lower levels of both positive affect and cohesiveness than families of non-self-injuring participants. Laye-Gindhu and Schonert-Reichl (2005) reported self-injurers were more likely to be from a single-parent family, but Garrison, Cherry and McKeown (1993) reported that whether or not both natural parents lived in the home was not a significant correlate. Higher family cohesion, however, was associated with less frequent occurrences of NSSI (Garrison et al., 1993), suggesting that family cohesion might be a protective factor for NSSI. Compared to non-self-injurers**,** self-injurers were more likely to have a parent with a serious illness or disability (Garrison et al., 1993).

Family functioning and emotional reactivity. It has been suggested that an early dysfunctional family environment is related to risk for multiple mental disorders in adulthood, risks that

may be mediated, in part, by deficits in emotion regulation skills. Taylor et al. (2006) examined neural mechanisms underlying these consequences of "risky" families (defined as exposing offspring to chronic or recurrent familial stress) by exploring neural activity to tasks involving responses to emotional stimuli. Participants completed an assessment of "risky" families and participated in a functional magnetic resonance imaging (fMRI) investigation of amygdala reactivity to the observation of fearful/angry faces. Results indicated that offspring from risky families showed little amygdala activation during the observation task and a strong positive correlation ($r = 0.66$) between amygdala and right ventrolateral prefrontal cortex and amygdala activation in the labeling task, suggesting a possible dysregulation in the neural systems involved in responses to emotional stimuli (Taylor et al., 2006).

Childhood Maltreatment, Emotional Reactivity and NSSI

Childhood maltreatment refers to four primary acts: physical abuse, neglect, sexual abuse, and emotional abuse. Clinical case studies indicated that adolescent NSSI is associated with childhood maltreatment (Favazza, 1996; Levenkron, 1998). That is, NSSI subjects reported more frequent physical abuse, emotion abuse, sexual abuse and neglect in comparison with subjects who did not engage in NSSI. Also, an increased number of trauma types was associated with NSSI. Importantly, sexual abuse was associated with NSSI in all studies (Zoroglu et al., 2003; Kiesel, & Lyons, 2001; Lipschitz et al., 1999; Nixon et al., 2002), as were physical abuse, emotional abuse, and parental neglect (Zoroglu et al., 2003;

Lipschitz et al., 1999; Nixon et al., 2002). Zoroglu et al (2003) examined abuse, neglect, self-mutilation and suicide attempt, and dissociative experiences among 862 Turkish high school students and reported that abused or neglected groups (34.3%) had 7.6-fold higher suicide attempts and 2.7-fold higher self-mutilation behaviors. Logistic regression showed that each type of trauma and dissociation contributed to suicide attempts and self-mutilation. Weierich and Nock (2008) examined relationship among childhood abuse, posttraumatic stress disorder (PTSD) symptom, and NSSI. Participants were 86 adolescents (78% female; mean age = 17.03 years, range = 12-19 years) who completed measures of childhood abuse, Diagnostic and Statistical Manual of Mental Disorders (4th ed.) PTSD symptoms, and NSSI. Analyses revealed a significant association between childhood sexual abuse and the presence and frequency of NSSI.

Emotional dysregulation is often caused by early exposure to psychological trauma (such as emotional abuse) or chronic maltreatment (such as child abuse, child neglect, or institutional neglect/abuse), and is strongly associated with post-traumatic stress disorder (e.g., linked to sexual abuse) (Pynoos, Steinberg, & Piacentini, 1999; Weierich & Nock, 2008). Child abuse and neglect affect the biologically-based capacity to regulate the intensity of affective responses, thus most abused and neglected children are unable to modulate emotions. Abused children often fail to develop the capacity to express specific and differentiated emotions (van der Kolk & Fisher, 1994).

Depression, Suicidal Behaviors and NSSI

Adolescent suicide is the second-leading cause of death for youth ages 15 to 24, only secondary to accidents, both in the United States (Center for Disease Control and Prevention, 2015) and in Taiwan. Although some disagreement exists among researchers, an important distinction has been made between suicidal behavior and NSSI, with suicidal behavior referring to engaging in the intent to end one' s life and NSSI referring to causing the direct and deliberate damage of one's own body tissue without suicidal intent (Nock & Favazza, 2009; Orlando, Broman-Fulks, Whitlock, Curtin, & Michael, 2015). That is, suicidal behaviors differ from NSSI in terms of intention, method, and severity/lethality. In addition, differences between suicidal behavior and NSSI exist in prevalence, frequency, and functions (Klonsky, May, & Glenn, 2013). Emerging research indicate that NSSI and suicidal behavior might be a continuum of self-injurious behavior. Hamza, Stewart and Willoughby (2012) reviewed 18 studies in which researchers specifically examined whether NSSI was a risk factor for suicidal behavior and concluded that NSSI was a robust predictor of suicidal thoughts and behaviors consistently across studies, and that higher levels of suicidal ideation and suicide attempt were significantly associated with individuals who engaged in NSSI. A higher risk of suicide is prominent for adolescents who concurrently engage in NSSI and suicidal behaviors, despite that most NSSI adolescents never attempt suicide. Only 14-30% of community adolescents who engaged in NSSI also ever engaged in suicide attempt; the co-

occurrence of NSSI and suicide attempts is about 4-7% (Garrison et al., 1993; Muehlenkamp & Gutierrez, 2007; Brausch & Gutierrez, 2010). Therefore, it is important for prevention and early interventions to identify factors which link and differentiate NSSI-only youth from youth with both NSSI and suicidal behaviors. However, studies that focus on community sample are scarce. Garrison and colleagues (1993) examined correlates of NSSI in youth 12-14 years (N= 444) and found significant associations between NSSI and suicidal ideation, major depression and undesirable life events. Two studies found more severe anhedonia and negative self-evaluations in comparisons of NSSI adolescents with at least one prior suicide attempt vs. NSSI-only adolescents (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007). Those findings suggest that depressive symptoms may account for the relationship between NSSI and suicidal behavior. Depression has been identified as a strong and consistent correlate and a significant predictor of adolescent suicidal behaviors (Thompson, Mazza, Herting, Randell, & Eggert, 2005). Research has shown that NSSI is a strong predictor of future suicide attempts in depressed adolescents (Klonsky, May, & Glenn, 2013; Guan, Fox, & Prinstein, 2012; Asarnow et al., 2011). Asarnow and colleagues (2011) examined suicide attempts (SAs) and NSSI in adolescents with treatment-resistant depression (N=334) over a 24-week period and reported that the frequency of NSSI was a stronger predictor of suicide attempts than were previous suicide attempts. Literature reviews illustrate surprising similarities between NSSI and depression: (1) the incidence of depression, notably

in girls, rises sharply after puberty; (2) negative family relationships, peer victimization through bullying, and maltreatment are common risks for depression (Thapar, Collishaw, Pine, & Thapar, 2012); (3) emotional dysfunction has been increasingly seen as central to depression (Rottenberg, 2017). Although heightened negative emotional reactivity is reported both in adolescent NSSI and depression, some differences should be noted: (1) the negative emotion is more persistent in depression; (2) for depressed individuals, NSSI is less likely to provide relief from a negative feeling ; (3) laboratory studies suggest that depression might involve a generalized loss of context-appropriate emotional reactivity to both positive and negative valenced stimuli, labeled emotion context insensitivity (Rottenberg, 2017). It is possible that depression and emotional reactivity might be able to differentiate subgroups of NSSI adolescents with and without suicide behaviors. Thus, for this study, depression and suicidal behavior were examined concurrently (Aim 3) to determine if there are distinct subgroupings of youth, and to explore the differential influence of contextual factors on such subgroupings.

Contextual Model of Adolescent NSSI

This study proposes an explanatory model of adolescent NSSI that incorporates the impact of contextual factors – specifically, childhood abuse, peer relationship quality, and family functioning – on adolescent self-injurious behavior, and that the influence of these contextual factors are mediated by emotional reactivity. Empirical studies demonstrate that

adolescents use NSSI to regulate heightened emotion and/or to cope with intolerable stress states, and that the behavior is maintained by automatic (operant) or social reinforcement. Childhood abuse history is known to cause deficits of emotion regulation. Stress events such as interpersonal or intrapersonal stress heighten emotional reactions. Knowledge "what" or "who" triggers intense negative emotion of self-injurers is limited. Thus, one important and logical step in this field of research is to incorporate contextual factors specific to adolescent emotion reactivity into models of adolescent self-injurious behavior.

CHAPTER 3.

RESEARCH DESIGN AND METHODS

This chapter describes the methodology that was used to test, in part and in full, an explanatory model of NSSI and includes study design, samples and settings, measures, procedures, data analysis, and human subjects and data safety and monitoring plans

Design

This study used a cross-sectional correlational design to test the explanatory model of adolescent NSSI, to examine for potential mediating and moderating effects of contextual factors on NSSI, and to explore for subgroupings of youth based on reported NSSI and/or suicidal behavior.

Sample

The study sample included 799 youth between the ages of 17 and 22 years, currently enrolled in a university located in northern Taiwan. None of participants were married. According to the National Statistics in Taiwan, in 2015 the average marriage age for males and females was 34.2 and 31.4 respectively. Thus, the probability of including participants who were married was low.

Inclusion and Exclusion Criteria

Inclusion criteria included (1) male and female youth, 17-22 years old and (2) able to read and write Chinese. Exclusion criteria were (1) intellectual limitations or (2)

developmental disabilities that would preclude study participation.

Recruitment

The recruitment site included a junior college, making it possible to recruit adolescents under the age of 18 as well as young adults to the age of 22. The designated site allowed for the study of NSSI in youth from diverse geographic and ethnic backgrounds, as the school recruits students from a national entrance exam system. Moreover, the school is a key aboriginal school in Taiwan, with at least 100 aboriginal students (Ministry of Education, Taiwan).

Power analysis

For regression analysis, statisticians recommend having at least 30 participants for each variable in the model to observe statistically significant path coefficients needed to validate the model, thus reducing the risk of a Type II error (Burns & Grove, 2005). Kline (2005) recommends that for structural equation modeling (SEM) a ratio of 20:1 cases to the number of free parameters for a complicated path model, but notes that a 10:1 ratio may be a more feasible (p. 111). Norris (2005) noted that a minimum sample size of 200 is likely to generate an adequate power (0.8) for SEM. A minimum of three indicators per latent factor is needed to ensure model identification (Kline, 2005, p. 172). Taken together, the projected minimum sample size of 200 would have been sufficient for model testing. However, because NSSI is a

low base rate phenomenon, at least 800 participants were recruited to ensure capturing a sufficient number of NSSI cases of both male and female students.

Measures

Six questionnaires used to capture the major theoretical concepts in the model are described below. Three of these questionnaires, originally published in English, were translated into Chinese and evaluated for translation validity prior to data collection. A multiple indicator approach was used to measure latent variables.

Nonsuicidal Self-Injury

Functional Assessment of Self-Mutilation (FASM; Lloyed, Kelley, & Hope, 1997; see Appendix 1) was used to assess non-suicidal self-injurious behavior. The FASM is a self-report measure of the methods, frequency, and functions of self-mutilation in adolescents. Questions about the onset, the length of time to contemplate the behavior, and the pain experienced during nonsuicidal self-injury are also included. The FASM begins with the question "In the past year, have you engaged in the following behaviors to deliberately harm yourself" then following 11 items of methods with yes/no format response (plus a fill-in 'other' category), along with spaces of each item to indicate the frequency and medical treatment of that behavior. The FASM then asks the question "While doing any of the above acts, were you trying to kill yourself?" with yes/no format response. For this study, those two questions are modified to one question "In the past year, have you engaged in the following

behaviors to deliberately harm yourself without trying to kill yourself?" Items are coded in terms of frequency based on a 0-4 point frequency scale (0 = 0 times, 1 = 1 time, 2 = 2-4 times, 3 = 5-10 times, 4 ≧ 11 times). According to the DSM 5, criteria for NSSI require 5 or more days of intentional self-inflicted damage to the surface of the body without suicidal intent within the past year. The FASM has been tested across several studies with adolescent samples (Nock & Prinstein, 2004, 2005; Yates, Tracy, & Luthar, 2008); acceptable internal consistency (Cronbach alpha) is reflected in community samples of 9^{th} - 12^{th} graders (alpha range = 0.84-0.91) and 12^{th} graders (alpha range = 0.67-0.85) (Yates, Tracy & Luthar, 2008). Because the FASM does not measure lifetime frequency of NSSI, the item, "How many times in your life have you engaged in self-harm without trying to kill yourself?" was added to the questionnaire.

Emotional Reactivity

The *Emotional Reactivity Scale* (ERS; Nock et al., see Appendix 2) is a 21-item self-report measure designed to assess experiences of emotional reactivity. The ERS consists of 21 items, divided into three subscales to measure emotion sensitivity (e.g., "My feelings get hurt easily," 10 items, α = .88), emotion intensity (e.g., "I experience emotions very strongly," 7 items, α = .86), and emotion persistence (e.g., "When something happens that upsets me, it's all I can think about it for a long time," 4 items, α = .86) that can be summed to one overall score (21 items, α = .94) . Each item is rated on a 5-point rating scale, ranging

from 0 = “not at all like me” to 4 = “completely like me.” Generally, the ERS total score has not been significantly related to age or sex. Factor analysis revealed a single factor of emotion reactivity best characterized the data (Nock et al., 2008). The ERS has shown strong internal consistency (alpha=.94), convergent and divergent validity via associations with behavioral inhibition/activation and temperament, and criterion-related validity as measured by associations with specific types of psychopathology and self-injurious thoughts and behaviors (SITB) in a sample of 87 adolescents and young adults (Nock et al., 2008).

Family Functioning

The *General Functioning* subscale (Epstein, Baldwin, & Bishop, 1983; see Appendix 3) of *McMaster Family Assessment Device* (FAD-GF) was used to assess family functioning. The FAD is a self-report instrument developed to assess structural and organizational properties of the family, and the patterns of transactions among family members that distinguish between healthy and unhealthy families. The FAD has seven subscales, including the General Functioning scale, which assesses overall family health and pathology, and one subscale for each of the six dimensions of family functioning including problem solving, communication, roles, affective responsiveness, affective involvement and behavior control. Sample General Functioning items include “We avoid discussing our fears and concerns” (Item 5), “There are lots of bad feelings in the family” (Item 7). The FAD has strong test-retest reliability and validity. Cronbach alpha's range from 0.72 to 0.92 between subscales in

various studies (Epstein et al., 1983; Miller, Epstein, Bishop, & Keitner, 1985). The 12 items of the *General Functioning* (GF) subscale were rated on a 4-point Likert response format from "strongly disagree" to "strongly agree." After recoding positively-oriented items, items were summed to obtain a total score ranging from 12 to 48 by reverse scoring, with a higher total score on the subscales indicating a higher level of family functioning. The *random algorithm* method of parcel approach was used to divide the GF scale items into 3 indicators, in which each item was assigned to one of the parcels randomly and without replacement (Matsunaga, 2008). The Chinese version of GF scale has demonstrated internal consistency, concurrent validity and construct validity with different adolescent samples in Hong Kong (Shek, 2001). Internal consistency of Chinese GF was 0.89 in a sample of 2054 Taiwanese students aged 15-20 (Chen & Cheng, 2001).

Peer Relationship Quality

The *Interpersonal Relationship* subscale of the *Adolescent Social Adjustment Scale* (ASAS-IR; Luo et al., 2004; see Appendix 4) was used to assess peer relationship quality. The ASAS is a 31-item questionnaire used to assess psychosocial factors associated with social adjustment among adolescents in Taiwan, including academic performance, family, interpersonal relationship and self-statement. The *Interpersonal Relationship* (IR) subscale assesses adolescent/youth perception of their interpersonal relationships with peers (e.g., friends, intimate friend) in the social context of Taiwan. Sample items are "I get along well

with others" (Item 1), "I am popular with the other-sex" (Item 8). The ASAS was constructed based on interview of high school students and literature reviews. The ASAS has been tested with a sample of 262 high school students in Taiwan. Cronbach's alpha of IR is reported as 0.84 (Luo et al., 2004). The 8 items of the IR subscale were rated with a 4- point Likert response options ranging from 1= "strongly disagree" to 4 = "strongly agree." The subscale items were divided into 3 groups based on similar semantics; each group served as a separate indicator, with high scores indicating positive or high peer relationship quality.

Childhood Abuse History

The *Child Maltreatment* module and the *Sexual Victimizations* module from the Juvenile Victimization Questionnaire, adult retrospective version (JVQ-AR; Finkelhor, Hamby, Ormrod, & Turner, 2005; see Appendix 5) was used to assess childhood abuse history. The JVQ-AR is a 34-item self-report instrument developed to assess crime, childhood maltreatment, and other victimization experiences at or before age 17. The Child Maltreatment module uses 4 items to assess physical abuse, psychological/emotional abuse, neglect, and custodial interference/family abduction, each of which serves as a separate indicator. The Sexual Victimizations module with 7 items assesses experiences of sexual assault or rape, which are summed to serve as a single indicator. The JVQ-AR items were rated with a 6-point response option scale ranging from 0 = "no" to 5 = "5 times or more times." Each module can be scored to produce a life-time incident rate for a single item or for

the module, or to produce a total number of *forms of victimization* for that module. Examples of questions include, "Not including spanking on your bottom, when you were a child (ages 0 to 17), did a grown-up in your life hit, beat, kick, or physically hurt you in any way?" and "When you were a child, did a grown-up you know touch your private parts when you didn't want it or make you touch their private parts? Or, did a grown-up you know force you to have sex?" The JVQ has been tested in a national sample of 2030 children ages 2-17 (Finkelhor et al., 2005). Test-retest reliability was adequate (average k=0.59) in a 3 to 4 week re-administration. In a test of construct validity, endorsements of JVQ items correlated well with measures of traumatic symptoms. Internal consistency reliability for the full JVQ was strong (Cronbach's alpha = 0.80).

Control and Demographic Variables

Suicidal behaviors (suicide ideation/suicide attempts) were assessed using the Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001). The SBQ-R is a 4-item self-report questionnaire measuring key dimensions of suicidal behaviors: lifetime suicide ideation and/or suicide attempt ("Have you ever thought about or attempted to kill yourself?"), frequency of suicidal ideation over the past 12 months ("How often have you thought about killing yourself in the past year?"), threat of suicide attempt ("Have you ever told someone that you were going to commit suicide, or that you might do it?"), and likelihood of suicidal behavior in the future ("How likely is it that you will attempt suicide

someday?"). Items are rated on 5- or 7-point Likert-type scales, ranging from 0 or 1 = "*never*" to 5 = "*very often*" or 6 = "*very likely.*" Higher scores indicate greater suicidal behaviors. The SBQ-R has been validated with a number of adolescent and general samples and has shown adequate internal consistency and reliability (Osman et al., 2001). Internal reliability for the SBQ-R was .81 in a sample of 331 college students (Chang et al., 2017).

Depression was assessed using the *Center for Epidemiologic Studies Depression Scale* (CES-D; Radloff, 1977) ten-item short form (CES-D 10; Kohout et al., 1993). Sample items include "I feel depressed," "I feel lonely," and "I feel that people dislike me." The CES-D 10 has strong test-retest reliability and validity across various populations. The validity and internal consistency of Chinese-version ten-item scale have also been demonstrated in a sample of 293 college students in Taiwan (Yu, Lin, & Hsu, 2013).

A questionnaire was included to elicit demographic information, including age, grade, gender, ethnicity, marital status, parents' marital status, parental education, household income, family composition, medical history, and psychiatric history. Medical and psychiatric history items include: "Have you ever been hospitalized? (Yes/No) For each hospitalization, please indicate when you were hospitalized and the reason for hospitalization." "Have you visited a doctor for psychiatric-mental health reasons such as depression?" (Repeated for suicidal thoughts or behavior problems, producing 3 separate Yes/ No responses.) "For each type of visit, indicate the number of times you visited and the how recent the last was," and

"Are you currently taking any medications? (Yes /No) If yes, in the section below, please describe the medication, dose and reason for taking." Demographic variables associated (r > .25) with emotional reactivity and/or NSSI in the preliminary analyses were included as adjustment variables in all analyses.

Translation validity

Three questionnaires, originally published in English (FASM, ERS, and JVQ-AR), were assessed for translation validity prior to data collection. First, using a translation-back translation procedure (van der Vijver & Leung, 1997), the questionnaires were translated into Chinese by the investigator and then translated back to English by an independent translator who was fluent in both Chinese and English language. The back-translated versions were compared to the original English versions to test their comparability and similarity on a scale 1-10 by three expert judges. An average score of 8 or more was criteria for acceptability. Second, face validity was assessed. Two Chinese language experts reviewed the Chinese version to validate the language, word choice, sentence structure and comprehensibility of terms. A panel of six 18-year-old students were asked to assess the scale items and instructions for accuracy and appropriateness for this target group. Third, content validity was evaluated by a panel of three experts in the field. The Chinese versions were evaluated for relevance and clarity using a scale of 1-10. Follow-up review and revisions were made based on items falling below 8 on the 10 point scale.

Procedures

The dissertation study proposal was reviewed for approval by the University of Washington Institutional Review Board and by the participating university in Taiwan before any participants were approached for participation in the study. The participating school in Taiwan required the UW IRB approved application for the study to be conducted. With UW IRB and school approval, the investigator attended classrooms at a designated and convenient time to explain the study to students and answer their questions. Consent forms with cover letters were distributed to explain the study focus (how youth deal with life stress), study procedures, typical and most sensitive types of questions that were asked, and benefits vs. risks of participation. As the legal age for consent in Taiwan is 20 years old, students under 20 years were asked to give the consent/assent form and letter to their parents/guardians to review one week before administration of the questionnaire. The PI is an instructor at the participating school. The PI informed students that deciding to participate or not to participate in the study would not affect their grades or school status. Potential participants and their parents/guardians were encouraged to contact the investigator by phone or e-mail to ask any questions they might have before making a decision to participate. If students did not consent to participate, or if their parents did not provide permission , they were not included in the study, and were free to leave the classroom during the administration of the questionnaire.

The consent/assent forms were collected before the survey by a research assistant, then sealed in an envelope, and locked in a secure cabinet at the PI's office.

After consent to participate was obtained, data were collected in classrooms. Participants filled out the paper-and-pen *Youth Coping Questionnaire* in their classrooms at an appointed time. The NSSI and emotional reactivity scales took about 5-10 minutes, and the other 4 parts of the questionnaires required about 5 minutes, totaling 30 minutes. Data collection began with a brief introduction about how to complete the questionnaire. Participants were advised that they could choose or not choose to participate, that they could omit any questions that they did not choose to answer, and they could withdraw from the study anytime during survey administration.

Questionnaires were distributed by the investigator, who was a registered nurse experienced in psychiatric mental health problems and adolescent issues, as well as by a research assistant with registered nurse license. For one class that the PI taught and graded, the questionnaires were collected by a separate neutral person, another psychiatric nursing instructor who did not teach or grade the class. Upon completing the questionnaires, participants were asked to place their questionnaires in an envelope, and then to seal the envelope to protect their confidentiality during the data collection process.

Because the questionnaire focused on sensitive issues, all participations received a brochure with general guidelines about how to manage stress along with a list of campus and

community resources for psychological counseling or therapy, in case they would personally like assistance in dealing with life stressors, depression, and/or suicide or NSSI behaviors. Participants also received a 100 TWD gift card (about 3.50 USD) as a means of thanking them for participating in the study.

After the data collection, participants' anonymous responses to the questionnaire were entered into a computer program on a password-protected computer. The paper questionnaires were kept in a locked cabinet. The computer was in locked office with restricted access.

Data Analysis

Preliminary data analysis was conducted using IBM SPSS (version 22) for descriptive statistics and measures of association. For **Aim 1**, structural equation modeling (AMOS, version 22) was used to test the hypothesized model, and for **Aim 2** multiple regression (SPSS) was used to test for moderating effects. For **Aim 3**, latent class analysis (LCA) was conducted using LatentGOLD, Version 5.1 (Vermunt & Magidson, 2016).

Preliminary Analysis

Prior to these analysis, all variables were examined for accuracy of data entry, missing values, outliers and the statistics assumptions associated with multivariate analysis (normality, independence of residuals, linearity, and homoscedasticity). The dependent or outcome variable was transformed, when necessary due to skewness or kurtosis (>25).

Missing data were examined using SPSS MVA (Missing Values Analysis) to determine if missingness is at random or not, using $\alpha = .05$ and tests conducted for variables with 5% or more missing data. When only a few cases (< 5%) had missing values, and missingness appeared to be at random, listwise analyses were used. Otherwise, the analyses were conducted using regression imputation procedures, in which a missing observation was replaced with a predicted score generated by from multiple regression based on nonmissing scores on other variables (Kline, 2005), or using available procedures for multiple imputation. Results using listwise deletion and value imputations were compared, and reported. For SEM, all indicators with less than 1% missing values were replaced using imputed *serial mean values* (replacing missing values with the mean for the entire series).

Descriptive statistics were used to characterize the sample. Internal consistency reliability (Cronbach's alpha) was calculated for all scaled variables. Pearson correlation coefficients were computed to determine whether associations existed among the study variables. Associations between demographic characteristics, depression, and key study variables were examined using correlations and t-tests for continuous variables, and chi-square (χ^2) tests for categorical variables. Demographic characteristic significantly associated with the key mediating or dependent variables were included as covariates in all subsequent analyses.

Analysis for Aim 1

Overview of model testing. Prior to testing the proposed contextual model of adolescent NSSI (Figure 1), the model was examined to see if necessary requirements for identification were met. A two-step modeling approach (Anderson & Gerbing, 1988) was used to test the model: the measurement model was fit, followed by testing of the structural model. This approach assists in locating specification error and the source of poor model fit for both the measurement model and the structural model (Kline, 2005). Structural equation modeling (IBM SPSS AMOS, Version 22) was used to test the proposed contextual model of adolescent NSSI. Maximum likelihood estimation was used to assess the fit between the data and the hypothesized specified theoretic model. Standardized and unstandardized path coefficients were used for model interpretation. The measurement model and the structural model were assessed using chi square (χ^2 $p > .05$), root mean square error of approximation (RMSEA <.08, with <.05 being preferred), Comparative Fit Index (CFI > .95), and the standardized root mean square residual (SRMR < .1) (Kline, 2005). Chi square (χ^2) assesses differences between the observed data and proposed model, but is less reliable with large samples. Consequently, multiple fit indices were used to evaluate models.

Measurement model. Initially the measurement model was tested using confirmatory factor analysis (CFA). First, assumptions of univariate and multivariate normality were tested. Variables with absolute skew index greater than 3.0 or kurtosis greater than 10 indicate

univariate non-normality (Kline, 2005, p. 50). SEM multivariate normality was acceptable as indicated by the multivariate Mardia's coefficient. Second, construct and discriminant validity (noncollinearity assumption) were tested. CFA was used to evaluate if the data fit the proposed measurement model, and if the indicators demonstrated strong and statistically significant loadings on the respective latent variables. The latent variables and measures used as indicators in the CFA model are shown in Table 2. Bootstrapping (2000 bootstrap samples) was used to calculate the 95% reliable interval for the correlation coefficients between latent factors. High correlations among the latent variables (> .85) indicate multicollinearity, and that two factors might not be distinct. Thus it might be necessary, if conceptually logical, to merge the factors or to drop one factor. Factor loadings greater than 0.4 were used to determine relative strength of the indicator associated with a given factor ($p < .05$). A composite reliability > 0.6 and average variance extracted (AVE) > 0.5 indicate construct validity (Fornell & Larcker,1981). Model fit was assessed with multiple indices, including the root mean square error of approximation (RMSEA), the comparative fit index (CFI > .90), and the standardized root mean square residual (SRMR < 0.08). Model modification was planned after examination of the hypothesized model, if the results revealed less than adequate model fit.

Table 2. Latent Variables, Measures, and Indicators in the CFA model

Latent Variables	Nonsuicidal Self-Injury	Emotional Reactivity	Family Functioning	Peer Relationship Quality	Childhood Abuse History
Measures *Indicators*	FASM 1. *past year frequency* 2. *lifetime frequency*	ERS 1. *emotion sensitivity* *2. emotion intensity* 3. *emotion persistence*	FAD-GF *Random algorithm* method used to parcel items into 3 indicators	ASAS-IR *Items parceled into 3 indicators based on similarity of item semantics.*	JVQ 1. *physical abuse* 2. *psychological/ emotional abuse* 3. *neglect* 4. *custodial interference/family abduction* 5. *sexual assault or rape*

Structural model. With an acceptable measurement model, the structural model was evaluated. First, the structural model was assessed for identification, then the model fit was estimated and evaluated using goodness-of-fit tests. The bootstrap test (with 2000 bootstrap samples) was used to assess the mediation effect of emotional reactivity on non-suicidal self-injurious behavior. Mediation was evaluated in the following steps: 1) the total effects of childhood abuse on NSSI were significant with bootstrap 95% confidence intervals excluding zero, 2) the indirect effect of childhood abuse on NSSI was significant with bootstrap 95% confidence intervals excluding zero, and 3) the direct effect of child abuse on NSSI. The direct effect was also significant with bootstrap 95% confidence intervals excluding zero, suggesting that the effect of child abuse on NSSI was partially mediated by emotional reactivity. If the direct effect were to be nonsignificant with bootstrap 95% confidence intervals including zero, this would suggest that the effect of childhood abuse on NSSI was fully mediated by emotional reactivity.

Analysis for Aim 2

Multiple regression with interaction terms was used to test the moderating effects of family functioning and the peer relationship quality on the relationship between childhood abuse and emotion reactivity. To test the moderating effects of family function, the childhood abuse and family function variables were entered into the equation, then the interaction term (childhood abuse x family function) was computed and included. In the regression model, childhood abuse, family function, and the interaction term (childhood abuse x family function) served as independent variables, and emotion reactivity was the dependent variable. R Square, F test and significance of regression coefficients (unstandardized and standardized B's) were evaluated, with significance for regression coefficients set at $p < 0.05$.

Analysis for Aim 3

Latent class analysis (LCA, using LatentGOLD, Version 5.1) was used to classify youth reporting NSSI and/or suicidal thoughts, and to examine the relative effects of contextual risk factors (childhood abuse, family function, peer relationship quality), emotion reactivity, and depression, on case classification. Latent class indicators included two NSSI items (NSSI past year frequency and NSSI lifetime frequency) from NSSI measure and four suicidal behaviors items from SBQ measure. Two NSSI items were "How many times in your life have you engaged in self-harm without trying to kill yourself?" and the multi-response items "In the past year, have you engaged in the following behaviors to deliberately harm

yourself without trying to kill yourself?" Four items used to measure suicidal behavior were: "Have you ever thought about or attempted to kill yourself?" "How often have you thought about killing yourself in the past year?" " Have you ever told someone that you were going to commit suicide, or that you might do it?" and "How likely is that you will attempt suicide someday?" Items were dummy-coded to conduct the latent class analysis. A nonsignificant likelihood ratio chi-square (LR X^2) indicated acceptable model fit. The information statistics Akaike information criterion (AIC), Bayesian information criterion (BIC), and sample size adjusted BIC (SSABIC) were used to compare competing models. The Lo-Mendell-Rubin's adjusted likelihood ration test (LRT) was used to compare models with differing numbers of latent classes. Entropy measures were used to assess the accuracy of participant classification for each model.

One-way ANOVA and post-hoc follow-up tests (i.e., Tukey) were used to compare contextual risk factors (childhood abuse, family function, peer relationship quality), emotion reactivity, and depression across class membership**.** Multinomial regression was used to assess the influence of these factors on class assignment.

Human Subjects and Data Safety and Monitoring Plans

Informed consent

A written consent form with cover letter was given to students one week before the survey. Students under 20 years were asked to give the letter and consent/assent form to their

parents/guardians to review. Potential participants and their parents were encouraged to contact the investigator by phone or e-mail to ask any questions they might have before making a decision to participate. If students did not consent to participate, or if their parents did not provide permission to participate, they were not included in the study. Permission from one parent was required; the requirement for both parents' permission was waived to protect the vulnerable participants who might have been abused or neglected.

The consent/assent forms and research procedures were approved by the University of Washington IRB prior to approaching any students or initiating data collection. The research purpose, procedures, potential benefits, and potential risks of participation were fully described in the consent/assent form. Also, individuals' rights to participation, withdrawal, safety, and confidentiality were communicated in the consent/assent forms.

Privacy and Confidentiality

Responses to questionnaires were all anonymous. Participation in the study required an individual's signed consent/assent, which were collected by a research assistant before administration of the questionnaire, sealed in a separate envelope, and locked in a cabinet in a locked office. Personnel in the participating school had no access to the questionnaires or data. Names from the consent/assent forms were not used or connected in any way to the study data in order to protect participants' identification. Code numbers were used on the questionnaires, and these were not connected to the participant's name or any other personally

identifiable information. In summarizing findings from the study, only grouped data were reported, no individual data were reported.

Benefits and Risks

Although participants received no direct benefit from participating in this study, the study provided information for understanding adolescent non-suicidal self-injurious behavior. This study sought to complement psychological models of NSSI with detailed attention to contextual factors, and should be helpful to health professionals in understanding the pathways to NSSI among Taiwanese adolescents. Understanding pathways related to adolescent NSSI will contribute to the design and delivery of appropriate preventive interventions.

Risks associated with study participation expected to be minimal. Participant concern, anxiety or stress related to being asked sensitive questions were expected. During administration of the questionnaire, the investigator or other faculty member (a psychiatric mental health nurse), and the research assistant (registered nurse), were vigilant in watching for participants' reactions, such as tears or body tension. All participants were advised not to participate or continue responding to the questionnaire if they felt uncomfortable about responding to questionnaire items. Upon completing the questionnaire, participations received written guidelines for managing stress and a list of campus and community referral

information for psychological counseling or therapy, to protect against missing someone who was distressed but was reluctant to speak with the investigator or other research staff.

Data and Security Protections

No personally identifying information was collected. Data were anonymous. All of the data security protections described for Level 2 of UW IRB were adopted. Only the investigator and her advisors had access to the anonymous data. After data collection, data were coded, and transferred from the paper questionnaire into a password-protected computer, with paper data retained in a locked cabinet. The computer was stored in a locked research office with restricted access to the computer. Data files were encrypted and password protected. Passwords used to access computer and data file were of sufficient strength to deter password cracking or guessing attacks to safeguard further against unauthorized access. Passwords were changed periodically. The computer was scanned for viruses and systems were in-place to detect attempts at unauthorized entry.

CHAPTER 4.

RESULTS

This chapter describes the characteristics of the sample, preliminary data analyses, and the results of testing specific study aims and their hypotheses.

Demographic Characteristics

All first-year university and junior college students were invited to participate in the study. Of 1272 students, 806 students (63.4%) completed the Youth Coping Questionnaire. After examining respondent patterns and missing values, 799 valid cases were included in the analysis. For the 7 excluded cases, 2 cases had completed only half the questionnaire items, 2 had identical responses for all items, and 3 cases had the same responses for all FAD-GF items, which contained 6 positively-oriented and 6 negatively-oriented items.

Sample demographic characteristics (Table 1) show that study participants were primarily female (n = 749), ages ranging 17 to 22 years (m =19.3, SD = 0.7). None of the participants was married. Most study participants (84.1%) lived with both biological parents, 13.1% lived with one parent, 2% lived with relatives, and one lived alone. In terms of health, 27.9% of participants reported having ever been hospitalized for medical problems, 4.3% reported having visited a doctor for depression, 1.1% having visited a doctor for suicidal thoughts, and 0.5% having visited a doctor for suicidal behaviors.

For the majority, parent ethnicity was Han Taiwanese (91.4% of mothers and 95.6% of

fathers), followed by foreign residents (6.4% mothers, 2% fathers), and native Taiwanese (2% mothers, 1% fathers). The results are consistent with the rates of foreign mothers for Taiwanese youths ages 19 years (about 6%) and the composition of native Taiwanese college students in Taiwan (2%) (Ministry of Education, Taiwan). For the sample, 78.6% of the parents were married, 13.6% divorced or separated, 4.4% widowed, and 2.8% other. The marital status in Taiwan for ages 40-54 years is 14%, similar to this sample (Ministry of Interior, Taiwan). Monthly household income was 41.3% between NT$40,001 and $80,000, 29% less than NT$40,000, and 28.8% more than NT$80,001. The household income results are comparable to findings from a national survey of randomly selected undergraduate students (N= 1361) (Guo, 2015).

Generally speaking, the economic and sociocultural characteristics of this sample were similar to those of the college students in Taiwan. Although the proportion of female students (93.7%) was close to the composition of the participating school (about 90%), the rate was much higher than national statistics on college students (50.6% female) (Ministry of Education, Taiwan).

Table 1. Demographic Characteristics of the Sample (N=799)

Demographic Variable	Frequency	%	Frequency	%
Sex				
Female	749	93.7		
Male	50	6.3		
Age mean=19.3 (SD=0.7)				
≥17 < 18	37	4.6		
≥18 < 19	278	34.9		
≥19 < 20	364	45.7		
≥20 < 21	109	13.7		
≥21 < 22	8	1.0		
Family composition				
Live with parents	672	84.1		
Live with single parent	105	13.1		
Live with relatives	16	2.0		
Other	1	0.1		
Missing	5	0.6		
Marital status				
Never married	799	100.0		
Parent Ethnicity		Mother		Father
Han Taiwanese	730	91.4	764	95.6
Native Taiwanese	16	2.0	14	1.8
Foreign residents	51	6.4	16	2.0
Missing	2	0.3	5	0.6
Parent marital status				
Married	628	78.6		
Divorced/separated	110	13.8		
Widowed	35	4.4		
Others	22	2.8		
Missing	4	0.5		
Parent education		Mother		Father
Elementary school	27	3.4	28	3.5
Junior high school	88	11.0	107	13.4
High school	301	37.7	267	33.4
Junior college	214	26.8	204	25.5
University or college	123	15.4	139	17.4
Master's degree	26	3.3	37	4.6
Doctoral degree	4	0.5	4	.5
Other	5	0.6	1	.1
Missing	11	1.4	12	1.5
Monthly household income				
≤ NT$40,000	232	29.0		
NT$40,001~$80,000	330	41.3		
≥ NT$80,001	198	24.8		
Missing	39	4.9		

NSSI Characteristics

Of the full sample, 233 participants (29.2%) reported having engaged in NSSI in the past year. Of those who had engaged in NSSI, 5.6% had engaged in the behavior once, 48.9% engaged in the behavior 2-4 times, 21.5% engaged in the behavior 5-10 times, and 24.0% engaged in the behavior more than 11 times (Table 2). The most commonly used methods were self-biting (16.6%), picking at a wound (13.5%), and self-hitting (8.6%). In total, 39.9% reported using only one method of NSSI, 29.6% reported using two methods of NSSI, 15.5% reported using three methods of NSSI, 10.3% reported using four methods of NSSI, and 4.7% reported using more than five methods of NSSI. The results differ from the adolescent NSSI study in Taiwan which found the most commonly endorsed methods to be carving on skin, followed by burning the skin (Chen, 2006), and different from study reviews that most common method adolescents used to engage in NSSI was cutting (Jacobson & Gould, 2007). Of this subsample, 12% subjects of NSSI reported having sought medical treatment for the behavior. Thinking time before engaging NSSI was reported as 48.9% none, 36.5% a few minutes, 7.7% less than 60 minutes, 2.6% more than one hour but less than 24 hours, 0.9% more than one day but less than one week, and 0.4% greater than a week. The most commonly endorsed level of pain during NSSI was little pain (58.4%), no pain (20.6%), moderate pain (10.3%), and severe pain (7.7%).

Of the full sample, 333 (41.7%) participants reported having ever engaged in NSSI. Of these, 63.1% had engaged in the behavior 1-4 times, 15.7% engaged in the behavior 5-10 times, 12.4% 11-50 times, 2.7% 50-100 times, and 6.0% more than 100 times. Most students (46.9%) reported having first engaged in self-harming behavior around 12-14 years of age, followed by 20.2% at 15-17 years, with 16% at less than 12 years. The lifetime prevalence of NSSI (41.7%) in this study sample was higher than the reported rates of 15.9% to 23% in Taiwan with adolescent ages 13-18 (Chen & Cheng, 2001; Lin, 2001; Chen, 2006). However, the rate is consistent with current adolescent NSSI studies with lifetime prevalence ranging from 5% to 42% in community samples across countries (Jacobson & Gould, 2007; Muehlenkamp et al., 2012). Similarly, the NSSI age of onset in this study was consistent with current studies in Taiwan and across other countries.

Chi square and independent-sample t-tests were used to test demographic differences between the NSSI youth and the Non-NSSI youth. Results showed significant group differences with respect to parent marital status and psychiatric history (ever visit doctor for depression, suicidal thoughts, or suicidal behaviors, all $p < 0.05$). NSSI youth tended to be significantly older, to have a less educated father, and to be living with a single parent or relatives ($p < 0.05$). Past year NSSI was more common among youth of foreign resident mothers ($p < 0.05$). No significant group differences were found for gender, monthly household income, paternal ethnicity or maternal education.

Of the total sample, 26.5% (n=212) reported having ever engaged in NSSI in their lifetime and in the past year, indicating that majority of self-injurers (63.7%) had engaged in NSSI over time. Also, 13.3% of the sample reported having ever engaged in NSSI more than 5 times in the past year, which was partially consistent with DSM-5 criteria for NSSI diagnosis, defined by five or more days of intentional self-inflicted damage to the surface of the body without suicidal intent within the past year.

Table 2. Characteristics of Non-Suicidal Self-Injury in Taiwanese College Students (N=799)

	All students		NSSI students	
	Frequency	%	Frequency	%
One-year frequency				
0	566	70.8		
1	13	1.6	13	5.6
2-4	114	14.3	114	48.9
5-10	50	6.3	50	21.5
> 10	56	7.0	56	24.0
Lifetime frequency				
0	466	58.3		
1-4	209	26.2	209	63.1
5-10	52	6.5	52	15.7
11-50	41	5.1	41	12.4
50-100	9	1.1	9	2.7
>100	20	2.5	20	6.0
Missing	2	.3	2	
Methods[ab] (n = 799)				
cut/crave	27	3.4	27	11.6
hit	69	8.6	69	29.6
pull hair	55	6.9	55	23.6
pick wound	108	13.5	108	46.4
biting	133	16.6	133	57.1
drawing blood	50	6.3	50	21.5
scrap	25	3.1	25	8.4
others	41	5.1	41	17.9
Thinking time before the act[a](n=233)				
None			114	48.9
a few minutes			85	36.5
< 60 minutes			18	7.7
> 1 hour but < 24 hours			6	2.6
> 1 day but < a week			2	0.9
> a week			1	0.4
missing			7	3.0
Act(s) continue despite wanting to cut down or stop[a] (n = 233)				
never			91	39.1
rarely			56	24.0
sometimes			54	23.2
often			19	8.2
always			13	5.6
Act(s) more frequent than expected[a] (n = 233)				
never			114	48.9
rarely			72	30.9
sometimes			37	15.9
often			5	2.1
always			5	2.1
Onset age				
none	462	57.8		
<12	54	6.8	54	16.0
12-14	158	19.8	158	46.9
15-17	68	8.5	68	20.2
>18	9	1.1	9	2.7
missing	48	6.0	48	14.2

[a] Of the full sample, 333 (41.7%) reported having ever engaged in NSSI; 233 participants (29.2%) reported engaged in NSSI in past year. [b] Some youth reported use of > 1 method.

Preliminary Data Analyses

The dependent and mediating variables were examined for outliers, missing data, and distributional properties (i.e., normality assumption). Based on the Kolmogorov–Smirnov test and visual inspection of histograms the dependent and mediating variables (past year NSSI frequency, NSSI lifetime frequency, and emotional reactivity) were not normally distributed ($p < 0.05$). The skew and kurtosis were, however, normally distributed with a skewness value of 1.383(SE=0.087) and a kurtosis of 0.474 (SE=0.173) for NSSI past year frequency, a skewness of 2.01(SE=0.087) and a kurtosis of 4.05 (SE=0.173) for NSSI lifetime frequency, and a skewness of 0.587(SE=0.087) and a kurtosis of -.216 (SE=0.173) for emotional reactivity.

Demographic variables and depression were examined as potential adjustment variables. Independent-sample t-tests and one way ANOVA with Turkey's post-hoc tests were conducted to test effects of demographic variables on the mediating and dependent variables in the study. Results showed that parent marital status and psychiatric history (ever visiting a doctor for depression, suicidal thoughts, or suicidal behaviors) were associated with NSSI past year frequency, NSSI lifetime frequency, and emotional reactivity ($p < 0.05$). Household income was associated with emotional reactivity ($p < 0.05$), but not with NSSI past year frequency and NSSI lifetime frequency. Gender, age, parent ethnicity, parent education, family composition, and medical history were not associated with effects on the dependent

variables. Based on these findings, parent marital status, household income, psychiatric history, and depression were included as adjustment variables in all subsequent analyses.

Descriptive statistics and internal consistency reliability (Cronbach's alpha) for key study variables are shown in Table 3. The α coefficients ranged from moderate to strong (0.64 to 0.96).

Table 3. Descriptive Statistics and Internal Consistency Reliability for Key Study Variables

Variable/Measure	Mean	Std. Deviation	Minimum	Maximum	Cronbach's Alpha
Nonsuicidal self-injury/FASM					0.831
Emotional reactivity/ERS	28.62	17.315	0	78	0.956
Family functioning/ FAD	38.69	7.300	12	48	0.932
Quality of peer relationships/IR	21.99	3.568	8	32	0.849
Childhood abuse /JVQ	5.76	5.969	0	36	0.663
a. any child maltreatment	5.00	4.743	0	20	0.641
b. any sexual victimization	0.76	2.468	0	25	0.691
Depression/CESD-10	7.95	5.826	0	28	0.886
Suicidal Behavior/SBQ-R	5.60	2.978	3	17	0.748

Note. The NSSI measure, not reported in this table, contains only two items: NSSI past year frequency and NSSI lifetime frequency (r = .73).

Pearson correlation coefficients (Table 4) were computed to test for associations between key variables, depression, and suicidal behaviors, and all variables were significantly associated with one another ($p < 0.01$).

Table 4. Pearson Correlations among Key Study Variables

Variables	1	2	3	4	5	6	7	8
1. NSSI past year frequency	1							
2. NSSI lifetime frequency	.725**	1						
3. Emotional reactivity	.333**	.286**	1					
4. Childhood abuse	.291**	.328**	.312**	1				
5. Family functioning	-.271**	-.251**	-.341**	-.399**	1			
6. Peer relationship quality	-.186**	-.184**	-.316**	-.084*	.258**	1		
7. Depression	.323**	.309**	.580**	.321**	-.393**	-.422**	1	
8. Suicidal Behavior	.384**	.425**	.430**	.384**	-.403**	-.238**	.446**	1

*p < 0.05; **p < 0.01 level, 2-tailed tests.

Analysis for Aim 1

Scholars have theorized and studies demonstrated that adolescents experience heightened and prolonged negative emotion prior to and during the act of NSSI, and that the influence of childhood abuse on emotional reactivity is a potentially salient process underlying self-injurious pathways. However, how childhood abuse and specific contextual factors are associated with emotional reactivity and how they influence adolescent NSSI is seldom examined. To fill this gap in the scientific literature, study Aim 1 was proposed to examine the mediating effect of emotional reactivity on NSSI.

Aim 1: Test the posited mediating influence of emotional reactivity on non-suicidal self-injurious behavior as specified (Figure 1), by examining the direct and indirect associations of contextual factors – childhood abuse, peer relationship quality, and family functioning – on non-suicidal self-injury mediated by emotional reactivity.

Hypotheses for Specific Aim 1

The following associations were posited:

1. Childhood abuse will have a direct positive effect on emotional reactivity ($Path_{23}$); the experience of childhood abuse will be associated with increased emotional reactivity.
2. Childhood abuse will have a direct positive effect on non-suicidal self-injurious behavior ($Path_{13}$); the experience of childhood abuse will be associated with increased non-suicidal self-injurious behavior.
3. Peer relationship quality will have a direct negative effect on non-suicidal self-injurious behavior ($Path_{15}$).
4. Family functioning will have a direct negative effect on non-suicidal self-injurious behavior ($Path_{14}$).
5. The hypothesized effects of childhood abuse on non-suicidal self-injurious behavior will be partially mediated by emotional reactivity ($Path_{13}$ and $Path_{23}$).

A two-step modeling approach (Anderson & Gerbing, 1988) was used to test the overall model. First measurement model parameters were estimated, then those for the structural model were estimated. Structural equation modeling (IBM SPSS AMOS, Version 22) was used. As SEM cannot be performed with missing values, all indicators with less than 1% missing values were replaced using imputed *serial mean values* (replacing missing values with the mean for the entire series).

Measurement model. There were 5 latent variables in the CFA model (Table 5 and Figure 2): childhood abuse, family functioning, peer relationship quality, emotional reactivity, and NSSI. Childhood abuse had 5 indicators in which the 4 items from the Child Maltreatment module of JVQ-AR (Finkelhor, Hamby, Ormrod, & Turner, 2005) was used as separate indicators to assess physical abuse, psychological/emotional abuse, neglect, and custodial interference/family abduction, and 7 items Sexual Victimizations module of JVQ-AR were summed to serve as a single indicator to assess sexual abuse. Family functioning had 3 indicators, and a *random algorithm* method of parcel approach (Matsunaga, 2008) was used to divide the 12-item FAD-GF scale (Epstein, Baldwin, & Bishop, 1983) into 3 indicators. Peer relationship quality had 3 indicators created by dividing the 8-item ASAS-IR (Luo et al., 2004) into 3 groupings based on by similar semantics. Emotional reactivity had 3 indicators created by using 3 components of 21-item ERS (Nock et al., 2008) as separate indicators to assess emotion sensitivity, emotion intensity and emotion persistence.

NSSI was based on 2 indicators: past year frequency and lifetime frequency. The indicator of past year frequency was from the FASM (Lloyed, Kelley, & Hope, 1973). Eleven items were recoded based on 0-4 point frequency response options. The single item “How many times in your life have you engaged in self-harm without trying to kill yourself?” measured on a 1-6 point frequency scale served as indicator of lifetime frequency. For testing

of the measurement model, all indicators were assumed to be independent of one another, thus no correlated residual error.

First, assumptions of univariate and multivariate normality were tested. According to Kline (2005, p. 50), variables with absolute skew index greater than 3.0 or kurtosis greater than 10 indicate univariate non-normality. Two indicators of sexual abuse and custodial interference/family abduction did not meet the normality assumption. It was not possible to transform data to meet the normality assumption for child abuse. The issue of nonnormality, however, was not serious because the involved indicators were not dependent variables and bootstrapping was used for model testing, which does not rely on the normality assumption. Thus, these indicators were used in model testing without transformations. SEM multivariate normality was acceptable as indicated by the multivariate Mardia's coefficient that was 66.165 < 288 (16*18=288, [N of observe variables]*[N of observe variables+2]) (Bollen, 1989).

Second, construct and discriminant validity (noncollinearity assumption) were tested. Confirmatory factor analysis (CFA) for the present sample indicated statistically significant loadings of the indicators on the respective latent variables ranging from 0.36 to 0.96 (Figure 2; Table 6). Fornell and Larcker (1981) recommend that a composite reliability > 0.6 and average variance extracted (AVE) > 0.5 indicate construct validity. If AVE is < 0.5, but composite reliability is > 0.6, the convergent validity of the construct may still be adequate.

The composite reliabilities of study latent variables were > 0.6 with AVE values > 0.5 except for child abuse history (AVE = 0.31, Table 6). Bootstrapping (2000 bootstrap samples) was used to calculate the 95% reliable interval for the correlation coefficients between latent factors. All 95% reliable intervals were < 1 (see Table 7) indicating that discriminant analysis had been established (Torkzadeh, Kaufteros, & Pfughoeft, 2003). These results as well as the model fit indices (CFI = 0.96, RMSEA = 0.06, and SRMR = 0.05, reported in Figure 2) indicated that the proposed measurement model was acceptable.

Table 5. Assessment of Normality for Indicators of Latent Variables

Latent Variable/Indicators	Min	max	skew	c.r.	kurtosis	c.r.
Childhood Abuse						
Physical abuse	.00	5.00	.22	2.51	-1.71	-9.88
Emotional abuse	.00	5.00	.48	5.52	-1.45	-8.35
Neglect	.00	5.00	2.92	33.71	7.61	43.91
Custodial interference	.00	5.00	3.59	41.38	12.04	69.49
Sexual abuse	.00	25.00	4.96	57.27	30.46	175.77
Family Functioning						
FAD1	4.00	16.00	-.55	-6.36	.007	.04
FAD2	4.00	16.00	-.86	-9.96	.24	1.40
FAD3	4.00	16.00	-.72	-8.30	.001	.004
Peer Relationship Quality						
IR1	4.00	16.00	-.43	-4.98	.67	3.85
IR2	2.00	8.00	-.34	-3.97	.49	2.83
IR3	2.00	8.00	-.36	-4.10	1.17	6.74
Emotional Reactivity						
Emotion persistence	.00	16.00	.28	3.26	-.62	-3.57
Emotion sensitivity	.00	40.00	.70	8.08	-.12	-.70
Emotion intensity	.00	27.00	.58	6.69	-.21	-1.19
NSSI						
Past year frequency	.00	4.00	1.38	15.91	.46	2.65
Lifetime frequency	1.00	6.00	2.01	23.23	4.03	23.27
Multivariate					112.36	66.17

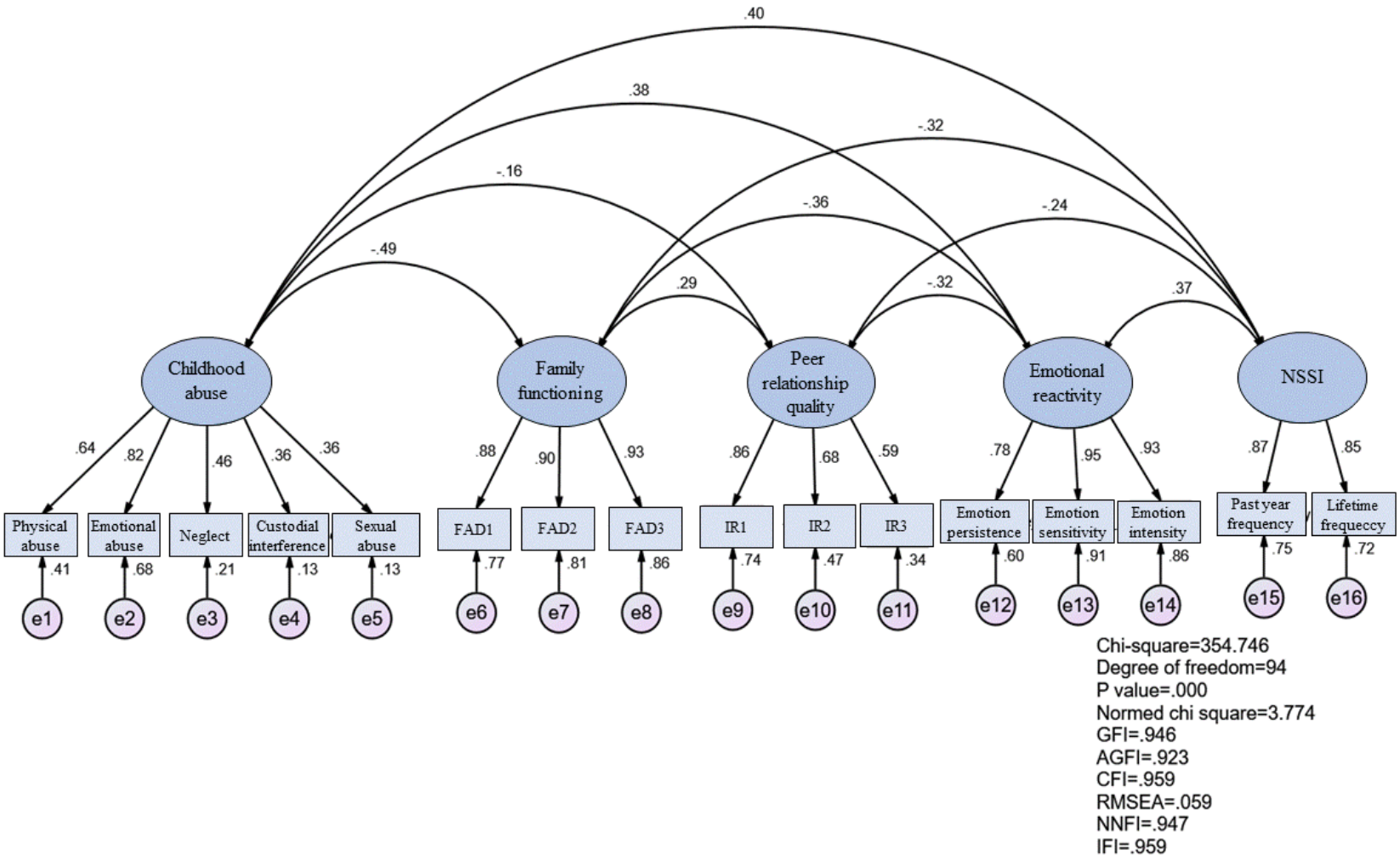

Fig 2. CFA model fit indices and standardized estimates (regression weights) of observed variables. The values under the rectangles are variance of the indicator. For example, 0.72 was the variance for *lifetime frequency*. It is estimated that the predictors of *lifetime frequency* explain 72.1 percent of its variance. In other words, the error variance of *lifetime frequency* was approximately 27.9 percent of the variance of *lifetime frequency* itself.

Table 6. Factor loadings, Composite Reliability of Latent Variables and Average Variance Extracted

Latent Variable	Observed variables	Factor Loading	Composite Reliability	Average Variance Extracted
Childhood Abuse	Physical abuse	.64	0.67	0.31
	Emotional abuse	.82		
	Neglect	.46		
	Custodial interference	.36		
	Sexual abuse	.36		
Family Functioning	FAD1	.88	0.92	0.79
	FAD2	.90		
	FAD3	.93		
Peer Relationship Quality	IR1	.86	0.75	0.51
	IR2	.68		
	IR3	.59		
Emotional Reactivity	Emotion persistence	.78	0.93	0.82
	Emotion sensitivity	.95		
	Emotion intensity	.93		
NSSI	Past year frequency	.87	0.85	0.74
	Lifetime frequency	.85		

Table 7. Bootstrap 95% Reliable Interval of Coefficient Correlation and Discriminant Validity

Parameter			Estimate	Lower	Upper	P
Childhood Abuse	⟷	Family Functioning	-.49	-.57	-.41	.001
Childhood Abuse	⟷	Peer Relationship Quality	-.16	-.25	-.07	.001
Childhood Abuse	⟷	Emotional Reactivity	.38	.30	.45	.001
Childhood Abuse	⟷	NSSI	.40	.32	.48	.001
Family Functioning	⟷	Peer Relationship Quality	.29	.21	.37	.001
Family Functioning	⟷	Emotional Reactivity	-.36	-.42	-.29	.001
Family Functioning	⟷	NSSI	-.32	-.40	-.25	.001
Peer Relationship Quality	⟷	Emotional Reactivity	-.32	-.42	-.22	.001
Peer Relationship Quality	⟷	NSSI	-.24	-.33	-.16	.001
Emotional Reactivity	⟷	NSSI	.37	.30	.44	.001

Structural model. The hypothesized structural model was tested using general and focused goodness-of-fit tests. As shown in Figure 3, overall the indices revealed that the fit between the data and the hypothesized model was good (CFI = 0.95, RMSEA = 0.05, and SRMR = 0.05).

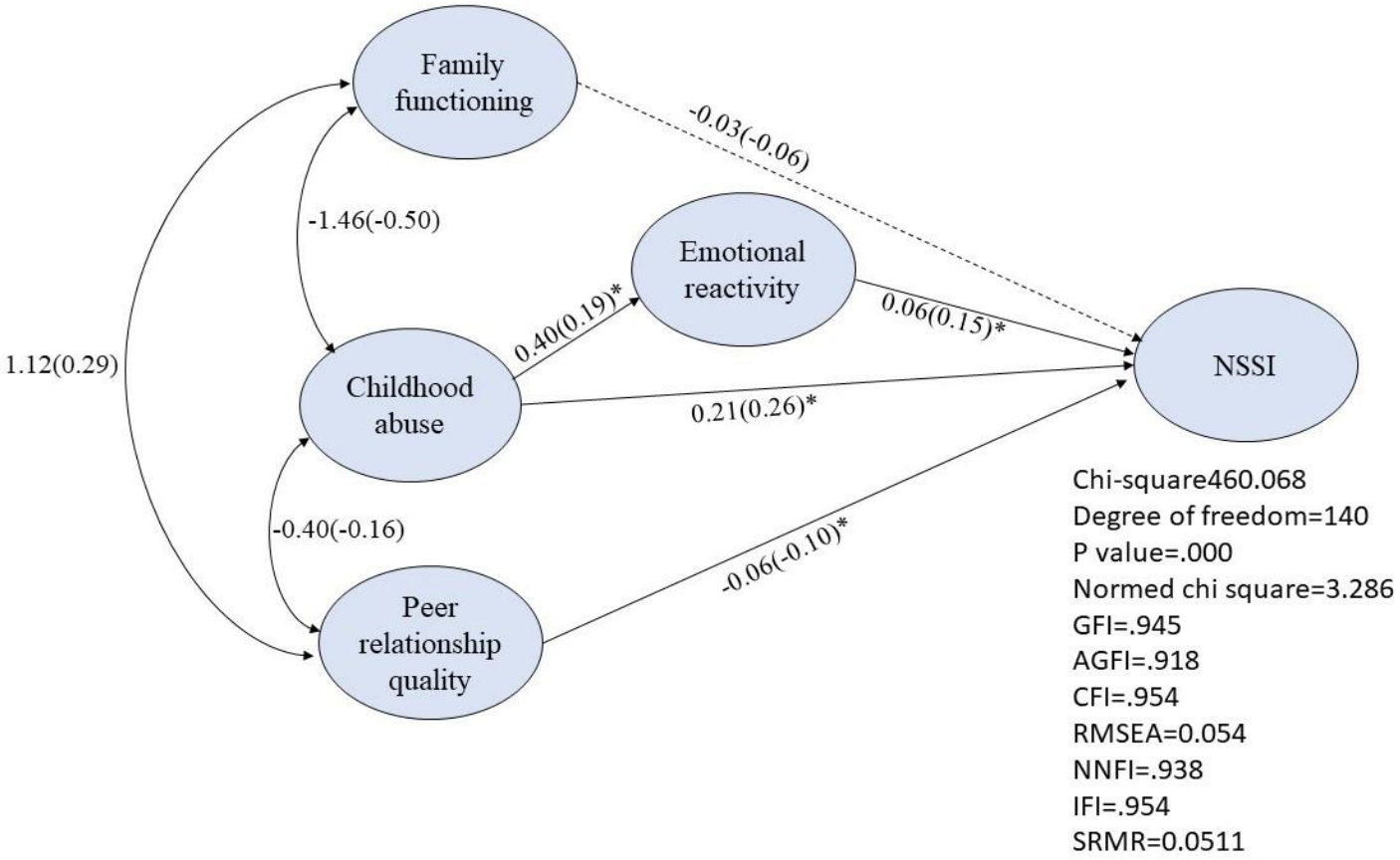

Figure 3. Structural model predicting childhood abuse on non-suicidal self-injury partially mediated by emotional reactivity controlling for depression, parent marital status, household income, and psychiatric history of doctor visits. Path values are unstandardized regression weights with standardized regression weights in parentheses.

The bootstrap test (with 2000 bootstrap samples) was used to test the mediation effect of emotional reactivity on non-suicidal self-injurious behavior. As shown in Table 8, the total and indirect effects of child abuse on NSSI were positive and significant with bootstrap 95% confidence intervals excluding zero, suggesting that emotional reactivity mediates the effect of child abuse on NSSI. The direct effect of child abuse on NSSI was also positive and significant with bootstrap 95% confidence intervals excluding zero. The results also provide evidence for the direct positive effect of childhood abuse on emotional reactivity and the direct negative effect of quality of peer relationships on NSSI. The direct effect of family functioning on NSSI was not significant.

Table 8. Total Effects, Indirect Effects, and Direct Effects Adjusting for Depression, Parent Marital Status, Household Income, Psychiatric History of Doctor Visits

				Bootstrapping				
	Estimate	Product of Coefficients		Bias-Corrected 95% CI		Percentile 95% CI		Decision
		SE	Z	Lower	Upper	Lower	Upper	
Total Effects								
Childhood abuse → NSSI	0.24	0.05	4.70	0.15	0.34	0.15	0.35	Accept H5
Indirect Effects								
Childhood abuse → NSSI	0.02	0.01	2.30	0.01	0.05	0.01	0.05	Accept H5
Direct Effects								
Childhood abuse → NSSI	0.21	0.05	4.24	0.12	0.33	0.12	0.33	Accept H2
Childhood Abuse →Emotional reactivity	0.40	0.10	4.11	0.23	0.61	0.23	0.61	Accept H1
Peer relationship quality → NSSI	-0.06	0.03	-2.03	-0.12	-0.002	-0.12	-0.002	Accept H3
Family functioning → NSSI	-0.03	0.03	-1.26	-0.09	0.02	-0.09	0.02	Reject H4

Note. 2000 bootstrap samples.

Analysis for Aim 2

Current theory points out the importance of the joint influences of early adverse experience and current environmental adversity on heightened emotional reactivity and negative health outcomes. Childhood abuse may interact with current environmental adversity to develop and maintain, via emotion regulation, NSSI. Thus, dissertation Aim 2 addressed the interaction effects of childhood abuse with current environmental factors (family functioning and peer relationship quality) on emotional reactivity to address whether or not positive contextual factors such as family functioning and quality peer relationships might buffer the effects of childhood abuse on emotional reactivity.

Aim 2: Test for the moderating effects of contextual factors (family functioning and peer relationship quality, Figure 1) on the association between childhood abuse and emotional reactivity.

Hypotheses for Specific Aim 2

1. The influence of childhood abuse on emotional reactivity will be moderated by family functioning, such that the influence of childhood abuse will be greater for youth with low family functioning.
2. The influence of childhood abuse on emotional reactivity will be moderated by family functioning, such that the influence of childhood abuse will be greater for youth reporting low peer relationship quality.

Moderation models. Multiple regression with interaction terms was used to test the moderating effects of family functioning and peer relationship quality on the relationship between childhood abuse and emotional reactivity. Visual inspection of histograms and P-P plot showed that the distribution of the residuals of the dependent variable, emotional reactivity, was approximately normally distributed. The variance inflation factor (VIF) was relatively low (<1.5) across variables, indicating no serious concerns of multicollinearity.

The independent variables of childhood abuse, family function, and peer relationship quality were centered, and interaction terms were computed between childhood abuse and each of the two hypothesized moderators (childhood abuse x family function, childhood abuse x peer relationship quality). The three-way interaction was not tested.

As shown in Table 9, childhood abuse, family functioning and peer relationship quality had significant effects on emotional reactivity ($B = 2.14$, $p < 0.05$; $B = -1.58$, $p < 0.05$; $B = -1.40$, $p < 0.05$, respectively). The influence of childhood abuse on emotional reactivity was not, however, moderated by either family functioning ($p = 0.17$) or peer relationship quality ($p = 0.33$).

Table 9. Multiple Regression Analysis: Moderating Effects of Family Functioning and Peer Relationship Quality on the Association between Childhood Abuse and Emotional Reactivity

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	16.05	2.06		7.81	< .0001
	Household income	-0.60	0.71	-0.03	-0.86	.393
	Parent marital status	0.10	0.78	0.004	0.12	.901
	Depression	1.68	0.09	0.57	18.49	< .0001
	Psychiatric history	2.25	2.37	0.03	0.95	.342
2	(Constant)	17.89	2.05		8.75	< .0001
	Household income	-0.05	0.70	-0.002	-0.07	.943
	Parent marital status	-0.32	0.78	-0.01	-0.41	.686
	Depression	1.40	0.11	0.48	13.25	< .0001
	Psychiatric history	0.94	2.34	0.01	0.40	.689
	Family functioning (z score)	-1.46	0.59	-0.09	-2.49	.013
	Peer Relationship Quality (z score)	-1.39	0.57	-0.08	-2.45	.015
	Childhood abuse (z score)	1.93	0.59	0.11	3.30	.001
3	(Constant)	17.97	2.05		8.76	< .0001
	Household income	0.02	0.70	0.001	0.02	.982
	Parent marital status	-0.24	0.78	-0.01	-0.31	.756
	Depression	1.39	0.11	0.48	13.23	< .0001
	Psychiatric history	1.46	2.36	0.02	0.62	.537
	Family functioning (z score)	-1.58	0.60	-0.09	-2.65	.008
	Peer Relationship Quality (z score)	-1.40	0.57	-0.08	-2.45	.015
	Childhood abuse (z score)	2.14	0.61	0.12	3.48	.001
	Interaction terms					
	Childhood abuse x family functioning	0.66	0.49	0.05	1.36	.174
	Childhood Abuse x peer relationship quality	0.45	0.46	0.03	0.98	.328

Table 10. Summary Statistics for Regression Models

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.58[a]	0.34	0.35	14.01	0.34	93.88	4	726	< .0001
2	.61[b]	0.37	0.36	13.75	0.027	10.23	3	723	< .0001
3	.61[c]	0.37	0.36	13.74	0.003	1.67	2	721	.188

a. Predictors: (Constant), psychiatric history, household income, parent marital status, depression
b. Predictors: (Constant), psychiatric history, household income, parent marital status, depression, childhood abuse (z score), peer relationship quality (z score), family functioning (z score)
c. Predictors: (Constant), psychiatric history of doctor visits, household income, parent marital status, depression, childhood abuse (z score), peer relationship quality (z score), family functioning (z score), childhood abuse x peer relationship quality, childhood abuse x family functioning
d. Dependent Variable: emotional reactivity

One adjustment variable, household income, had 39 missing values (4.9% < 5%), and more than 30 cases were excluded from the moderating test with listwise analysis. To determine if these missing cases may have biased the findings, the hypothesized moderating effects were further tested by excluding household income as a covariate and including the covariate with serial means imputation. The results from these analyses were comparable. Based on these results, Aim 2 hypotheses 1 and 2 were not accepted. That is, there was no clear evidence that either family functioning or peer relationship quality served to moderate the effects of childhood abuse on emotional reactivity.

Analysis for Aim 3

Little is understood about what individual differences exist among subgroups of youth experiencing NSSI vs. NSSI & suicidal behaviors vs. no NSSI. Study Aim 3 addressed whether or not there are distinct subgroupings of youth with NSSI with and without suicidal behaviors. The differential influence of contextual factors on such subgroupings were also explored.

Aim 3. Explore the influence of contextual risk factors (childhood abuse, family functioning, quality of peer relationships), emotion reactivity and depression on case classification relative to non-suicidal self injury and/or suicidal behaviors.

Four classes of youth were anticipated based on youth reporting of: (1) low NSSI and low suicidal behavior (thoughts, attempts, intent); (2) low NSSI and high suicidal behavior/intent; (3) high NSSI and high suicidal behavior/intent; and (4) high NSSI, low suicidal behavior/intent.

Hypotheses for Specific Aim 3

1. Childhood abuse, family functioning, quality of peer relationships, and emotion reactivity will be most strongly associated with Class 3 (high NSSI and high suicidal behavior/intent) compared to Class 1, 2 or 4.

2. Depression will be most strongly associated with Class 3 (high NSSI and suicidal behavior/intent).

Extraction of latent classes. Latent class analysis (LCA) was conducted using LatentGOLD, Version 5.1 (Vermunt & Magidson, 2016) to explore subgroup heterogeneity among individuals engaging in self-injurious behaviors. Latent class indicators included two NSSI items (NSSI past year frequency and NSSI lifetime frequency) and suicidal behaviors items from SBQ measure. To conduct the latent class analysis, items were dummy-coded. Responses of *0* frequency, *never*, and *no* were coded as 1; responses > *0* frequency (*ever* or *yes)* were coded as 2. The SBQ item "How likely is that you will attempt suicide someday?" was coded differently, in which either responses of *never*, *no chance at all*, *rather unlikely* and *unlikely* were coded as 1, and any response of *likely*, *rather likely*, and *very likely* was coded as 2. Latent class analyses (LCA) were conducted exploring for 1-6 class solutions. The 4-class solution was considered to be the best fitting model (see Table 10). Akaike information criterion (AIC) and Bayesian information criterion (BIC) are goodness of fit measures used to compare competing models; lower observed values indicate better fit. The four class model was selected based on substantive assessment in conjuncture with low values of AIC (4371.83) and BIC (4498.14), and $p > 0.05$ ($G^2 = 45.78$, df=36, p=0.13).

Results indicated that model fit expectation for classification (see Table 11 and Figure 4) in that 44.9% of participants belonged to Class 1 (low risk of NSSI and suicidal behavior, low NSSI/suicide), 19.8% belonged to Class 2 (high risk of suicidal behavior and low risk of NSSI, high suicide/low NSSI), 17.3% to Class 3 (high risk of NSSI and suicidal

behavior/intent, high NSSI/suicide), and 17.9% to Class 4 (high risk of NSSI and low risk of suicidal behavior, high NSSI/low suicide).

Table 10. Fit Indices for Latent Class Analysis of Self-Injurious Behaviors

Model	BIC(LL)	AIC(LL)	SABIC(LL)	Npar	G^2	\df	p-value	Class..Error
1 class	5479.6899	5451.6199	5460.6367	6	1167.5728	57	6.3e-207	0.0000
2 classes	4706.7611	4645.9426	4665.4790	13	347.8956	50	3.1e-46	0.0513
3 classes	4592.9752	4499.4084	4529.4644	20	187.3613	43	6.2e-20	0.0713
4 classes	**4498.1411**	**4371.8259**	**4412.4015**	27	45.7788	36	**0.13**	0.0852
5 classes	4532.2539	4373.1902	4424.2855	34	33.1431	29	0.27	0.1053
6 classes	4572.2607	4380.4487	4442.0635	41	26.4016	22	0.23	0.1371

Note. The lower the BIC, AIC, and SABIC values, the better the model fit. Based on these fit indices as well as substantive considerations, the 4-class solution (Model 4) was chosen as the optimal solution for this youth population. Abbreviations: **LL**, log-likelihood; **BIC**, Bayesian information criterion; **AIC**, Akaike information criterion; **SABIC**, sample-size adjusted BIC; **Npar**, number of parameters; $\mathbf{G^2}$, log-likelihood ratio test; **Class Err**, classification error.

Class 1 low NSSI/suicide risk was characterized by a near zero probability of endorsing all self-injury items, with the exception of having ever thought about or attempted to kill self (item lifetime suicide ideation/attempt, probability of 0.14). **Class 2** low NSSI/high suicide risk was characterized by a higher probability of endorsing all suicidal behavior items, particularly having ever thought about or attempted to kill self (item lifetime suicide ideation/attempt, probability of 0.99) and having ever thought about or attempted to kill self in the past year (item past year suicide ideation, probability of 0.59). Individuals in this group were also characterized by a nearly zero probability of endorsing having ever engaged in NSSI in the past year (item past year NSSI) with some endorsing having *ever* engaged in NSSI in their lives (item lifetime NSSI, probability of 0.33). **Class 3** high NSSI/suicide risk

was characterized by probability of larger than 0.5 of endorsing all suicidal behavior *and* NSSI items, with the exception of likelihood of suicidal behavior in the future (item likelihood of future suicide, probability of 0.33). **Class 4** high NSSI/low suicide was characterized by a higher probability of endorsing two NSSI items (probabilities of 0.61 and 0.98) and probability of less than 0.5 of endorsing all suicidal behavior items. The results support the premise that there are distinct subgroupings of NSSI youth with and without suicidal behaviors.

Table 11. Conditional Probabilities of Variables for Self-Injurious Behaviors Grouped by Class

Variable	Class 1	Class 2	Class 3	Class 4
Suicidal behavior				
Lifetime suicide ideation/attempt	0.14	0.999	0.98	0.496
Past year suicide ideation	0.006	0.59	0.85	0.001
Threat of suicide attempt	0.03	0.39	0.55	0.08
Likelihood of future suicide	0.01	0.14	0.33	0.0006
NSSI				
Past year NSSI	0.03	0.01	0.96	0.62
Lifetime NSSI	0.01	0.33	0.95	0.99

*All responses where a group member was more likely to reply "yes" are indicated by a value > 0.50 (0.50 indicates half endorsed "yes" and half "no").

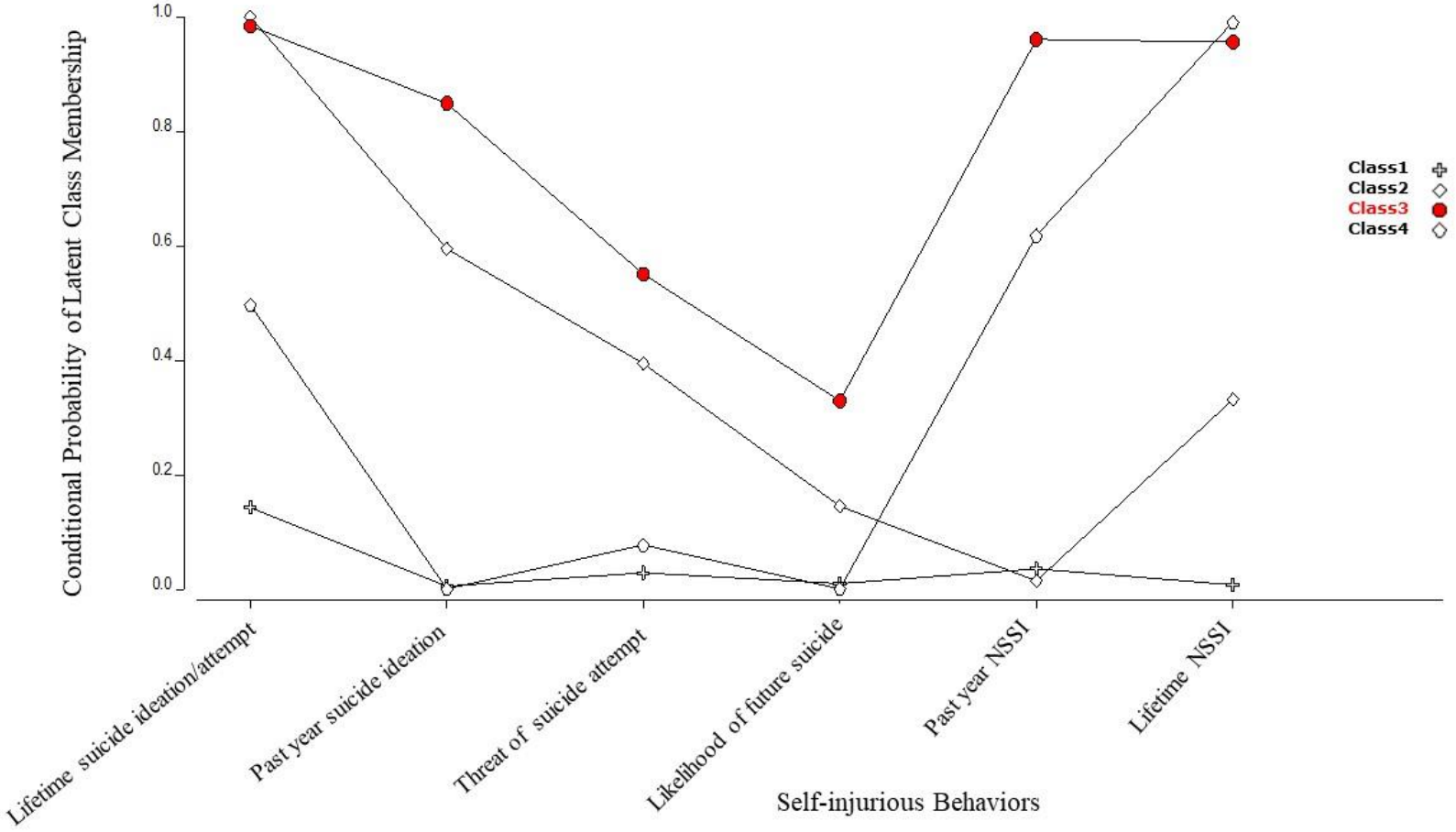

Figure 4. Conditional probabilities from latent class analysis of self-injurious behaviors for 4-class solution model; Class 1: low risk of NSSI and suicidal behavior (low NSSI/suicide risk); Class 2: low risk of NSSI and high risk of suicidal behavior (thoughts, attempts, intent) (low NSSI/ high suicide risk); Class 3: high risk for NSSI and suicidal behavior/intent (high NSSI/high suicide risk); Class 4: high risk of NSSI and low risk of suicidal behaviors (high NSSI/low suicide risk).

Class comparisons. An overriding question was how the four classes of youth differed from one another with respect to individual characteristics (emotional reactivity, depression) and their contextual experiences (childhood abuse, family function, peer relationship quality). To compare individuals within each class across contextual risk factors, one-way ANOVA with Turkey's post-hoc follow-up tests were conducted (see Table 12).

Results showed significant class differences across contextual risk factors, emotional reactivity and depression ($p < 0.001$). Follow-up Turkey analyses revealed that overall, Class 3 (high NSSI/high suicide risk) reported the highest risk levels across contextual factors, emotional reactivity, and depression, followed by Class 2 (low NSSI/ high suicide risk), Class 4 (high NSSI/low suicide risk), and Class 1 (low NSSI/low suicide risk). Class 3, the highest risk class, differed significantly from the other three classes on childhood abuse, family functioning, emotional reactivity, and depression. Class 3 also differed significantly from Class 1 and Class 4 on quality of peer relationships, but there were no significant differences between Class 2 and Class 3. In addition, Class 2 did not differ significantly from Class 4 on childhood abuse, family function, quality of peer relationships and emotional reactivity. Importantly, all four classes differed significantly from each other on depression, with Class 3 showing the highest level of depression, followed by Class 2, Class 4 and Class 1. Class 3 was the only group with average depression scores above the designated cut point for

depression (CES-D). On the other hand, individuals in Class 2 and Class 3 were, on average, above the clinical cut point for high suicide risk based on the SBQ-R.

Table 12. Significant Differences, Means, and Standard Deviations among Classes of Self-Injurious Behaviors

Variable	F(df1, df2)	*p* value	Class 1 Low NSSI/ Low suicide (N=344)	Class 2 Low NSSI/ High suicide (N=151)	Class 3 HighNSSI/ High suicide (N=134)	Class 4 High NSSI/ Low suicide (N=139)	Significant Group Differences*
Physical abuse	F(3, 764)=20.93	<.0001	1.64(2.06)	2.73(2.19)	3.14(2.03)	2.52(2.21)	12*13*14* 34*
Emotional abuse	F(3, 764)=38.86	<.0001	1.16(1.72)	2.50(2.10)	3.04(2.09)	2.29(2.11)	12*13*14* 34*
Neglect	F(3, 764)=7.56	<.0001	0.24(0.88)	0.49(1.26)	0.80(1.58)	0.46(1.20)	13* 23*34*
Custodial Interference	F(3, 764)=3.40	.017	0.21(0.88)	0.46(1.28)	0.51(1.27)	0.38(1.11)	13*
Sexual abuse	F(3, 764)=11.60	<.0001	0.24(1.07)	0.83(2.61)	1.59(3.82)	1.08(2.70)	12*13*14* 23*
Total Child abuse	F(3, 764)=39.13	<.0001	3.50(4.46)	7.01(5.81)	9.09(6.94)	6.73(6.14)	12*13*14* 23*34*
Emotional reactivity	F(3, 764)=46.58	<.0001	22.42(15.62)	32.15(16.24)	40.94(16.28)	27.92(16.06)	12*13*14* 23*34*
Family functioning	F(3, 764)=39.05	<.0001	41.28(6.05)	36.93(7.85)	34.27(7.66)	38.76(6.37)	12*13*14* 23*34*
Peer relationship quality	F(3, 764)=19.34	<.0001	22.96(3.35)	21.40(3.50)	20.49(3.71)	21.69(3.40)	12*13*14* 34*
Depression (CES-D 10)	F(3, 764)=56.88	<.0001	**5.53(4.48)**	**9.87(5.70)**	**11.99(6.28)**	**7.96(5.59)**	12*13*14* 23*24*34*
Total SBQ-R	F(3, 764)=344.36	<.0001	3.70(1.11)	**7.92(2.48)**	**9.10(3.03)**	4.41(1.49)	12*13*14* 23*24*34*

Note. CES-D values equal to or above 10 signify depression. SBQ-R scores range 3-18, clinical cutoff = 7.
Group comparison ij represent comparisons between Class i and Class j. For instance, the value 12 implies that Class 1 and Class 2 differed significantly.
*p < 0.05.

To explore differential influence of contextual factors on subgroupings of self-injurious behaviors. Multinomial regression was used to assess simultaneously the influence of childhood abuse, family function, quality of peer relationships, emotional reactivity, and depression on class assignment. The reference group was Class 1 (low NSSI/suicide, see Table 13). The overall resulting model was statistically significant, x^2 (15) = 260.64,

Nagelkerke $R^2 = 0.311$, $p < .001$. Contributions by all predictors were significant ($p < 0.001$), with the exception of peer relationship quality ($p = 0.059$). Compared to Class 1 (low NSSI/suicide), significant associations were found for Class 3 (high NSSI/suicide) for all predictors (emotional reactivity odds ratio [OR] = 1.03; family function OR = 0.93; peer relationship quality OR = 0.92; child abuse OR = 1.13; depression OR = 1.11). Compared to Class 1, levels of child abuse and depression were significantly associated with all of the other classes. In addition, compared to Class 1, Class 2 (low NSSI/high suicide) showed a significant negative association with family functioning (OR = 0.96), and Class 4 (high NSSI/low suicide) revealed a strong association with peer relationship quality (OR = 0.93).

Table 13. Parameter Estimates Contrasting Class 1 vs. Classes 2, 3 and 4 (N = 768)

Class[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B) Lower Bound	Upper Bound
Class 2	Intercept	.44	1.03	.18	1	.672			
Low NSSI/	Emotional reactivity	.01	.01	1.70	1	.192	1.01	.99	1.03
High suicidality	Family functioning	-.04	.02	6.26	1	**.012**	.96	.93	.99
	Peer relationship	-.05	.03	2.30	1	.129	.95	.89	1.02
	Child abuse	.09	.02	18.67	1	**<.0001**	1.10	1.05	1.15
	Depression	.10	.02	17.61	1	**<.0001**	1.11	1.06	1.16
Class 3	Intercept	.89	1.12	.64	1	.426			
High NSSI/	Emotional reactivity	.03	.01	15.76	1	**<.0001**	1.03	1.02	1.05
High suicidality	Family functioning	-.07	.02	14.13	1	**<.0001**	.93	.90	.97
	Peer relationship	-.08	.04	5.27	1	**.022**	.92	.86	.99
	Child abuse	.12	.02	28.36	1	**<.0001**	1.13	1.08	1.18
	Depression	.10	.03	15.33	1	**<.0001**	1.11	1.05	1.17
Class 4	Intercept	.32	1.06	.09	1	.761			
High NSSI/	Emotional reactivity	.003	.01	.13	1	.717	1.00	.99	1.02
Low suicidality	Family functioning	-.01	.02	.51	1	.474	.99	.96	1.02
	Peer relationship	-.08	.03	5.05	1	**.025**	.93	.87	.99
	Child abuse	.11	.02	25.88	1	**<.0001**	1.12	1.07	1.17
	Depression	.05	.03	4.50	1	**.034**	1.06	1.00	1.11

Note. Class 1 (low NSSI/low suicide risk) was the reference category. B = estimate; Exp(B) = odds ratio. "Exp(B)," or the odds ratio, is the predicted change in odds for a unit increase in the predictor. The "exp" refers to the exponential value of B.

Based on these results, Aim 3 hypotheses 1 and 2 were accepted. That is, there was significant evidence that individual characteristics (emotional reactivity, depression) and contextual experiences (childhood abuse, family function, peer relationship quality) were most strongly associated with high risk of NSSI and suicidal behavior/intent among youth.

CHAPTER 5.

DISCUSSION

This chapter provides a discussion of the dissertation research findings, including a detailed discussion the characteristics of the sample, interpretation of findings that emerged in addressing the specific study aims and testing their hypotheses. Study limitations, implications and major conclusions are also presented.

Although research has demonstrated that adolescents experience heightened and prolonged negative emotion prior to and during the act of NSSI, little research has examined the effects of contextual factors on emotional reactivity and their influences on adolescent NSSI. To understand the association among contextual risk factors, emotional reactivity, and NSSI, this study constructed the theoretical model (Figure 1) and examined the hypothesized relationships in a sample of junior college and college students age 17-22 years in Taiwan as follows. Key hypothesis addressed the mediating effects of emotional reactivity on NSSI behaviors, and the potential moderating effects of contextual factors (childhood abuse, peer relationship quality and family functioning) on emotional reactivity, adjusting for known influential factors including depression, parent marital status, household income, and psychiatric history of doctor visits. Consistent with model hypotheses, the effect of childhood abuse on NSSI was partially mediated by emotional reactivity, and poor peer relationship quality uniquely predict NSSI. However, low family functioning did not predict NSSI. Lower

family functioning and poor peer relationship quality heightened emotional reactivity. However, there was no clear evidence that either family functioning or peer relationship quality served to moderate the effects of childhood abuse on emotional reactivity. Because little is understood about what individual differences exist among subgroups of youth experiencing NSSI with and without suicidal behaviors, the relative effects of contextual factors and individual variability (emotion reactivity and depression) on case classification relative to NSSI and/or suicidal behaviors were then explored. Consistent with the hypotheses, four classes of distinct subgroups of self-injurious behaviors were identified as Class 1, low risk of NSSI and suicidal behavior, Class 2, low risk of NSSI and high risk of suicidal behavior, Class 3, high risk of NSSI and suicidal behavior/intent, and Class 4, high risk of NSSI and low risk of suicidal behavior. Results showed significant class differences across contextual risk factors, emotional reactivity and depression. Significant evidence was found that individual characteristics (emotional reactivity, depression) and contextual experiences (childhood abuse, family function, peer relationship quality) were most strongly associated with high risk of NSSI and suicidal behavior/intent among youth. Importantly, all four classes differed significantly from each other on depression.

Characteristics of NSSI

Consistent with other current studies, the onset age of NSSI was between 12 and 14, and most of self-injurers harm themselves repetitively, thinking a few minutes or without thinking

before engaging in NSSI, and experiencing little pain or no pain during NSSI. The lifetime prevalence of NSSI (41.7%) observed in this dissertation sample is also consistent with current reports of adolescent NSSI, with lifetime prevalence ranging from 5% to 42% across countries in community samples (Muehlenkamp et al., 2012). Lifetime prevalence in this study, however, was higher than earlier reported rates of 15.9% to 23% in Taiwanese adolescent ages 13-18 (Chen & Cheng, 2001; Lin, 2001; Chen, 2006) and higher than the pooled NSSI prevalence 17.2% among adolescents, and 13.4% among young adults in a recent meta-analysis (Swannell, Martin, Page, Hasking, & St. John, 2014). The higher prevalence could be associated with the anonymity ensured in this study, or with the use of the specific NSSI measure based on a checklist of the number of specified NSSI methods used. The variability seen in existing NSSI prevalence estimates is influenced by features of anonymity and measurement tools, especially if the research tool is a checklist rather than a single item, yes vs. no question (Muehlenkamp et al., 2012; Swannell, et al., 2014). Checklists and anonymity may yield more accurate results because checklists require respondents to take more time to process each item (Schaeffer & Presser, 2003), and anonymity facilitates respondents in revealing the sensitive, often concealed issue of NSSI (Swannell, et al., 2014).

The finding for lifetime prevalence in this dissertation research is consistent with other studies that used the same or similar checklist measure with students. For example,

Zetterqvist and colleagues (2013) surveyed 3,060 (50.5 % female) Swedish adolescents aged 15–17 years and reported 41.6% having engaged in NSSI at least once; Hamza and Willoughby (2013) surveyed 1,090 (70.3% female) first-year undergraduate students (mean age = 19.11, SD =1.05) and reported that 40.27% engaged in NSSI at least once. The results are also consistent with another nonclinical sample study that demonstrated equivalent NSSI prevalence across gender (Muehlenkamp et al., 2012; Swannell, et al., 2014). However, this dissertation study sample was primarily female, thus interpretation of the results with respect to male youth is cautioned.

Inconsistent with a review study (Jacobson & Gould, 2007), the most commonly used methods in this dissertation research were self-biting and picking at a wound, but not cutting or hitting. The type of methods endorsed may be influenced by whether a checklist measure was used and what methods were listed on the checklist. For example, other studies reported self-battery (Muehlenkamp, Brausch, Quigley, & Whitlock, 2013), biting (Zetterqvist, Lundh, Dahlstrom, & Svedin, 2013), hair pulling and pinching (Hamza & Willoughby, 2013) were most commonly endorsed methods. Although some researchers have argued picking at a wound is a "normative" behavior (e.g., Fox, et al., 2015), others exclude these types of behaviors. We surmised it would not be appropriate to exclude the "picking at wound" item. From academic and clinical interviews, we noted that many NSSI individuals reported that they often picked at their cutting/carving/burning wounds to get relief or pain, which was

evidenced in this present study as most participants (85%) who endorsed this item also endorsed other NSSI methods. The heterogeneous methods of individuals endorsed to engage in self- injury suggest that self-injurers tend to use accessible methods to deal with their urges to harm themselves.

In this study, 13.3% reported having ever engaged in NSSI more than 5 times in the past year, with 6.3% 5-10 times and 7.0% more than 10 times. The findings partially fit with DSM-5 criteria for NSSI diagnosis, defined by five or more days of intentional self-inflicted damage to the surface of the body without suicidal intent within the past year. However, increasingly empirical studies have demonstrated that individuals who meet DSM criteria report frequencies that are considerably higher than the minimum criteria of 5 or more acts of NSSI in one year (e.g. Andover, 2014; Muehlenkamp &Brausch, 2016; Selby et al., 2015). For example, Zetterqvist and colleagues (2013) reported an average of 11 acts of NSSI in community adolescents who met criteria for NSSI Disorder (Zetterqvist, Lundh, Dahlstrom, & Svedin, 2013). Muehlenkamp, Brausch, and Washburn (2017) identified significant differentiation of groups of youth based on a NSSI frequency of 25 or more days in the past year with a sample of 746 adolescent psychiatric patients. They found that the High-NSSI group (25+ days of NSSI) scored higher on most NSSI features including DSM-5 proposed Criterion B and C symptoms than Moderate-NSSI (5-24 days of NSSI) and Low-NSSI (1-4

days of NSSI). Additional research is needed to verify the minimum frequency or cutpoints of NSSI that requires clinical attention.

Direct and Mediated Influences of Contextual Factors on NSSI

The Specific Aim 1 hypotheses posited that contextual factors – childhood abuse, peer relationship quality, and family functioning – would have direct effects on non-suicidal self-injury, and that effects of childhood abuse on non-suicidal self-injurious behavior would be partially mediated by emotional reactivity. Results demonstrated childhood abuse had direct and indirect positive effects on NSSI, and that the effects were partially mediated by emotional reactivity, adjusting for demographic variables and depression. The finding is in line with current studies demonstrating that childhood abuse history is positively associated with NSSI. For example, in a recent systematic review of 26 studies, Serafini et al. (2017) concluded that childhood maltreatment is a significant risk factor for NSSI. The results are also consistent with previous research that NSSI adolescents experience heightened emotional reactivity (Nock & Mendes, 2008; Glenn, Blumenthal, Klonsky & Hajcak, 2011), and that emotional reactivity directly influences NSSI (Kleiman, Ammerman, Look, Berman, & McCloskey, 2014). Importantly, the findings highlight the role of emotional reactivity underlying the pathway from childhood abuse to NSSI. Consistent with theories of Linehan (1993) and Yates (2009), the results support the hypotheses that childhood abuse history may cause deficits in emotion regulation (e.g. emotional reactivity) and, consequently self-

injurious behaviors develop to manage emotional distress. The results are also consistent with other research findings. For example, similar Peh and colleagues (2017), with a sample of 108 adolescent patients (mean age 17.0 years, SD = 1.65; 59.3% female), found that emotion dysregulation mediated the association between the severity of maltreatment exposure and self-harm frequency. More importantly, the present dissertation study extends our understanding about a specific dimension of the emotion regulation process—emotion reactivity—that underlies the pathway from childhood abuse to NSSI. Lang and Sharma-Patel (2011) proposed three different overlapping pathways contributing to the link between childhood maltreatment and self-injurious behaviors. They are (1) the regulatory pathway that describes the disturbance created by trauma in cognitive and affective processing, integration of thinking and feeling, and development of the capacity to understand and express emotional states; (2) the representational/interpersonal pathway that describes how self-injury eventuates from disturbances in child-caregiver attachment; and (3) the reactive/neurobiological pathway that describes neurobiological responding to trauma, including excitatory and inhibitory processes that underlie self-injury. The present study addressed the reactive/neurobiological pathway through its focus on emotional reactivity; most other recent studies have focused on other pathways. For example, in their review, Andover and Morris (2014) indicated that nearly all empirical studies of trait-level emotion dysregulation in NSSI assessed six domains of emotion regulation difficulties by using the

Difficulties in Emotion Regulation Scale (DERS) (e.g. Peh et al., 2017), which included:.1) nonacceptance of negative emotions, 2) difficulty in engaging goal-directed behaviors, 3) difficulty in accessing effective emotion regulation strategies, 4) impulsivity, 5) limited emotional awareness and 6) limited emotional clarity. These domains are similar to the regulatory pathway of emotion regulation that relates to whether an individual can identify, accept, express, and manage intense affect in an organized, cohesive manner (Lang & Sharma-Patel, 2011). The present study is, to our knowledge, the first community-sample study to assess the role of emotional reactivity as a mediator of the relationship between childhood abuse and NSSI.

Consistent with the hypotheses proposed in the proposed dissertation model, the results of the current study revealed that poor peer relationship quality predicted NSSI. Specifically, participants who endorsed low scores in items such as “get along well with others” “popular and welcome” “can express themselves” were prone to engaged in NSSI. The results of this dissertation research are also consistent with other scientific evidence demonstrating that difficulty in adolescent peer relationships may be a key NSSI risk factor. Importantly, the findings extend our understanding about how peer relationships influence NSSI, as most empirical studies have examined other peer factors associated with NSSI, such as peer victimization/bullying (e.g., Adrian et al., 2011; Jiang et al., 2016) or peer ‘contagion’ (e.g., Prinstein et al., 2010; You et al., 2013).

On the other hand, low family functioning did not predict NSSI, inconsistent with the hypotheses. There are possible explanations for this failure. First, although existing research has consistently demonstrated that poor family functioning is associated with NSSI (e.g., Nixon & Heath, 2009; Cassels, et al., 2018), other research has also shown no associations between the presence of NSSI and family functioning (e.g., Baetens, 2015). The failure to consistently identify family functioning in research as risk factor associated with NSSI may be due to differences in how family functioning has been defined across studies. For example, Jutengren, Kerr and Stattin (2011) defined negative parenting behaviors as a domain of dysfunctional family, and their measures capture parents' angry outbursts and coldness-rejection, whereas in their research Law and Shek (2016) covered a broader range of family contexts including mutuality, conflicts, and communication. In fact, Vale, Nixon and Kucharski (2009) suggest that "no specific family factors have been clearly identified in research as risk factors associated with adolescent self-injury." Future research will need to conceptualize family functioning more comprehensively (e.g., including parenting style, family cohesion, conflicts, interaction and communication), and differentiate the relative associations of multiple aspects of family functioning with NSSI. Second, the association between family factors and NSSI may be better accounted for by other facets of family, such as family socioeconomic status. In our SEM model, we found family income had a direct effect on NSSI. Other research (e.g., Bureau et al., 2010; Nixon et al., 2008; Baetens et al.,

2014) has also shown an association between NSSI and socioeconomic status. It is also possible that family functioning had an effect, but its effect was attenuated with childhood abuse, another family factor, also included in the analysis. In fact, when childhood abuse was removed from the analysis, family functioning had a significant unique impact on NSSI.

Moderating Effects of Family Functioning and Peer Relationship Quality

Specific Aim 2 hypotheses predicted that family functioning and peer relationship quality would moderate the effects of childhood abuse on emotional reactivity. No clear evidence was found to indicate that family functioning or peer relationship quality served to moderate the effects of childhood abuse on emotional reactivity. However, it is worth noting that low family functioning and poor peer relationship quality heightened emotional reactivity. These results are consistent with other research that has indicated that family functioning and peer relationships are major stressors capable of eliciting emotional arousal in adolescents (e.g. Larson, Clore, & Wood, 1999; Taylor et al, 2006). However, this dissertation research failed to support current theories about the joint influences of early adverse experience and current environmental adversity on heightened emotional reactivity and negative health outcomes. One possible explanation for this failure is that the associations may be complex and possibly nonlinear. According to the biological sensitivity to context theory (Ellis & Boyce, 2008), an individual develops heightened stress reactivity as a result of the interaction between genetic and early environmental experiences. Adolescents who have high reactivity are very sensitive

to context that there is a curvilinear, U-shaped relation within both highly stressful and highly protected social environments. That is, adolescents who have high reactivity appear to be more responsive to both adverse and supportive contextual influences. Empirical research also shows evidence of similar emotional reactivity patterns. For example, Infurna and colleges (2015) examined whether self-reports of childhood trauma were associated with emotional reactivity to daily negative and positive events in a community sample (n = 191, Mage = 54, SD = 7.50, 54% female). Results indicated that participants who reported higher levels of childhood trauma showed stronger decreases in well-being when experiencing negative events and also stronger increases in well-being with positive events. Along another direction, Sourander et al. (2006) found that acts of deliberate self harm (suicide, attempted suicide, NSSI, and risk-taking behaviors) are due to an accumulation of earlier family and parental distress, and a child's externalizing and internalizing problems. It is thus possible that heightened emotional reactivity and engagement in NSSI is not conditioned by contextual factors, but impacted by the accumulation of contextual stressors.

Contextual and Individual Risks on NSSI with or without Suicidal Behaviors

Specific Aim 3 hypotheses predicted the influence of contextual risk factors (childhood abuse, family functioning, peer relationship quality), and individual characteristics (emotion reactivity, depression) on case classification relative to non-suicidal self injury coupled with or without suicidal behaviors. Consistent with the proposed hypotheses, four distinct

subgroups of self-injurious behaviors were identified: Class 1, low risk of NSSI and suicidal behavior, Class 2, low risk of NSSI and high risk of suicidal behavior, Class 3, high risk of NSSI and suicidal behavior/intent, and Class 4, high risk of NSSI and low risk of suicidal behavior. Comparison among the four classes showed significant class differences across contextual risk factors, emotional reactivity and depression, and that these risk factors were most strongly associated with high risk of NSSI and suicidal behavior/intent among youth. The findings are important in several ways. First, this study demonstrated there are distinct subgroupings of youth with NSSI with and without suicidal behaviors, and measures of contextual risk, emotional reactivity, and depression were distinguishable by class. Importantly, the results showed pattern between these risk factors and classes of self-injurious behaviors. Specifically, the level of risk of the measured factors decreased by classification across Class 3 (high NSSI/high suicide), Class 2 (low NSSI/ high suicide risk), Class 4 (high NSSI/low suicide risk) to Class 1 (low NSSI/low suicide risk). To our best knowledge, this study is the first to identify that contextual and individual risks influence differences in youth who harm themselves and do or do not report suicidal behaviors. Second, depression was identified as a key risk factor and could differentiate youth with self-injurious behaviors. All four classes differed significantly from each other on depression; Class 3 (high NSSI/high suicide) was the only group with average depression scores above the designated cut point for depression (CES-D) indicating that depressive symptoms may account for the relationship

associated with NSSI and suicidal behaviors. Hamza, Stewart and Willoughby (2012) discuss three explanations as to why NSSI and suicidal behavior are linked. First, NSSI may be a gateway form of self-injury that leads to more extreme forms of self-injury with similar experiential qualities (Gateway Theory). Second, a third unmeasured variable may account for the co-occurrence of NSSI and suicidal behaviors. That is, NSSI and suicidal behaviors may share similar risk factors. Third, based on Joiner's Theory of Acquired Capability for Suicide (2005), the act of NSSI may increase the acquired capability for suicide, because NSSI may habituate an individual to the fear and pain associated with suicidal self-harming behaviors. Aim 3 related findings provide evidence most reasonably supported by the third variable explanation. That is, links between NSSI and suicidal behaviors may be explained by shared contextual or individual risk factors. Interesting, compared to Class 1(low NSSI/low suicide), Class 2 (low NSSI/ high suicide) showed a significant negative association with family functioning, but no association with peer relationship quality. Class 4 (high NSSI/low suicide) revealed a strong association with peer relationship quality, but no significant association with family functioning. Together these and previous findings of this study, it is possible that peer relationship is a more important risk factor than family functioning associated with NSSI. The results are also consistent with current research showing that family factors—such as family support or cohesion—are strongly associated with adolescent suicide. Also compared to Class 1, Class 3 (high NSSI/high suicide) was the only group

significantly associated with emotional reactivity. Thus, it is possible there may be a third biological factors related to emotion reactivity in NSSI youth with suicidal behaviors. Recent research has found neurobiological evidence associated with NSSI. For example, Klimes-Dougan and colleagues (2017) examined salivary cortisol release following the Trier Social Stress Test (TSST) in adolescents (N = 153) with major depressive disorder (MDD) and NSSI adolescents with MDD and no NSSI, and healthy controls. Results showed that those with MDD and NSSI had significantly lower cortisol levels than those with MDD and no NSSI ($p = .004$), suggesting a disrupted HPA axis in NSSI adolescents.

Limitations

Although the proposed model tested in this research implies a causal relationship, the data are based on a cross-sectional design; further validation of the theoretical relationships tested will require a longitudinal design. Theory testing was limited to one hypothesized model, focus on three contextual variables and two individual variables. There are competing theoretical models that may produce different results. For instance, in a community sample of adolescents with no history of NSSI followed for 3 years (n= 933, ages 14 year), Cassels and colleagues (2018) demonstrated that poor family functioning mediates the link between childhood family adversity adolescent NSSI. In addition, retrospective recall of childhood abuse is subject to recall bias. Reviews suggest that retrospective reports of adverse childhood experiences can provide useful and fairly accurate data (Hardt & Rutter, 2004).

Recent findings suggest that the stability of retrospective self-reports about childhood adversity is not related to the health state at the time of reporting (Monteiro & Maia, 2010; Pinto, Correia, & Maia, 2014). Self-report responses are subjective and also may are vulnerable to other forms of bias (e.g., social desirability). The single-informant method used in this dissertation research raises concerns of shared method variance. For example, responding to all items at one time may make these related concepts highly accessible to respondents, and thus create bias (Feldman & Lynch, 1988). While the sample size was large, the sample was based on convenience sampling and included only youth in late adolescence. Thus, the results may not be generalizable to all Taiwanese adolescents or other adolescent samples. Moreover, the sample was primarily female, with a relatively small number of males. Thus, extrapolation of the findings to male youth is cautioned. Finally, the study was limited by the use of a frequency measure of NSSI as the major outcome variable; future research needs to incorporate more comprehensive indicators to measure the severity (e.g., duration, intensity) of NSSI.

Implications

The dissertation research results provide unique and important insights into how contextual factors influence NSSI in late adolescents. Several implications can be drawn from the study for prevention programs, clinical practice and future research. First, the study identified significant pathways and associations among childhood abuse, peer relationship, family

functioning, emotional reactivity, and NSSI, which indicate that early intervention should focus on improving family function, preventing child abuse, improving children's social relationship skills as well as improving emotion regulation strategies to prevent self-injurious behavior during adolescence. Second, in this study depression differentiated NSSI youth with suicidal behavior from those without. Screening measures of depression that can be administered on a large-scale in school or other settings could be especially helpful in identifying individuals at risk, providing targeted interventions, and funneling appropriate treatment and prevention resources to those who most need them. Third, the results have important implications for future research. The present study provide a preliminary step in assessing the mediating effect of emotional reactivity from childhood abuse to NSSI in a community sample; longitudinal research is needed to validate the results and explore behavioral trajectories across time. In addition, future research is needed to examine for logical cut-off scores of depression for NSSI youth with and without suicide. The definition and measure of family-related risk factors need to be expanded. Future research will also need to examine how childhood abuse history accumulates and interacts with distal contextual factors.

Conclusion

This study sought to understand how contextual factors influence adolescent NSSI. This dissertation research was specifically designed to complement knowledge gleaned from

psychological models of self-injurious behavior, but with detailed attention to contextual factors. The results showed that childhood abuse had both direct and indirect effects on NSSI, and that emotional reactivity mediated the effects from childhood abuse to NSSI. Peer relationship quality was significantly associated with NSSI, and family functioning was significantly associated with suicidal behaviors occurring with or without NSSI. Importantly, contextual risk factors, emotional reactivity and depression significantly differentiate youth reporting NSSI occurring both with and without suicidal behavior. These dissertation findings provide a strong framework to help educators, health professionals, and researchers design and implement treatment and prevention interventions for youth.

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Appendices: Instruments in the *Youth Coping Questionnaire*

Appendix 1. Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997)

A. In the <u>past year</u>, have you engaged in the following behaviors to <u>deliberately harm yourself</u> without trying to kill yourself (check all that apply):

	No	Yes	How many times?	Have you gotten medical treatment?
1. cut or carved on your skin				
2. hit yourself on purpose				
3. pulled your hair out				
4. gave yourself a tattoo				
5. picked at a wound				
6. burned your skin (i.e., with a cigarette, match or other hot object)				
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				
12. 12. other: _____				

B. If not in the past year, have you EVER done any of the above acts? ☐Yes ☐ No

B1. How many times in your life have you engaged in self-harm without trying to kill yourself?

☐1-4 times ☐5-10 times ☐11-50 times ☐50-100 times ☐ more than 100 times

B2. How old were you when you first harmed yourself in this way? _____

<u>If yes to any of the above behaviors in the past year</u>, please complete the questions (C-H) below:

C. How long did you think about doing the above act(s) before actually doing it?

☐ none ☐ "a few minutes" ☐ < 60 minutes ☐ > 1 hour but < 24 hours
☐ more than 1 day but less than a week ☐ greater than a week

D. Did you perform any of the above behaviors while you were taking drugs or alcohol?

☐Yes ☐ No

E. Did you experience pain during this self-harm?

☐ severe pain ☐ moderate pain ☐little pain ☐no pain

F1. Did the act(s) of self-harm continue despite your wanting to cut down or stop?

☐Never ☐Rarely ☐Sometimes ☐ Often ☐always

F2. Were the act(s) of self-harm more frequent than expected despite your wanting to manage?

☐Never ☐Rarely ☐Sometimes ☐ Often ☐always

G. Did you harm yourself for any of the reasons listed below? (check all reasons that apply):

	0 Never	1 Rarely	2 Sometimes	3 Often
1. to avoid school, work, or other activities	0	1	2	3
2. to relieve feeling "numb" or empty	0	1	2	3
3. to get attention	0	1	2	3
4. to feel something, even if it was pain	0	1	2	3
5. to avoid having to do something unpleasant you don't want to do	0	1	2	3
6. to get control of a situation	0	1	2	3
7. to try to get a reaction from someone, even if its a negative reaction	0	1	2	3
8. to receive more attention from your parents or	0	1	2	3
9. to avoid being with people	0	1	2	3
10. to punish yourself	0	1	2	3
11. to get other people to act differently or change	0	1	2	3
12. to be like someone you respect	0	1	2	3
13. to avoid punishment or paying the consequences	0	1	2	3
14. to stop bad feelings	0	1	2	3
15. to let others know how desperate you were	0	1	2	3
16. to feel more a part of a group	0	1	2	3
17. to get your parents to understand or notice you	0	1	2	3
18. to give yourself something to do when alone	0	1	2	3
19. to give yourself something to do when with others	0	1	2	3
20. to get help	0	1	2	3
21. to make others angry	0	1	2	3
22. to feel relaxed	0	1	2	3
23. other:	0	1	2	3

Please continue on the next page……

Appendix 2. Emotion Reactivity Scale (ERS; Nock, Wedig, Holmberg, & Hooley, 2008)

This questionnaire asks different questions about how you experience emotions **on a regular basis (for example, each day)**. When you are asked about being "emotional," this may refer to being angry, sad, excited, or some other emotion. Please rate the following statements.

		0 Not at all like me	1 A little like me	2 Somewhat like me	3 A lot like me	4 Completely like me
1	When something happens that upsets me, it's all I can think about it for a long time.	**0**	**1**	**2**	**3**	**4**
2	My feelings get hurt easily.	**0**	**1**	**2**	**3**	**4**
3	When I experience emotions, I feel them very strongly/intensely.	**0**	**1**	**2**	**3**	**4**
4	When I'm emotionally upset, my whole body gets physically upset as well.	**0**	**1**	**2**	**3**	**4**
5	I tend to get very emotional very easily.	**0**	**1**	**2**	**3**	**4**
6	I experience emotions very strongly.	**0**	**1**	**2**	**3**	**4**
7	I often feel extremely anxious.	**0**	**1**	**2**	**3**	**4**
8	When I feel emotional, it's hard for me to imagine feeling any other way.	**0**	**1**	**2**	**3**	**4**
9	Even the littlest things make me emotional.	**0**	**1**	**2**	**3**	**4**
10	If I have a disagreement with someone, it takes a long time for me to get over it.	**0**	**1**	**2**	**3**	**4**
11	When I am angry/upset, it takes me much longer than most people to calm down.	**0**	**1**	**2**	**3**	**4**
12	I get angry at people very easily.	**0**	**1**	**2**	**3**	**4**
13	I am often bothered by things that other people don't react to.	**0**	**1**	**2**	**3**	**4**
14	I am easily agitated.	**0**	**1**	**2**	**3**	**4**
15	My emotions go from neutral to extreme in an instant.	0	1	2	3	4
16	When something bad happens, my mood changes very quickly. People tell me I have a very short fuse.	**0**	**1**	**2**	**3**	**4**
17	People tell me that my emotions are often too intense for the situation.	**0**	**1**	**2**	**3**	**4**
18	I am a very sensitive person.	**0**	**1**	**2**	**3**	**4**
19	My moods are very strong and powerful.	**0**	**1**	**2**	**3**	**4**
20	I often get so upset it's hard for me to think straight.	**0**	**1**	**2**	**3**	**4**
21	Other people tell me I'm overreacting.	**0**	**1**	**2**	**3**	**4**

Please continue on the next page……

Appendix 3. Subscales of McMaster Family Assessment Device (FAD) (Epstein, Baldwin, & Bishop, 1983)

Please **Circle** the number that best applies to you.

	Strongly agree	Agree	Disagree	Strongly disagree
1. Planning family activities is difficult because we misunderstand each other.	4	3	2	1
2. In time of crisis we can turn to each other for support.	4	3	2	1
3. We cannot talk to each other about sadness we feel.	4	3	2	1
4. Individuals are accepted for what they are.	4	3	2	1
5. We avoid discussing our fears and concerns.	4	3	2	1
6. We can express feelings to each other.	4	3	2	1
7. There are lots of bad feelings in the family.	4	3	2	1
8. We feel accepted for what we are.	4	3	2	1
9. Making decisions is a problem for our family.	4	3	2	1
10. We are able to make decisions about how to solve problems.	4	3	2	1
11. We don't get along well together.	4	3	2	1
12. We confide in each other.	4	3	2	1

Please continue on the next page……

Appendix 4. Interpersonal Relationship subscale of the Adolescent Social Adjustment Scale (Luo, 2004)

Please **Circle** the number that best applies to you.

	Strongly disagree	Disagree	Agree	Strongly agree
	4	3	2	1
1. I get along well with others.	4	3	2	1
2. I can express myself well.	4	3	2	1
3. I am rather good looking.	4	3	2	1
4. I have good personality.	4	3	2	1
5. I know how to handle my own emotions effectively.	4	3	2	1
6. I am popular and welcome.	4	3	2	1
7. I have rather strong attraction to the same sex.	4	3	2	1
8. I have rather strong attraction to the other-sex.	4	3	2	1

Please continue on the next page……

Appendix 5. Juvenile Victimization Questionnaire (JVQ)- adult retrospective version (JVQ-AR; Finkelhor, Hamby, Ormrod, & Turner, 2005)

These are questions about some things that might have happened during your childhood. Your "childhood" begins when you are born and continues through age 17. Try your best to think about your entire childhood as you answer these questions. we ask about grown-ups who took care of you when you were a child (age 0 to 17). This means parents, babysitters, adults who live with you, or others who watch you.

	1 time	**2 times**	**3 times**	**4 times**	**5 times or more**	**No**
1. Not including spanking on your bottom, when you were a child, did a grown-up in your life hit, beat, kick, or physically hurt you in any way?	1	2	3	4	5	0
2. When you were a child, did you get scared or feel really bad because grown-ups in your life called you names, said mean things to you, or said they didn't want you?	1	2	3	4	5	0
3. When someone is neglected, it means that the grown-ups in their life didn't take care of them the way they should. They might not get them enough food, take them to the doctor when they are sick, or make sure they have a safe place to stay. When you were a child, did you get neglected?	1	2	3	4	5	0
4. Sometimes a family fights over where a child should live. When you were a child, did a parent take, keep, or hide you to stop you from being with another parent?	1	2	3	4	5	0
5. When you were a child, did a grown-up YOU KNOW touch your private parts when you didn't want it or make you touch their private parts? Or did a grown-up YOU KNOW force you to have sex?	1	2	3	4	5	0
6. When you were a child, did a grown-up YOU KNOW touch your private parts when you didn't want it or make you touch their private parts? Or did a grown-up YOU KNOW force you to have sex?	1	2	3	4	5	0
7. Now think about kids your age, like from school, a boy friend or girl friend, or even a brother or sister. When you were a child, did another child or teen make you do sexual things?	1	2	3	4	5	0
8. When you were a child, did anyone TRY to force you to have sex, that is sexual intercourse of any kind, even if it didn't happen?	1	2	3	4	5	0
9. When you were a child, did anyone make you look at their private parts by using force or surprise, or by "flashing" you?	1	2	3	4	5	0
10. When you were a child, did anyone hurt your feelings by saying or writing something sexual about you or your body?	1	2	3	4	5	0
11. When you were a child, did you do sexual things with anyone 18 or older, even things you both wanted?	1	2	3	4	5	0

Please continue on the next page……

Appendix 6. Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), ten-item short form CES-D 10; Kohout et al., 1993)

Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the **past week**: (*circle **one** number on each item*)

During the past week……	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	All of the time (5-7 days)
1. I felt depressed.	0	1	2	3
2. I felt that everything I did was an effort.	0	1	2	3
3. My sleep was restless.	0	1	2	3
4. I was happy.	0	1	2	3
5. I felt lonely.	0	1	2	3
6. People were unfriendly.	0	1	2	3
7. I enjoyed life.	0	1	2	3
8. I felt sad.	0	1	2	3
9. I felt that people disliked me.	0	1	2	3
10. I could not get "going."	0	1	2	3

Please continue on the next page……

Appendix 7. Suicide Behaviors Questionnaire-Revised (SBQ-R; Osman et al, 1999)

Instructions: Please check the number beside the statement or phrase that best applies to you.

1. Have you ever thought about or attempted to kill yourself?(check one only)

- ☐ 1. Never
- ☐ 2. It was just a brief passing thought
- ☐ 3a. I have had a plan at least once to kill myself but did not try to do it
- ☐ 3b. I have had a plan at least once to kill myself and really wanted to die
- ☐ 4a. I have attempted to kill myself, but did not want to die
- ☐ 4b. I have attempted to kill myself, and really hoped to die

2. How often have you thought about killing yourself in the past year? (check one only)

- ☐ 1. Never
- ☐ 2. Rarely (1 time)
- ☐ 3. Sometimes (2 times)
- ☐ 4. Often (3-4times)
- ☐ 5. Very Often (5 or more times)

3. Have you ever told someone that you were going to commit suicide, or that you might do it? (check one only)

- ☐ 1. No
- ☐ 2a. Yes, at one time, but did not really want to die
- ☐ 2b. Yes, at one time, and really wanted to die
- ☐ 3a. Yes, more than once, but did not want to do it
- ☐ 3b. Yes, more than once, and really wanted to do it

4. How likely is that you will attempt suicide someday? (check one only)

- ☐ 0. Never
- ☐ 1. No chance at all
- ☐ 2. Rather unlikely
- ☐ 3. Unlikely
- ☐ 4. Likely
- ☐ 5. Rather likely
- ☐ 6. Very likely

Please continue on the next page……

Appendix 8. Demographic Information

1. Age:_____(year/month) _____
2. Gender: ☐Female ☐ Male
3. Marital status: ☐never married ☐married ☐separated ☐ divorced
4. Parental Ethnicity:
   4a. Mother: ☐Han Taiwanese ☐Native Taiwanese ☐Foreign residents (please specify):_____
   4b. Father: ☐Han Taiwanese ☐Native Taiwanese ☐Foreign residents (please specify):_____
5. Parents' marital status:
   ☐never married ☐married to spouse ☐separated ☐ divorced ☐widowed father ☐widowed mother ☐remarried ☐other (please specify):_____
6. Parental education:
   6a. Mother: ☐ elementary school ☐ junior high school ☐ high school ☐junior college ☐ university or college ☐ master ☐ doctoral degree ☐other (please specify):_____
   6b. Father: ☐ elementary school ☐ junior high school ☐ high school ☐ junior college ☐ university or college ☐ master ☐ doctoral degree ☐other (please specify):_____
7. Monthly household income:
   ☐<NT$25,000 ☐ NT$25,000~$40,000 ☐ NT$40,001~$60,000
   ☐ NT$60,001~$80,000 ☐ NT$80,001~$100,000 ☐>$100,000
8. Family composition:
   How many people are there in your family?_____
   Family members: ☐Mother ☐Father ☐Brother ☐Sister ☐Other family members (please specify):_____
9. Medical/Psychiatric history
   9a. Have you ever been hospitalized? ☐Yes ☐No
   9b. How many times? _____
   9c. For each hospitalization, please indicate when you were hospitalized and the reason for hospitalization.
      c1. Month/Year:_____reason:_____
      c2. Month/Year:_____reason:_____
      c3. Month/Year:_____reason:_____
      c4. Month/Year:_____reason:_____
      c5. Month/Year:_____reason:_____
   9d. Have you visited a doctor for psychiatric-mental health reasons such as depression?
      ☐Yes. Number of times you visited_____How recent the last was_____
      ☐No.
   9e. Have you visited a doctor for psychiatric-mental health reasons such as suicidal thoughts?
      ☐Yes Number of times you visited_____How recent the last was_____
      ☐No
   9f. Have you visited a doctor for psychiatric-mental health reasons such as suicidal behavior?
      ☐Yes Number of times you visited_____How recent the last was_____
      ☐No

Thank you for your responses!

Note. The measures used in this dissertation research were administered in Chinese to participating university students. Please contact the investigator for additional information regarding the Chinese translated versions of the instruments.