

EMOTION REGULATION PROCESSES IN ADOLESCENT NON-SUICIDAL SELF-INJURY
(NSSI): THE ROLES OF COGNITIVE REAPPRAISAL, EXPRESSIVE SUPPRESSION, AND
RUMINATION

by

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ABSTRACT

Poor emotion regulation has been implicated in the occurrence of non-suicidal self-injury (NSSI), yet how this affects adolescent self-injury is not well understood, particularly in light of changes in emotion regulation during adolescence. The set of three empirical studies reported in this thesis aimed broadly to examine the roles of three emotion regulation processes (cognitive reappraisal, expressive suppression and rumination) in NSSI among adolescents. Together, these studies investigated how the emotion regulation processes of interest were related to NSSI, and in particular, to its onset and on-going severity as assessed by frequency, duration and medical seriousness of methods used.

Method: Data from 3,143 predominantly female high school students (aged 12-18 years), recruited from Australian secondary schools, were analysed. Of these, 555 indicated they had a history of NSSI. Mean age of onset ranged from 12-14 years, with most participants reporting they had engaged in NSSI in the twelve months preceding data collection. Reported frequency of NSSI ranged from one to 300 times. Cutting and hitting oneself were the most common forms of NSSI although a range of methods and multiple methods were reported.

Results: Adolescents who engaged in NSSI were more likely, compared to their non-self-injuring peers, to use emotion regulation processes which tend to heighten negative emotional states (i.e. expressive suppression and rumination) rather than those which can potentially reduce these emotions (i.e. cognitive reappraisal). Nonsignificant differences in the trajectories of these processes across the study period suggest similar developmental patterns between groups. However, self-injurers were more likely to have experienced more adverse life events. Taken together, these

findings suggest adolescents who self-injure are more vulnerable and less prepared to respond effectively to the emotional challenges they experience. This observation is especially pertinent in NSSI onset where acute life stressors increased risk of engaging in NSSI for the first time (but were not related to NSSI severity) and echoes the general consensus that adolescent self-injury is associated with deficits in emotion-focused coping and difficulties with emotion regulation when faced with adversity.

A hypothesised model that specified the relationships between adverse life events, psychological distress and NSSI were each moderated by the emotion regulation processes of interest was only minimally supported. While this indicated direct effects were more pertinent, only cognitive reappraisal emerged as a significant predictor of future NSSI. Reappraisal was protective of first episode NSSI occurring 12-months from baseline but not at 24-months. Increasing use of cognitive reappraisal was also related to decreasing NSSI severity (i.e. frequency, duration, medical severity) over a two-year period. Findings on the contribution of reappraisal in NSSI onset and its escalation over time hint at the influence of developmental changes in these relationships.

Conclusion: Results emphasised different processes are implicated in engaging in NSSI for the first time, and in the overall severity of the behaviour. Adolescents may engage in NSSI as a response to emotional distress, however behavioural contingencies are likely more relevant in the maintenance and escalation of the behaviour. In both instances, addressing adolescents' appraisals of stressful situations and life events, including the meanings they attribute to them, is likely to be beneficial. Implications for interventions addressing adolescent NSSI across the spectrum of prevention and treatment are discussed.

GENERAL DECLARATION

In accordance with Monash University Doctorate Regulation 17.2 Doctor of Philosophy and Research Master's regulations the following declarations are made:

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes four original papers published or accepted for publication in peer reviewed journals. The core theme of the thesis is the role of emotion regulation processes in adolescent non-suicidal self-injury. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the candidate, working within the School of Psychological Sciences under the supervision of Associate Professor Penelope Hasking.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

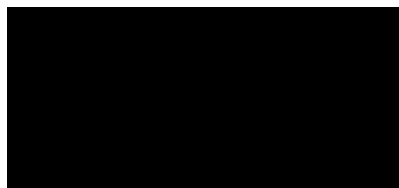
In the case of Chapters 5-7 and Appendix A my contribution to the work involved the following:

Thesis chapter	Publication title	Publication status	Nature and extent of candidate's contribution
Chapter 5	The roles of emotion regulation and ruminative thoughts in non-suicidal self-injury	Published	Generation of ideas, data analysis and write up. 80%
Chapter 6	Emotion regulation in first episode adolescent non-suicidal self-injury: What difference does a year make?	In press	Generation of ideas, data analysis and write up. 80%
Chapter 7	Change in emotion regulation strategy use and its impact on adolescent non-suicidal self-injury: A three-year longitudinal analysis using latent growth modelling	In press	Generation of ideas, data analysis and write up. 80%
Appendix A	Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire	Published	Generation of ideas, data analysis and write up. 40%

I have renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

Signed:

Date:



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AUTHOR'S NOTE

A thesis by publication is one where core chapters comprise papers or articles that have been published, accepted for publication, or submitted to a journal. It is not a different qualification, but rather, reflects a different format to traditional theses. The Monash University Faculty of Medicine, Nursing and Health Sciences requires that papers/articles “must have at least been submitted for publication, though not necessarily accepted”. In accordance with the Monash University Institute of Graduate Research guidelines, both published and submitted papers are reproduced in their manuscript format within the main body of the thesis.

As a thesis by publication must contain a sustained and cohesive theme, framing and linking text on how the reported research fits within the overall thesis framework is included for each of the papers in this thesis. Annotations within each paper (described as “AUTHOR'S NOTE”) are also used sparingly for this purpose.

Tables and figures have been re-numbered and, in some cases, re-formatted to retain consistency within the entire work. While every effort has been made to minimise repetition of content, some overlap and/or repetition is inevitable. This is particularly the case when describing the general themes that underlie each of the papers, and when describing the overall research design and methodology.

CHAPTER ONE

INTRODUCTION

Non-suicidal self-injury (NSSI) is the deliberate damage to the body in the absence of intent to die (Martin, Swannell, Harrison, Hazell, & Taylor, 2010; Nock, 2009). While it is a symptom criteria for a diagnosis of Borderline Personality Disorder (American Psychiatric Association, APA, 2013), studies show that, among both adults and adolescents, it is uniquely associated with clinical impairment over and above a diagnosis of the disorder (Glenn & Klonsky, 2013; Selby, Bender, Gordon, Nock, & Joiner, 2012). Indeed, NSSI has recently been included in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) as a condition requiring further research as a standalone diagnostic category (APA, 2013).

There are several reasons for increasing understanding of NSSI. Among adults and adolescents, it is associated with poorer psychological health and well-being (Bjärehed & Lundh, 2008; Martin et al., 2010). Specific symptoms of psychopathology associated with NSSI include depression (Fliege, Lee, Grimm, & Klapp, 2009; Giletta, Scholte, Engels, Ciairano, & Prinstein, 2012; Hankin & Abela, 2011; Klonsky, Olthmanns, & Turkheimer, 2003; Martin et al., 2010), anxiety (Klonsky et al., 2003; Martin et al., 2010), and substance abuse (Dilberto & Nock, 2008; Giletta et al., 2012; Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008; Martin et al., 2010). Martin et al. (2010) reported self-injurers have higher odds of poor psychological health (OR = 5.5), depressive (OR = 6.6) and anxiety (OR = 7.7) symptoms, and substance use (tobacco, OR = 3.3; alcohol, OR = 4.2; illicit drugs, OR = 2.1-6.0). Importantly, NSSI is a risk factor for later suicide (Klonsky, May, & Glenn, 2013; Whitlock et al., 2013), including among adolescents

(Andover, Morris, Wren, & Bruzzese, 2012; Guan, Fox, & Prinstein, 2012). Individuals with NSSI history are 41.6 times more likely to report a previous suicide attempt (Martin et al., 2010), and longer NSSI histories among adolescents increases suicide risk (Howe-Martin, Murrell, & Guarniccia, 2012; Nock et al., 2006).

NSSI typically first occurs during adolescence (Hankin & Abela, 2011; Jacobson & Gould, 2007; Nock, 2009), with repeated self-injury during adolescence increasing the likelihood of its persistence into adulthood, especially among girls (Moran et al., 2012). Increasing knowledge of the underlying processes in adolescent NSSI is therefore of critical importance for the development of prevention and early intervention both to reduce risk of future NSSI, as well as risk of further psychological deterioration and psychopathology in adulthood.

Research into adolescent NSSI is also important in its own right as the behaviour is associated with negative psychological outcomes, as described above. Thus, improving understanding of adolescent NSSI and particularly, factors related to its onset and maintenance can also have more immediate benefits by ensuring the psychological health and well-being of adolescents.

1.1 Scope of the Problem

1.1.1 Definitional issues

Given NSSI is characterised by intentional self-directed harm, past research efforts on NSSI have studied it alongside suicide, as is evident in research into “parasuicide” and “deliberate self-harm” (Nock, 2012). The general consensus in recent years, however, is that NSSI represents a distinct phenomenon that is critically distinguished from other self-harm behaviours (including suicide) by individuals’ underlying intent (Nock, 2012). As such, it is distinguished from harmful behaviours, such as smoking or drug use where the consequences of the behaviour are unintended; and from suicidal

behaviour, where the consequences are intended to be fatal (Nock, 2009). In regard to suicidal behaviour, several authors have noted that, despite their similarities, both behaviours also differ in prevalence, frequency and methods (see Hamza, Stewart, & Willoughby, 2012; Klonsky et al., 2013). NSSI has a higher prevalence than suicidal behaviour, occurs more frequently, and typically involves methods that are non-lethal.

1.1.2 Adolescent NSSI – prevalence and features

In Australia, approximately 1 in 10 adolescents have engaged in NSSI at least once (Martin et al., 2010). In contrast, suicide rates among Australians aged 15 to 19 years are estimated at approximately 10 in 100,000 persons (McNamara, 2013). International prevalence rates of adolescent NSSI have been estimated at between 12.5% and 23.6% (Muehlenkamp, Claes, & Plener; 2012; Swannell, Martin, Page, Hasking, & St. John, 2014), while estimates of suicide among adolescents range from 1.3% to 10.1% (Bridge, Goldstein, & Brent, 2006).

Common methods of self-injury include cutting, scratching, hitting one's body or part of the body on a hard surface, hitting or punching oneself, biting, and burning (Baetens, Claes, Willem, Muehlenkamp, & Bijttebier, 2011; Bjärehed & Lundh, 2008; Hilt, Cha, & Nolen-Hoeksema, 2008; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Martin et al., 2010; You, Leung, Fu, & Lai, 2011). In contrast, suicide attempts involve more lethal methods such as hanging, poisoning, and drug overdose (Bridge et al., 2006; McNamara, 2013).

NSSI typically occurs in the context of experiencing negative mood states such as sadness, guilt, anxiety and anger (Armey, Crowther, & Miller, 2011; Jacobson & Gould, 2007; Kakhnovets, Young, Purnell, Huebner, & Bishop, 2010; Nock, Prinstein, & Sterba, 2009). Individuals report being soothed and relieved after engaging in self-injury (Armey et al., 2011; Kakhnovets et al., 2010). It is therefore unsurprising that the

predominant and most frequently cited motivation for NSSI is to regulate negative emotional states (Klonsky, 2009; Martin et al., 2010; Nock & Prinstein, 2004; Nock et al., 2009), and further emphasises the distinction between NSSI and suicide. The observation by Walsh (2005) is pertinent in this regard: “the intent of the self-injuring person is not to *terminate* consciousness (as in suicide) but to *modify* it” (at p. 7).

1.2 NSSI and Emotion Regulation

As discussed in the next chapter, several perspectives and theories on NSSI indicate how individuals regulate their emotions is critical to understanding the aetiology and maintenance of the behaviour. Emotion regulation refers to a set of responses involved in initiating, maintaining and modifying the occurrence, intensity, duration and expression of emotions (Gross, 1998a, 1998b). As it may be enacted automatically and unconsciously (Gross, 1998a, 1998b; Koole, 2009), for the remainder of this thesis, the term “emotion regulation *processes*” will be used rather than “*strategies*”, as the latter connotes conscious effortful activity.

Emotion regulation processes that have been implicated in NSSI include cognitive reappraisal and expressive suppression (Hasking, Momeni, Swannell, & Chia, 2008; Hasking et al., 2010; Martin et al., 2010; Williams & Hasking, 2010), as well as rumination (Armey & Crowther, 2008; Bjärehed & Lundh, 2008; Hilt, Cha et al., 2008; Selby, Connell, & Joiner, 2010). However, few studies have examined these emotion regulation processes in adolescent NSSI. In addition, the majority of studies are cross-sectional which limits understanding of the trajectory of NSSI and its covariates. This is particularly pertinent during adolescence when changes in the use of emotion regulation processes are apparent (Gross, 2013; Zeman, Cassano, Perry-Parrish, & Stegall, 2006).

1.3 Thesis Outline

This thesis by publication discusses and reports findings from a multiwave research program into the roles of three emotion regulation processes (cognitive reappraisal, expressive suppression and rumination) in adolescent NSSI. Specifically, the program addressed the following questions:

1. In what ways are the emotion regulation processes of cognitive reappraisal, expressive suppression and ruminative thinking generally related to NSSI?
2. How do these emotion regulation processes impact on NSSI onset and maintenance?

Forming part of a broader project on how adolescents cope with emotional problems funded by the Australian Research Council, the research reported in this thesis comprises three studies undertaken during the candidacy of a Doctor of Psychology (Clinical). Data was collected from Australian high school students in 41 schools across six state/territory jurisdictions.

The thesis is organised into eight chapters; beginning with this brief overview. Subsequent chapters (Chapters 2 and 3) will review and discuss the theoretical and empirical literature on NSSI. Explanations that identify the underlying processes and mechanisms for the behaviour will be discussed, as well as the rationale for focusing on the emotion regulation processes of cognitive reappraisal, expressive suppression and rumination.

Following from a discussion on the roles of these processes in emotional experience and the empirical findings regarding their associations with NSSI, an overview of the research program is provided in Chapter 4. This chapter describes the design and methodology for the research, and reports general characteristics of the participants in the studies.

The remaining chapters (Chapters 5 – 8) describe and discuss the findings from the three empirical studies. The first of these tested a theoretical model of NSSI using structural equation modelling with the aim of understanding the relationships between cognitive reappraisal, expressive suppression and rumination with NSSI in the context of adverse life events and psychological distress (see Chapter 5). While findings were useful in providing insight into how these psychological factors are implicated in NSSI, the study was cross-sectional and therefore limited the strength of inferences that could be made regarding how these psychological constructs are related to NSSI onset and ongoing severity. Consequently, the second study (see Chapter 6) utilised a prospective design to examine how the three emotion regulation processes under investigation featured in first episode NSSI (i.e. NSSI onset). Additionally, this study also took into account the developmental context in which NSSI occurs by examining the extent to which participants' ages moderated the relationships of interest. Finally, the third study (see Chapter 7) focuses on how these emotion regulation processes influenced change in NSSI severity over time. Findings from the three empirical studies are summarised and synthesised in Chapter 8, which also discusses implications for current understanding of adolescent NSSI and recommendations for the future.

During the Doctor of Psychology candidacy, a preliminary study on the structure of the Ruminative Thought Style Questionnaire (RTSQ; Brinker & Dozois, 2009) was undertaken. Subscales were identified which were used in the abovementioned three

studies to allow for a more nuanced understanding of the role of rumination in NSSI. To retain the coherence of the core narrative for the thesis, rather than devote a specific chapter to this study, the published article (Tanner, **Voon**, Hasking, & Martin, 2013) in *Cognitive Therapy and Research* is reproduced in Appendix A.

Together, the research reported in this thesis contributes additional knowledge to the understanding of adolescent NSSI. Few studies have examined how emotion regulation processes such as cognitive reappraisal, expressive suppression and rumination may be related to NSSI in this population. Given the general consensus that NSSI is associated with negative emotional states, findings provide further insights into the development of prevention, early intervention and treatment of NSSI among adolescents.

CHAPTER TWO

PERSPECTIVES AND THEORIES ON NSSI

Nock (2009) observed that several factors are implicated in NSSI; which he classifies as *distal*, *proximal* and *NSSI-specific vulnerabilities*. Distal vulnerabilities include genetic predispositions for high sensitivity to emotional stimuli and for extreme emotional reactions, as well as invalidating childhood environments. These contribute to more proximal vulnerabilities, such as maladaptive coping styles and poor communication, which may manifest in both intra- and interpersonal domains. While these factors are common to other problem behaviours and psychiatric disorders, Nock observed that the presence of NSSI-specific vulnerabilities explains why some individuals engage in the behaviour while others do not. Together, these three types of vulnerabilities illuminate the underlying processes and mechanisms in the aetiology and maintenance of NSSI and provide clues for the development of therapeutic interventions.

Although the current research does not specifically test Nock's broad model of NSSI and is focused specifically on the proximal vulnerability of emotion regulation, nonetheless the model provides a useful framework for organising the various perspectives and theories on NSSI which will be discussed in this chapter. The aim of the current chapter is to review the various conceptualisations of NSSI vulnerability and how these perspectives implicate emotion regulation as an important construct in the understanding of the behaviour. Current interventions for NSSI will also be discussed.

2.1 Invalidating Childhood Experiences

The role of invalidating childhood environments in NSSI arose primarily from the work of Marcia Linehan on Borderline Personality Disorder (Gratz, 2003). According to Linehan (1993), individual vulnerability factors such as emotional reactivity and emotional sensitivity interact with invalidating early childhood environments which contribute to emotion regulation deficits in later life. Linehan described invalidating environments broadly as those characterised by erratic and inappropriate responses to “private experiences” such as beliefs, thoughts and feelings, which tend to be extreme (i.e. through overreaction or underreaction). The emotionally vulnerable child learns there is a discrepancy between what s/he feels privately and what the environment will acknowledge and support, and learns to control her/his emotional expressiveness. Reciprocal dynamics between child and environment therefore establish a climate where the child’s capacity to appropriately identify and regulate her/his emotional arousal, to tolerate distress, and to trust her/his emotional responses, becomes increasingly restricted. These environments contribute to a style of emotional expressivity that swings from extreme inhibition to extreme disinhibition. According to Linehan, self-harm behaviours such as NSSI are a means to down-regulate emotions experienced as intense.

The role of invalidating childhood environments and NSSI has predominantly been researched in the context of childhood abuse. NSSI is associated with childhood physical and sexual abuse (Fliege et al., 2009; Gratz, 2003; Gratz & Chapman, 2007), as well as emotional neglect (Fliege et al., 2009; Gratz, 2003). Among Australians aged 18 years and over, those with a history of NSSI were 5.9 times more likely to report a history of childhood sexual abuse, 5.8 times more likely to report a history of childhood physical abuse, and 3.9 times more likely to report a history of parental neglect compared with

those without a history of NSSI (Martin et al., 2010). Swannell et al. (2012), on the other hand, reported physical abuse and neglect increased odds of NSSI among females whereas only physical abuse was an independent predictor among males

However, not all individuals with abuse histories engage in NSSI. The difference lies in how individuals regulate their emotions. Several studies have shown that *emotion dysregulation* is a significant predictor of NSSI over and above childhood maltreatment (Gratz, 2006; Gratz & Chapman, 2007; Gratz & Roemer, 2008; Muehlenkamp, Kerr, Bradley, & Larsen, 2010). In this regard, emotion dysregulation refers to a constellation of factors including nonacceptance of emotional experience, difficulties with goal-directed behaviours and impulse control, lack of emotional awareness, limited number and restricted access to emotion regulation strategies, and lack of emotional clarity.

Differential associations with NSSI have been found for the various aspects of emotion dysregulation. Limited access to emotion regulation strategies partially mediated the relationship between childhood maltreatment and NSSI among female undergraduates (Gratz & Roemer, 2008), while poor awareness of emotion and reluctance to express emotions was a partial mediator among female adolescents in a clinical setting (Sim, Adrian, Zeman, Cassano, & Friedrich, 2009). Swannell et al. (2012) reported alexithymia (i.e. difficulty articulating emotion), which is conceptually similar to lack of emotional awareness and clarity, also partially mediated the relationships between physical abuse, neglect and NSSI among females aged 18 years and over.

Although childhood maltreatment may be implicated in the pathogenesis of self-injurious behaviour, Lang and Sharma-Patel (2011) noted that the strength of evidence for each type of childhood maltreatment differed. The strongest evidence was for the association between childhood sexual abuse and NSSI (cf. Swannell et al., 2012), whereas the findings in relation to neglect and NSSI were mixed. The differential

contribution of childhood maltreatment subtypes to NSSI may be influenced by how these experiences affect individuals' emotion regulation differently. Muehlenkamp et al. (2010) reported different patterns of deficits in emotion regulation across abuse subtypes. Individuals with a history of physical abuse and who engaged in NSSI were more likely to report deficits in identifying and recognising their emotional experiences, and lack of awareness of their emotions. Those with a history of both physical and sexual abuse were more likely to have difficulties with behavioural control in the context of emotional distress, and to have difficulties accepting distressing emotions.

Together, the above studies show distal factors such as childhood abuse increased vulnerability to NSSI. However, although an important consideration in the aetiology of the behaviour, the evidence suggests these environments play a role in NSSI through the way they shape how individuals regulate their emotions. Extending Linehan's (1993) theory, Lang and Sharma-Patel (2011) posit that invalidating environments contribute to emotion dysregulation through disruptions in three developmental pathways: regulatory, representational, and reactive. Firstly, children from abusive environments have difficulty expressing their emotions and having their emotions reflected, accepted or clarified. They have limited models of effective emotion regulation and/or have limited opportunities to practice effective emotion regulation. Secondly, invalidating childhood environments give rise to representations of the world as threatening, others as unreliable, and the self as inept (see Bureau et al., 2010; Yates, Tracy, & Luthar, 2008 on how these schemas are related to NSSI). Finally, Lang and Sharma-Patel noted that as a consequence of disruptions in the regulatory and representational pathways, individuals develop a heightened sense of danger and experience high levels of arousal in the face of stressful situations and life events. They may perceive that they have limited internal and external resources available for coping with these stressors and

resort to NSSI through observing others benefiting from it (i.e. a *social learning hypothesis* of NSSI).

The above observations by Lang and Sharma-Patel dovetail with findings from a separate body of research focussing on NSSI and coping; which suggests it is related to lack of effective coping strategies. Early conceptualisations suggest individuals engage in NSSI due to deficits in coping with problems (Haines & Williams, 1997). However, as will be discussed below, rather than general deficits in coping with environmental demands, it appears that the link between coping and NSSI centres on ineffective strategies for coping with emotional distress.

2.2 Coping and Experiential Avoidance

Studies among adolescents (Evans, Hawton, & Rodham, 2005), undergraduate students (Andover, Pepper, & Gibb, 2007; Borrill, Fox, Flynn, & Roger, 2009; Brown, Williams, & Collins, 2007) and prisoners (Kirchner, Forns, & Mohino, 2008) show that high use of avoidant coping strategies is associated with presence of NSSI, as well as NSSI severity (Hasking et al., 2008). These studies highlight that individuals who engage in NSSI are less likely to use coping strategies aimed at resolving stressful situations. Rather, they are more likely to engage in avoidant behaviours which potentially maintain the emotional arousal arising from persisting problems.

Related to the above, individuals who engage in NSSI are also more likely to engage in emotion-focused coping strategies (Borrill et al., 2009; Mikolajczak, Petrides, & Hurry, 2009), perhaps in an attempt to alleviate aversive emotions triggered by unresolved problems. Williams and Hasking (2010) examined the relationship between psychological distress, NSSI and coping strategies using composite NSSI scores that took into account the frequency, recency and severity of each method reported by participants and weighted by the number of methods used. While, individuals who

relied on avoidant coping strategies were more likely to have higher composite NSSI scores when experiencing psychological distress, there was also a positive relationship between psychological distress and NSSI among participants who did not rely on emotion-focused coping strategies.

Given the cross-sectional nature and design of these studies, causal relationships can only be speculative; however, together they indicate NSSI is associated with a constellation of behaviours aimed at problem avoidance which maintain emotional turmoil experienced in the context of stressful situations and life events. Deficits in effective emotion-focused coping may leave individuals with no other recourse than to engage in NSSI to alleviate their distress. Such a dynamic is proposed and elaborated by Chapman, Gratz, and Brown (2006) in their *Experiential Avoidance Model*.

Within the model, NSSI is characterised as a form of distraction and escape from unwanted internal experiences. While it is focused on avoidance of emotion, the model could theoretically be extended to include unwanted and aversive bodily sensations, thoughts, memories and behavioural dispositions, and importantly, the events and contexts that occasion them (for discussion of experiential avoidance see Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). As such, the Experiential Avoidance Model accounts for the initial motivation for problem avoidance (given that problems are associated with emotional distress) which sets off a chain of events and behaviours culminating in NSSI. For Chapman et al., limited access to effective strategies to regulate emotional arousal is a key factor within this chain. Without recourse to strategies to modulate their emotional states, individuals are thus left to contend with these unwanted emotions (which are often experienced as intense) and therefore resort to maladaptive responses to further escape from them.

A number of factors differentiate NSSI from other avoidance behaviours (such as binge drinking or substance use) and contribute to individuals choosing to engage in NSSI rather than other maladaptive behaviours. According to Chapman et al., NSSI may elicit endogenous opioids which have an analgesic effect and provide relief from emotional distress. Alternatively, NSSI diverts attention away from the experience of emotional pain and focuses attention on the physical pain of the injury. In either case, continued engagement in NSSI is determined by continued reinforcement of the behaviour and by verbal rules which specify that NSSI is related to feeling better (i.e. *rule governed behaviour*).

The Experiential Avoidance Model integrates findings from the coping literature to provide an explanation for NSSI. It speculates that high emotional arousal, low distress tolerance, and lack of effective emotion regulation strategies are implicated. However, it is largely silent on the factors that influence individuals' aversion to the internal experiences which are avoided¹ and provides little explanation for the intensity of emotional experience that appears to be the primary driver for NSSI. For this, distal factors such as a genetic predisposition for emotional reactivity and sensitivity in interaction with invalidating childhood environments, as discussed previously, are likely to play a role. An additional explanation for the intense emotions experienced by individuals who self-injure arises from research on emotion regulation, which will be discussed in further detail in the next chapter. Briefly, emotion regulation processes increase or decrease emotional experience. In the context of NSSI, the types of emotion regulation individuals engage when they are experiencing negative emotions may therefore provide clues regarding the mechanisms that drive NSSI. A tendency to rely on emotion regulation processes that heighten negative emotion states, and/or less

¹ Hayes et al. (1996) suggest that experiential avoidance is embedded in language and may be the product of social learning (e.g. when children learn to or are encouraged to suppress emotion).

reliance on processes that reduce negative emotion states may account for the emotional intensity that accompanies NSSI. Indeed, the *Emotional Cascade Model* (Selby & Joiner, 2009), which is described in the next chapter, proposes such a dynamic and implicates a vicious cycle of rumination and cascades of negative emotion in NSSI.

2.3 Behavioural Reinforcement

Chapman et al. (2006) acknowledged that behavioural contingencies such as reinforcement and rule-governed behaviour may account for how NSSI is maintained. This observation echoes the premise of Nock and Prinstein's (2004) *Functional Model of NSSI*, which draws on commonly reported motivations for engaging in NSSI.

The Functional Model of NSSI posits that the behaviour is reinforcing in the context of negative emotion as it helps to reduce or end a negative affective state (hence *automatic-negative reinforcement*), or alternatively, to achieve a desired psychological state (*automatic-positive reinforcement*). In both these instances, individuals engage in NSSI with the goal of feeling better. Nock and Prinstein also observed that apart from regulating one's emotional state, NSSI may serve a social/interpersonal function where individuals seek escape from interpersonal demands through engaging in NSSI (*social-negative reinforcement*) or they seek to gain attention from others or access to resources as a consequence of their behaviour (*social-positive reinforcement*). In all these scenarios, the achievement of these functional goals serves as reinforcement for the behaviour.

It ought to be noted that, although Nock and Prinstein identified two general functions of NSSI (i.e. intrapersonal and interpersonal), they acknowledged that regulating emotional states was the reason most frequently cited by adolescents for engaging in NSSI. The authors observed that social/interpersonal functions of NSSI may therefore be secondary to the intrapersonal function of feeling better. Nonetheless, the

Functional Model of NSSI highlights that behavioural contingencies play an important role in the maintenance of the behaviour and should be considered in the design of interventions.

2.4 NSSI-specific Vulnerability Factors

Together the perspectives and theories on NSSI discussed thus far identify distal and proximal factors in the aetiology and maintenance of the behaviour. As Nock (2009) noted, however, these factors are common across a range of problem behaviours and psychopathology. NSSI-specific vulnerability factors, on the other hand, explain why individuals may choose NSSI over other ways of coping with emotional distress. Indeed the presence of these factors is acknowledged by Linehan (1993), Chapman et al. (2006), and Lang and Sharma-Patel (2011) in their theories on NSSI.

Discussed below are vulnerability factors that have been the focus of research and their identification was guided by Nock's (2009) integrated model. Again, these factors are not the focus of the current research. However, they are presented in this chapter to present a more complete account of NSSI.

2.4.1 Social learning hypothesis

The social learning hypothesis posits that individuals choose NSSI as a coping behaviour as a consequence of observing others or, more broadly, due to social influences. Early work among adolescents who have engaged in NSSI, reported incidents of friends' NSSI were significantly associated with engaging in NSSI to gain attention from others (Nock & Prinstein, 2005). Of concern, is that Nock et al. (2009) found that some adolescents reported engaging in NSSI after being encouraged by others to do so. Although the proportion of adolescents was small (3.8%) and not statistically significant, the odds of engaging in NSSI were almost double in the context of encouragement by others. More recently, Hasking, Andrews, and Martin (2013)

reported exposure to NSSI by at least one friend predicted onset and maintenance of NSSI over and above gender and psychological distress. The authors observed that adolescents experiencing distress from many acute life stressors may resort to NSSI as a consequence of learning about it as a coping strategy from their peers. Peer exposure also increased likelihood of continued engagement in NSSI in the context of more adverse life events even when controlling for past NSSI.

It should be noted that while peer exposure predicted both onset and continued engagement in NSSI, there may be other factors which link exposure to NSSI. Hasking et al. (2013) found no differences in the number of friends who self-injured among self-injurers and controls, and observed that it may be the quality of the relationship rather than the number of peers that is salient. Related to this observation, adolescents who engaged in NSSI were more likely to report greater affiliation with friends and peers who have engaged in NSSI (Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010; Prinstein, et al., 2010), as they are less likely to receive censure from their friends and peers for their behaviour. This concurs with findings from a study among adolescents who engaged in deliberate self-harm (with or without fatal intent), which found that adolescents who did not report self-harm at baseline but subsequently engaged in self-harming behaviours, and those who reported repeated self-harm during a six-month period, were more likely to report that their friends and peers were more positive toward self-harm (O'Connor, Rasmussen, & Hawton, 2009).

In summary, like-behaviours and positive attitudes of friends and peers are important influences in the initiation and maintenance of NSSI. Whether adolescents who engage in NSSI are already part of these social networks or subsequently develop greater affiliation with these networks, Nock and Prinstein's (2004) Functional Model of NSSI suggests that these social networks are likely to play a role in reinforcing the

behaviour. Peer attitudes and a sense of group belonging may be socially reinforcing, and explain how some individuals become overidentified with the behaviour and prefer engaging in NSSI to achieve similar functions to other alternative behaviours (Nock, 2009).

A discussion of social influences in NSSI would not be complete without mention of sociocultural influences (and in particular, the media) in exposing individuals to NSSI. Whitlock, Purington, and Gershkovich (2009) analysed the frequency of NSSI-related images and stories in popular media and found these have increased between 1966 and 2005. They speculated that media coverage and portrayal of NSSI may serve to disseminate and normalise the behaviour, leading to priming effects for those who have never engaged in NSSI. This view is consistent with other contemporaneous research reporting between 20% to 50% of participants indicating they had obtained the idea to engage in NSSI from exposure through television and film (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009; Nixon, Cloutier, & Jansson, 2008).

The link between media exposure and NSSI was explored in greater detail in a recent study by Radovic and Hasking (2013). They found that the number of films participants had seen which featured a scene of NSSI was positively correlated with likelihood of engaging in NSSI. Importantly, identifying with the films' self-injuring characters was a significant independent predictor over and above the contribution of knowledge about NSSI. Of note is the average age of NSSI onset reported by participants and the average age of participants when they viewed the films depicting NSSI. Average age of onset was younger, suggesting participants may have started engaging in NSSI prior to viewing the films. Extending Whitlock et al.'s observation, priming effects in popular media could also serve to reinforce the behaviour and contribute to its maintenance among individuals who have already started engaging in the behaviour.

Indeed, Lewis and colleagues (see Lewis & Baker, 2011; Lewis, Heath, St Denis, & Noble, 2011; Lewis, Heath, Sornberger, & Aruthnott, 2012; Lewis, Rosenrot, & Messner, 2012) cited reports from individuals accessing Internet-based NSSI materials in which they described experiencing the urge to self-injure from viewing images on these websites. Of concern is that such materials are easily and frequently accessed. While none of the sources of Internet-based NSSI information explicitly encouraged the behaviour, some of the material can be normalising and reinforcing (e.g. self-disclosure of NSSI, depiction of the behaviour as an effective coping strategy, positive comments on *YouTube* to video uploaders depicting NSSI). Together, the above studies extend the social learning hypothesis of NSSI to include wider sociocultural factors such as film and the Internet, and highlight that these factors are important considerations in NSSI onset and its continuation.

2.4.2 Social signalling hypothesis

As individuals who engage in NSSI tend to have poorer coping skills as previously discussed, Nock (2009) suggested a *social signalling hypothesis* which posits that NSSI may be a way of communicating distress when other methods have failed. Scoliers et al. (2009) conducted a principal components analysis of reasons for engaging in NSSI provided by 30,477 adolescents aged 14-17 years across seven countries (Australia, Belgium, England, Hungary, Ireland, the Netherlands and Norway). They found most adolescents who have engaged in NSSI reported a “cry for help” motive in addition to a “cry of pain” motive. Hilt, Nock et al. (2008) reported adolescents who engaged in NSSI had poorer relationship quality with parents compared with those who did not engage in NSSI, and importantly, over an 11-month period reported increases in the quality of relationships with their fathers. While the authors did not assess adolescents’ motivations for engaging in NSSI, the findings suggest the behaviour may serve a

communicative function which in turn was socially reinforced by the improved parent-child relationship.

2.4.3 Self-punishment hypothesis

Nock (2009) also identified a *self-punishment hypothesis* where NSSI serves as a form of punishment. He postulates that NSSI may be the result of learnt behaviour from abusive or invalidating childhood environments. The hypothesis provides some explanation for reports by individuals that they engaged in NSSI to punish themselves, and has some support in the empirical literature. Weismore and Esposito-Smythers (2010), for example, reported adolescents who had been physically or sexually assaulted and who held more negative perceptions of themselves were more likely to engage in NSSI compared with those with assault history but held more positive self-views. Additionally, research into body image and NSSI shows that negative evaluations of one's body are related to increased NSSI (see Duggan, Toste, & Heath, 2013; Muehlenkamp & Brausch, 2012).

As previously noted, the most commonly cited reason for engaging in NSSI was to regulate emotional states. Self-punishment was the next most common motivation (Klonsky, 2007). Interestingly, Duggan et al. found that the relationship between negative body image and NSSI was partially mediated by emotion dysregulation; which again highlights the centrality of emotion regulation in NSSI.

2.4.4 Opioid/analgesia hypothesis

An intriguing line of research lies in the role of endogenous opioids in NSSI (Chapman et al., 2006; Nock, 2009). The *opioid/analgesia hypothesis* suggests individuals who engage in NSSI have lower resting opioid levels which makes them more susceptible to feelings of dysphoria and dissociation, and increased sensitivity to the analgesic effects of pain and reduction of negative affect following NSSI (Bresin &

Gordon, 2013). Stanley et al. (2010) found partial support for the hypothesis, observing a lower level of β -endorphin and met-enkephalin in the cerebrospinal fluid of psychiatric patients with NSSI history compared with diagnostically matched controls. However, research in this area is in its nascent stages (Bresin & Gordon, 2013; Nock, 2009).

2.5 Current Interventions

As noted in the introduction to this chapter, the various vulnerability factors discussed above provide clues regarding the aetiology and maintenance of NSSI, and may potentially assist with identifying targets for therapeutic interventions. This is particularly pertinent as there are currently few interventions that have been developed specifically for NSSI. Most interventions are focused on self-harm behaviours broadly, which include self-injury with fatal intent and nondirect methods of harm². Additionally, those interventions that have been evaluated, have mostly been with adult participants, and focused on treatment for self-harm. Ougrin, Tranah, Leigh, Taylor, and Asarnow (2012) observed that some school-based prevention programs have been trialled, particularly for suicide. However, evidence of their efficacy is weak.

Current treatment interventions for self-harm draw on a range of therapeutic approaches including Cognitive-Behaviour Therapy, Dialectical Behaviour Therapy, and Mentalisation-Based Therapy (Brausch & Girresch, 2012; Kerr, Muehlenkamp, & Turner, 2010; Ougrin et al., 2012; Stoffers, et al., 2012; Washburn et al., 2012). As will be seen in the following discussion, while distal, proximal and NSSI-specific vulnerabilities have been identified, the majority of interventions have focused on proximal factors as it is likely that these are more amenable to change. Moreover, existing interventions have

² Accordingly, in this section, the term “self-harm” is used to denote all self-injurious behaviours regardless of intent and includes overdose, while NSSI is used to specifically refer to self-directed physical violence without fatal intent.

favoured a more comprehensive approach which addresses cognitive and emotional triggers for NSSI. Evaluations indicate such an approach is likely to be promising, particularly where it also includes skills building in managing emotions. However, more rigorous evaluations of existing interventions are required before firm conclusions regarding efficacious treatments for adolescent NSSI can be made.

2.5.1 Cognitive-Behaviour Therapy (CBT)

CBT is a treatment approach that comprises both cognitive and behavioural components (Stoffers et al., 2012). In their reviews, Brausch and Girresch (2012) and Washburn et al. (2012) noted that one of the earliest interventions applied to self-harm behaviours is a form of CBT known as *Problem Solving Therapy*. The intervention assists individuals to cope with and resolve problems and includes cognitive restructuring to engender a more positive orientation to problems, as well as skills training in coping and rational problem-solving. Use of this intervention to address self-injurious behaviours draws on early conceptualisations of such behaviours as a general deficit in coping skills. However, authors of both reviews noted that the strength of evidence for the intervention was weak. While initial evaluations were promising (showing a trend towards reductions in self-harm behaviours), the intervention did not produce statistically significant differences compared to controls. Although evaluations of Problem Solving Therapy measured self-harm behaviours broadly, nonetheless findings are consistent with the view that NSSI entails more than deficits in coping and problem-solving skills, and suggest the need for more comprehensive approaches.

Washburn et al. (2012) noted that such an observation led to the development of *Manual Assisted Cognitive-Behavioural Therapy* (MACT). The intervention integrated CBT with solution-focused therapy and included a bibliotherapy component aimed at improving emotion regulation, and coping with negative cognitions (Kerr et al., 2010).

Two early evaluations of MACT showed reductions in frequency of self-harm and duration between self-harm episodes in the intervention group, but these outcomes were not significantly different from similar reductions in the control group (see Evans et al., 1999; Tyrer et al., 2003). Kerr et al. (2010) noted that the nonsignificant results in these studies could be due to the heterogeneity in how the intervention was delivered. Following these trials, Weinberg, Gunderson, Hennen, and Cutter (2006) evaluated the efficacy of MACT in reducing NSSI and suicide attempts among women with Borderline Personality Disorder (aged 18-40 years). Participants were randomly assigned to a MACT intervention or treatment-as-usual (TAU). The authors reported significant reductions in frequency of NSSI post-treatment as well as at 6-month follow-up. Moreover, NSSI severity was significantly lower compared with TAU at follow-up.

Further emphasising the utility of focussing on other factors than coping with and resolving problems, Slee, Garnefski, van der Leeden, Arensman, and Spinhoven (2008) evaluated a CBT intervention to address deliberate self-harm among 15-35 year olds and reported significant reductions over 9 months in number of self-harm episodes among the intervention group compared with TAU. The intervention comprised individual sessions to address cognitive and emotional triggers for self-harm behaviours and included a focus on cognitive distortion, emotion regulation and problem-solving. A follow-up study (Slee, Spinhoven, Garnefski, & Arensman, 2008), showed that improved emotion regulation partially mediated reductions in self-harm following the intervention.

More recently, Taylor et al. (2011) evaluated the efficacy of a similar intervention (*Manualised Cognitive-Behavioural Therapy*) developed specifically for adolescents aged 12-18 years. This intervention comprised individual therapy sessions utilising a standard manual which included modules on identifying cognitive and emotional

triggers for self-harm behaviour, as well as modules teaching coping skills. Preliminary findings were promising and showed reductions in frequency of deliberate self-harm post-treatment and at 3-month follow-up. However, the study did not include a control group and, therefore, inferences regarding its efficacy cannot be made conclusively.

2.5.2 Dialectical Behaviour Therapy (DBT)

Of all interventions addressing self-harm, DBT has received the most attention with treatment efficacy assessed via numerous evaluations including randomised controlled trials (Stoffers et al., 2012; Washburn et al., 2012). Developed by Marcia Linehan (1993) to treat Borderline Personality Disorder, it comprises a combination of individual therapy and skills training components where participants are taught skills in mindfulness and acceptance, emotion regulation, distress tolerance, and interpersonal effectiveness. Similar to CBT-based interventions described above, individual therapy in DBT includes identification of cognitive, emotional and situational triggers for target self-harm behaviours, and counselling/coaching on the use of appropriate cognitive and behavioural skills to cope with these triggers (Koerner & Dimeff, 2007). Together the various components of the intervention aim to improve individuals' capacity to accept the negative emotions that motivate them to engage in self-harm; to tolerate aversive situations, thoughts and emotions; to identify, appraise, and modulate their emotional experiences; and to improve interpersonal relationships. Importantly, therapy progresses through a number of stages with the initial stage focussing primarily on reducing self-harm. A client progresses to the later stages of therapy only after demonstrating their capacity to manage their impulse to self-harm. In this regard, DBT has been described as a specific treatment for self-harm rather than treating it as a peripheral consequence of psychopathology (Feigenbaum, 2010; Lynch & Cozza, 2009).

Evaluations of DBT among adults with Borderline Personality Disorder have demonstrated reductions in self-harm among participants. Stoffers et al. (2012) reported that pooled effect estimates from three trials undertaken between 2001 and 2005 showed significant reductions compared with TAU. However, a more recent Australian trial (Carter, Wilcox, Lewin, Conrad, & Bendit, 2010) did not find significantly different results between a modified DBT program and TAU.

While DBT has been adapted for adolescents (DBT-A), these have not been subjected to randomised control trials and results are mixed (Brausch & Girresch, 2012; Kerr et al., 2010; Washburn et al., 2012). Nonsignificant group differences were reported when comparing DBT-A with TAU on suicide attempts (Rathus & Miller, 2002) and self-harm (Katz, Cox, Gunasekara, & Miller, 2004). Two other studies reported significant post-treatment reductions in self-harm (James, Taylor, Winmill, & Alfoadari, 2008) and NSSI (Fleischhaker et al., 2011); although the absence of a control group limits conclusions regarding the efficacy of these interventions among adolescents.

2.5.3 Mentalization-based Therapy (MBT)

MBT draws on psychodynamic theories (Kerr et al., 2010; Stoffers et al., 2012), and aims to “strengthen patients’ capacity to understand their own and others’ mental states in attachment contexts in order to address their difficulties with affect, impulse regulation, and interpersonal functioning which act as triggers for acts of suicide and self-harm” (Bateman & Fonagy, 2009, at p. 1355). Thus, MBT assists with improved interpersonal function by building individuals’ capacity to *mentalize* and be aware of how thoughts and emotions influence their own and others’ behaviours (Kerr et al., 2010).

Stoffers et al. (2012) noted that, comparing the intervention with TAU, MBT achieved significant reductions in self-harm among adults in two trials undertaken in

1999 and 2009. More recently, Rossouw and Fonagy (2012) reported significant group differences among adolescents randomly assigned to a MBT treatment group versus TAU controls. Those in the treatment group had lower scores on self-harm at 12-months, and showed greater reductions in self-harm over the course of treatment. Although results are promising, further replication is required.

2.5.4 Emotion Regulation Group Therapy

Finally, following research on the impact of emotion dysregulation on NSSI, Gratz and Gunderson (2006) developed a 14-week emotion regulation group intervention specifically for NSSI. Drawing on a range of extant psychotherapeutic approaches including Acceptance and Commitment Therapy and DBT, the intervention focused on building emotional awareness and acceptance of emotions (versus emotional avoidance). Initial results among a group of women with Borderline Personality Disorder were positive and showed significant between-group differences (i.e. intervention vs TAU) in reductions in NSSI. Findings were replicated in a subsequent pilot study extending the intervention to more diverse settings and groups of women with Borderline Personality Disorder (Gratz & Tull, 2011). Importantly, in a follow-up study which analysed data collated from the above trials (Gratz, Levy, & Tull, 2012), decreases in NSSI and emotion dysregulation were reported among the intervention groups (RCT and open trial completers)³ but not among controls. Moreover, a mediation analysis showed that emotion dysregulation mediated the relationship between intervention and outcome. Thus, the available evidence indicates that this intervention is promising. However, it has not been applied to adolescents.

³ The intervention groups comprised of the “RCT” group in Gratz & Gunderson (2006) and the “open trial completers” in Gratz & Tull (2011). The control group were the TAUs in Gratz & Gunderson (2006).

2.6 Conclusion

This chapter explored several perspectives and theories on NSSI utilising Nock's (2009) integrated model as a guiding framework. It also canvassed the current evidence-base for interventions for NSSI and other self-injurious behaviours. The discussion highlights NSSI is a behaviour that is associated with emotional coping in the context of stress, and that the emotional arousal experienced in these circumstances and the perceived inability to respond adaptively may be a product of invalidating childhood environments. These environments contribute to a tendency to perceive emotions as threatening and are therefore unwanted or aversive, particularly given the tendency for emotions to escalate in intensity or provoke extreme reactions from others. Invalidating childhood environments also fail to provide the individual with adequate skills in emotion regulation thereby perpetuating a vicious cycle of emotion dysregulation. Although distal factors such as invalidating childhood environments account for how self-injurers have difficulty with emotion regulation, NSSI-specific vulnerabilities explain why NSSI is chosen in place of alternative behaviours to cope with heightened emotional distress. In both instances, lack of effective emotion regulation skills is implicated as an important element in NSSI.

This observation is highlighted in the survey of interventions for self-injurious behaviours, broadly defined. Although these interventions did not specifically examine NSSI, they do suggest that interventions which incorporate a focus on how emotional experience impacts on behaviour and which include skilling individuals in the use of more adaptive emotion regulation are likely to be promising. The extent to which these interventions are effective in adolescent NSSI remains to be seen. However, results from trials suggest further enquiry into how specific emotion regulation processes are

implicated in NSSI among adolescents can have practical utility by informing ongoing work in this area.

CHAPTER THREE

EMOTION REGULATION PROCESSES AND NSSI

There is increasing recognition that emotion regulation deficits are implicated in mental health and psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Berking & Wupperman, 2012). The various perspectives on NSSI reviewed so far suggest they are also pertinent in this area. The broad conceptualisation of emotion regulation (see Gross, 1998a, 1998b) suggests a range of responses aimed at up- and/or down-regulating both positive and negative emotions may be subsumed under the rubric of *emotion regulation* (Berking & Wupperman, 2012; Koole, 2009). This breadth is evident in that emotion regulation, as noted in Chapter 1, refers to both automatic and controlled efforts, which may in turn be conscious or unconscious (Gross, 1998a, 1998b; Koole, 2009). Paradoxically, to the extent that emotion regulation is conscious, the degree of emotional change and the type of emotion experienced may not be what was initially intended (Koole, 2009). For these reasons, emotion regulation is a complex construct and continues to attract debates including how it can be distinguished from emotion generation (see Berking & Wupperman, 2012; Gross, 2013; Gross & Barrett, 2011; Lewis, Zinbarg, & Durbin, 2010).

Given the breadth of processes that fall within the concept of emotion regulation, it is necessary to narrow the focus of the current enquiry into how these processes relate to NSSI. For this purpose, two theories are selected from which three emotion regulation processes are identified for further study. The first is Gross' process model of emotion regulation (1998a, 1998b) which is one of the most widely used frameworks in the field (Gullone, Hughes, King, & Tonge, 2010; Webb, Miles, & Sheeran, 2012). It

provides a useful guide to conceptualising emotion regulation processes and how they down-regulate distress, and thereby prevent engagement in NSSI. Cognitive reappraisal and expressive suppression are two processes which have been identified and studied within Gross' model. Following a description of the model, in this chapter research on their impact on emotional experience and their associations with NSSI will be explored.

The second theoretical perspective is the Emotional Cascade Model developed by Selby and Joiner (2009) to explain dysregulated behaviours such as NSSI. The model identifies a possible mechanism for the high levels of distress that accompanies NSSI. Central to the model is rumination which has been implicated in a number of mood-related disorders including depression (Mor & Winquist, 2002; Smith & Alloy, 2009; Thomsen, 2006) and anxiety (Calmes & Roberts, 2007; Harrington & Blakenship, 2002; Muris, Roelofs, Meesters, & Boomsma, 2004; Nolen-Hoeksema, 2000), as well as a range of disorders of behaviour such as violence and aggression (Caprara, Paciello, Gerbino, & Cunigini, 2007; Peled & Moretti, 2007), substance use and eating disorders (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007; Selby, Anestis, & Joiner, 2008; Skitch & Abela, 2008).

An investigation into the role of emotion regulation in adolescent NSSI would not be complete without mention of how changes may occur in the frequency and proficiency in the use of cognitive reappraisal, expressive suppression and rumination through adolescence. Therefore, the final section of the chapter focuses on this topic and presents findings from a review of the literature.

3.1 Gross' Process Model of Emotion Regulation

The process model of emotion regulation developed by Gross (1998a; 1998b) posits that emotions arise in a person-situation context in which attention is focused on features of a person-situation transaction to which personal meanings are ascribed and

out of which an emotional response is elicited. An emotional response includes physiological, experiential and/or behavioural components, each of which may be modulated. Thus, emotion regulation processes may be antecedent-focused which target factors leading up to an emotional response, or response-focused which target the physiological, experiential and/or behavioural elements of the emotional response.

Five types of emotion regulation processes are described within Gross' process model: (i) *situation selection*, (ii) *situation modification*, (iii) *attentional deployment*, (iv) *cognitive change*, and (v) *response modulation*, of which only the last is response-focused. Situation selection refers to the process whereby an individual decides to enter into or engage in a particular person-situation transaction. Once selected, an individual could engage in situation modification to increase or decrease its emotional impact. The degree to which situations can be avoided or modified varies but even if one enters into a particular person-situation transaction, the emotional impact of that transaction could be modified depending on the aspects of that transaction one attends to (hence, attentional deployment). One may choose to attend to aspects of a situation that are less likely to evoke an emotional response or be sensitive to aspects that have a tendency to do so. The degree to which an emotional response is elicited is influenced by the meanings that one ascribes to those attended aspects. Hence, individuals could select from several possible meanings of a situation including those which are less likely to elicit an emotional response (e.g. to interpret a remark as benign/neutral instead of insulting/personal). Individuals can also choose to limit the expression of the emotional response through response modulation (e.g. reducing or modifying a behavioural response to physiological arousal when experiencing anger). Some emotional responses are easier to modulate than others, however; and it is likely easier to regulate behavioural expression of emotion than its experiential and physiological expression.

As an example, imagine one were invited to attend a function where one anticipates unpleasantness from a particular individual. Situation selection suggests one might decline the invitation or avoid interactions with the particular individual. Even if it is not possible to avoid the person, situation modification is employed when choosing to discuss only neutral conversational topics. Ignoring overtures or signals by the other person to discuss sensitive topics in the interaction is an example of attentional deployment. Different meanings could be ascribed to these signals. One could interpret these signals as the person wishing to enter into an argument and prolong the unpleasantness, or one might engage in cognitive change and interpret the overtures as the other wanting to negotiate an amicable resolution. Finally, where the interaction elicits an emotional response, one might engage in response modulation to up- or down-regulate physiological arousal and the degree of behavioural expression associated with the response.

3.2 Cognitive Reappraisal and Expressive Suppression in Emotion Regulation and NSSI

As stated at the beginning of this chapter, cognitive reappraisal and expressive suppression are two processes which are specifically elaborated and researched within the framework of the process model (Gross & John, 2003; Gullone et al., 2010; John & Gross, 2004; Webb et al., 2012). Broadly, cognitive reappraisal is an antecedent-focused strategy aimed at reducing the emotional salience of a situation through cognitive change, whereas expressive suppression is a response-focused strategy which involves the inhibition of emotional expression. Importantly, expressive suppression refers specifically to the suppression of emotional expressive *behaviour* (Gross & John, 2003; Gross & Levenson, 1993, 1997; John & Gross, 2004).

Among adults, cognitive reappraisal is related to a greater experience and expression of positive emotion but a lower experience and expression of negative emotion (Gross & John, 2003). Expressive suppression leads to lower experience and expression of positive emotion but higher experience (but not expression) of negative emotion (Gross & John, 2003). A recent meta-analysis of experimental studies on emotion regulation reported differential impacts of these processes: reappraisal had small to medium effect sizes on emotion, while the effect of suppression was small (Webb et al., 2012). Effect sizes tended to be larger in studies where there were repeated attempts at regulating emotions. Importantly, no significant differences were found regarding valence of the target emotion to be regulated, but emotion regulation goals were influential in the relative efficacy of emotion regulation processes; there were larger effect sizes in studies where the direction of emotion regulation was contra-hedonic (i.e. individuals were attempting to feel worse – less positive emotion or more negative emotion). Thus, while both reappraisal and suppression had an effect on emotional experience, the extent to which these translate to engaging in NSSI where individuals are arguably attempting to feel better (i.e. more positive emotion or less negative emotion) remains to be seen. Finally, Webb et al. reported differential effects of gender (studies with larger proportion of women tended to report larger effect sizes), but sample age was not a significant factor in effect sizes. The age range of the study samples in the meta-analysis was 8-81 years, indicating these findings are applicable to adolescents.

Generally, cognitive reappraisal is positively related to psychological well-being and functioning compared with expressive suppression (John & Gross, 2004). Specifically among adolescents, less use of cognitive reappraisal and a greater tendency to engage in expressive suppression is related to depressive symptomatology (Betts,

Gullone, & Allen, 2009; Hughes, Gullone, & Watson, 2011) and school refusal and anxiety (Hughes, Gullone, Dudley, & Tonge, 2010). These studies hint at the protective effect of reappraisal and suggest expressive suppression is associated with worse outcomes in psychological health and well-being among adolescents. Moreover, although emotion regulation goals may influence the effect sizes of these emotion regulation processes, these studies indicate the impact of reappraisal and suppression translates across to secondary outcomes such as depressive and anxiety disorders, and may therefore be equally transferable in NSSI.

As NSSI is associated with higher levels of negative emotion and distress, it is expected that more frequent use of cognitive reappraisal will be associated with better outcomes than expressive suppression. Specifically, a tendency to use cognitive reappraisal is likely to decrease the emotional salience of problems and therefore decrease negative emotion and distress, while the tendency to suppress emotional expression is more likely to amplify negative emotion states. Together these processes may contribute to the experience of bodies being under the strain of emotional turmoil that has been described by individuals who engage in NSSI (Horne & Csipke, 2009). However, findings from the NSSI literature are mixed.

Among adolescents aged 13-18 years (Hasking et al., 2010) and young adults aged 18-30 years (Williams & Hasking, 2010), correlations between cognitive reappraisal and expressive suppression with NSSI are in the expected direction: negative correlations between cognitive reappraisal and NSSI, and positive correlations between expressive suppression and NSSI. However, Martin et al. (2010) reported no differences in the use of expressive suppression between individuals aged 10 years and above who did and did not engage in NSSI. Rather, individuals who self-injured were 3.3 times more likely to report difficulty using cognitive reappraisal compared with those who did

not self-injure. Conversely, Hasking et al. (2008) reported significant group differences (no NSSI, mild NSSI, moderate/severe NSSI)⁴ among 18-30 year olds on expressive suppression but not for cognitive reappraisal. Individuals with moderate/severe NSSI had the highest mean score on expressive suppression while those who did not engage in NSSI had the lowest mean score. Interestingly, the authors also reported participants in the moderate/severe group had lower scores on the coping subscale *Positive reinterpretation and growth* compared with the no NSSI group. An overlap between this subscale and cognitive reappraisal might, therefore, account for null findings on reappraisal in this study.

Nonetheless, the discrepant findings in the above studies may be due to different criterion variables under investigation. Martin et al. (2010) focused on NSSI history, while Hasking and colleagues (Hasking et al., 2008, 2010; Williams & Hasking, 2010), utilised a composite score of NSSI derived from the frequency, recency and severity of NSSI. These emotion regulation processes may therefore play different roles in NSSI; with cognitive reappraisal more relevant to whether individuals engage in the behaviour, whereas expressive suppression may be more relevant to the *severity* of NSSI. Three recent studies on adolescent NSSI are pertinent to the current discussion and suggest these emotion regulation processes may be differentially related to onset and continuation of the behaviour. Neither emotion regulation processes predicted first episode NSSI (Andrews, Martin, Hasking, & Page, *in press*; Tatnell, Kelada, Hasking, & Martin, 2014), while both were implicated in its continuation (Andrews, Martin, Hasking, & Page, 2013). In the latter case, adolescents who continued to engage in NSSI 12-months from baseline were more likely to report lower tendency to engage in both

⁴ Hasking et al. (2008) derived composite NSSI scores that took into account the frequency, recency and severity of the behaviour, weighted by number of methods used. Participants were classified in the mild NSSI category if they reported infrequent and low severity NSSI. Those in the moderate/severe group engaged in NSSI at least once a month with wounds requiring first aid.

cognitive reappraisal and expressive suppression, compared with adolescents who stopped self-injuring. Clearly further research is required to disentangle the relative roles of reappraisal and suppression in NSSI.

In regard to NSSI severity, while expressive suppression showed a positive relationship, Hasking et al. (2008) were unable to detect statistically significant between-group differences among the non-NSSI, mild NSSI, moderate/severe NSSI groups. Williams and Hasking (2010) found that although both emotion regulation processes were associated with NSSI, neither emerged as a significant predictor when previous diagnosis of psychiatric illness, psychological distress, and coping styles were considered. Rather, emotion-focused and avoidant coping styles predicted NSSI over and above previous diagnosis of psychiatric illness and psychological distress. The authors speculated that the high correlations between the emotion regulation processes and emotion-focused coping may confound their contribution in NSSI as these processes may be part of a wider range of emotion-focused coping.

Similarly, Hasking et al. (2010) examined the influence of emotion regulation and coping on the relationship between the “Big 5” personality factors (Costa & McCrae, 1992; Goldberg, 1999) and NSSI, and found both emotion regulation processes were significantly correlated with coping styles, but did not predict NSSI over and above psychological distress, personality factors and coping. However, interactions between personality factors and emotion regulation were significant. Conscientiousness exerted a protective effect for NSSI in the context of high expressive suppression and lack of problem-solving skills. Neuroticism featured as an additional risk among those with high expressive suppression. These studies further underscore the differential roles of reappraisal and suppression on different aspects of NSSI and hint at the relative importance of expressive suppression in the severity of the behaviour.

A number of studies on the related construct of *emotional inexpressivity* deserve to be mentioned. Conceptualised more as a personality trait than an emotion regulation process, emotional inexpressivity refers to individuals' tendency to curtail displays of emotions regardless of the valence of the emotion or the manner of expression (i.e. facial, vocal, or behavioural; Gratz & Chapman, 2007). It is therefore similar to expressive suppression.

Previous research showed that while emotional inexpressivity did not reliably distinguish female (Gratz, 2006) and male (Gratz & Chapman, 2007) undergraduates with a history of NSSI and those who did not, it was significantly associated with frequency of NSSI among women with a history of the behaviour (Gratz, 2006; Gratz & Roemer, 2008). More importantly, among the female undergraduates, the interaction of emotional inexpressivity, childhood maltreatment, and affect intensity/reactivity was a significant predictor such that greater emotional inexpressivity and greater affect intensity/reactivity distinguished women with a history of NSSI in the context of more childhood maltreatment (Gratz, 2006).

Findings from the above studies on emotional inexpressivity are consistent with studies on expressive suppression, highlighting a null relationship between deficits in emotional expression and the presence of NSSI but significant associations in regard to the severity (i.e. frequency) of NSSI. Moreover, the findings from the study reported by Gratz (2006) suggest expressive suppression may be implicated in NSSI only to the extent that individuals are experiencing heightened emotions and/or psychological distress. This interaction was not examined in previous studies but is theoretically consistent. Given NSSI is often accompanied by negative emotional states, and emotion regulation processes are involved with modifying the intensity, duration and expression of these emotional states, a *distress x emotion regulation process* interaction may

illuminate the underlying dynamic for NSSI. In other words, given these processes may reduce or amplify distress, stronger relationships between distress and NSSI might be expected in the context of less use of cognitive reappraisal, and/or greater tendency for expressive suppression. Although no studies to-date have tested this hypothesis, the presence of a *distress x process* interaction is proposed in the Emotional Cascade Model developed by Selby and Joiner (2009), albeit in relation to rumination.

3.3 An Emotional Cascade Model for Dysregulated Behaviours

The Emotional Cascade Model builds on Linehan's work to explain dysregulated behaviours which have been observed in individuals with Borderline Personality Disorder (Selby & Joiner, 2009). According to the authors, dysregulated behaviours such as substance use, eating disorders, and NSSI are distractions from negative emotional experiences emerging from a repetitive and vicious cycle of "emotional cascades". These cascades of emotion begin with minute emotional stimuli which become amplified by a cycle of rumination. It is important to note that the Emotional Cascade Model was originally developed to explain dysregulated behaviours in Borderline Personality Disorder. However, as will be seen below, there is empirical support for the model among nonclinical samples as associations between rumination and NSSI have elsewhere been reported.

3.4 Rumination in Emotion Regulation and NSSI

Within the Emotional Cascade Model, rumination is defined as "a tendency to repetitively think about the causes, situational factors, and consequences of one's negative emotional experience – in other words continuously thinking about and focusing attention on emotionally relevant stimuli" (Selby & Joiner, 2009, at p. 220; see also Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Thus while rumination arose independently of Gross' process model of emotion regulation, it has been categorised as

an attention deployment process whereby individuals are re-immersed in the initial situation (Webb et al., 2012). Unless new meanings are ascribed to those aspects that are the focus of rumination, the activity is likely to evoke the same emotions, which would account for reports of both constructive and maladaptive outcomes associated with the behaviour (for discussion of constructive outcomes of rumination see Tait & Silver, 1989; King & Pennebaker, 1996; Watkins, 2004).

As stated at the beginning of this chapter, there is strong empirical support for the association between rumination and a range of mood states including depression, anxiety and anger. Extending these findings, other studies have shown that ruminating on one's sad mood increased the level of distress regarding current concerns (Conway, Csank, Holm, & Blake, 2000), and that the tendency to ruminate about negative inferences following stressful events (*stress-reactive rumination*) moderated the relationship between negative cognitive styles and prospective rate, number, and duration of depressive episodes, and had a larger effect than ruminating on depressed mood (*depressive rumination*; Robinson & Alloy, 2003). Individuals who were more prone to engaging in stress-reactive rumination and who had a more negative cognitive style were more likely to fare worse with their depression, than individuals who had one or neither of these risk factors. Finally, stress-reactive rumination also predicted depressive symptoms and substance use among adolescents in the context of more negative events (Skitch & Abela, 2008).

The contribution of rumination to negative affective states in the context of stressful situations and life events may be due to its impact on how individuals cope with their problems. Rumination, for example, predicted higher disengagement from problems (Hong, 2007), reduced problem-solving behaviours (Lyubomirsky, Kasri, & Khem, 2003; Ward, Lyubomirsky, Sousa, & Nolen-Hoeksema, 2003), and decreased use

of emotion-focused coping strategies and cognitive disengagement from problems (Kelly, Matheson, Ravindran, Merali, & Anisman, 2007). Thus, rumination is likely to delay successful resolution of stressful situations, and prolong emotional arousal and negative affect arising from these situations and adverse life events.

In regard to NSSI, several studies have demonstrated rumination to be a significant risk factor among adults (Armey & Crowther, 2008; Borrill et al., 2009). Bjärehed and Lundh (2008) reported adolescents with higher levels of rumination at baseline were more likely to engage in more frequent NSSI two months later. Interestingly, Hilt, Cha et al. (2008) found that a ruminative response style moderated the relationship between depressive symptoms and NSSI for automatic-positive reinforcement (i.e. to generate emotion; Nock & Prinstein, 2004) but not for automatic-negative reinforcement (i.e. to down-regulate emotion; Nock & Prinstein, 2004). The authors speculated that the specific content of ruminative thoughts on negative emotion (e.g. thinking about how one feels nothing in the context of depressive symptoms) may explain the association with the automatic-positive reinforcement function of NSSI as individuals may engage in the behaviour in order to feel something. Whereas in regard to automatic-negative reinforcement, rumination may not moderate depressive symptoms and NSSI because (i) depressive symptoms may have a direct effect on NSSI, (ii) there may be a different moderator variable, and (iii) individual differences such as beliefs about rumination may obscure the moderation effect.

These studies laid the foundation for the subsequent development of the Emotional Cascade Model. An early test of the model (Selby et al., 2010) found significant direct and interaction effects between rumination and painful and provocative life events; both of which were predictors of number of NSSI episodes among undergraduates. Individuals who had experienced more painful and provocative

life events and who had greater ruminative dispositions were more likely to have engaged in frequent NSSI compared with individuals who were less prone to engage in rumination. In a more recent study (Selby, Franklin, Carson-Wong, & Rizvi, 2013) trait rumination was predictive of daily NSSI episodes, but its effect was no longer significant when considered alongside daily fluctuations of rumination (*instability of rumination*)⁵. Additionally, daily fluctuations of negative emotion (*instability of negative emotion*) were also predictive of number of NSSI episodes. In other words, individuals who engaged in more frequent and experienced greater changes in levels of rumination, and individuals who experienced more frequent and greater changes in levels of negative emotion, were likely to have more NSSI episodes. A significant interaction between instability of rumination and instability of emotion was found but results provided weak support for the model. Although individuals with greater fluctuation in both rumination and negative affect had more episodes of NSSI as would be expected, instability of rumination was also predictive of NSSI even when levels of daily negative emotion were stable⁶. These two latter studies provide preliminary support for the Emotional Cascade Model by highlighting the role of rumination in NSSI and in particular the dynamics between rumination and negative emotion.

The abovementioned studies reported robust findings in relation to associations between rumination and NSSI, and suggest further investigation into *distress x process* interactions could be helpful in elucidating the underlying mechanisms for the behaviour. As these studies focus only on frequency of NSSI, it remains to be seen if rumination might be predictive of NSSI onset and if it might play a role in other aspects

⁵ The instability indices in the study were calculated as a function of the frequency and amount of rumination/negative emotion experienced, number of observations, and time interval between observations.

⁶ Based on the Emotional Cascade Model, fluctuations in rumination should only predict NSSI in the context of more frequent and greater changes in levels of negative emotion.

of NSSI (i.e. severity and duration). Similar to some of the research on cognitive reappraisal and expressive suppression, two studies utilised composite scores for NSSI that included not only frequency, but severity of injuries and duration. Findings from these studies were, however, inconsistent.

Hoff and Muehlenkamp (2009) investigated the influence of different aspects of ruminative thinking and found that undergraduates with higher composite NSSI severity scores also scored significantly higher on both *brooding* and *reflection* compared with controls, although only reflection predicted NSSI. In this regard, brooding refers to a passive comparison of one's current state with an unachieved standard and reflection refers to a purposeful engagement in cognitive problem-solving to alleviate depressive symptoms (Treyner, Gonzalez, & Nolen-Hoeksema, 2003; Schoofs, Hermans, & Raes, 2010). Hoff and Muehlenkamp suggested the lack of a unique effect of brooding may be due to an overlap with other measures in the study such as the measure for perfectionism, and observed that further research into the relationship between different aspects of rumination and NSSI was needed.

More recently, Tanner, Hasking and Martin (*in press*) found rumination did not independently predict composite NSSI severity among adolescents when controlling for psychological distress. The authors suggested the contribution of rumination in NSSI may be specific to the valence of thought content, and that it may be the absence of positive thought content rather than the presence of negative thought content when ruminating that contributes to NSSI.

That there may be differential contributions of aspects of ruminative thinking in NSSI is highlighted by Selby et al. (2013). In their study, rumination on the past had a positive relationship with NSSI frequency, whereas rumination on the future and on emotional states had an inverse relationship. Rumination on current circumstances was

not significantly related to NSSI. Importantly, there was a significant interaction between ruminating on the past and fluctuations in sadness which suggests more daily episodes of NSSI among individuals caught in a vicious cycle of dwelling on past events and experiencing sad mood.

Results from these latter studies indicate there may be specific characteristics of ruminative thinking that contribute to vulnerability to self-injurious behaviour. Such a view is consistent with current research on rumination. Investigations into facets of ruminative thinking and their relative impact on psychological health and well-being are therefore discussed in the following subsection, together with implications for research on adolescent NSSI.

3.4.1 Facets of ruminative thinking and implications for NSSI

Segerstrom, Stanton, Alden and Shortridge (2003) postulated that repetitive thinking styles such as rumination exist along two dimensions. How repetitive and recurrent thoughts contribute to maladjustment depends on (i) whether individuals are focused on positive or negative thought content, and (ii) whether they are searching for different perspectives or new insights, problem-solving or preparing for future eventualities. Such a view was echoed by Webb et al. (2012) in their meta-analysis of research on emotion regulation which showed differential effect sizes dependent on the goals of regulating the emotion, the number of attempts at emotion regulation, and the specific processes used to regulate emotion.

Segerstrom et al. (2003) factor analysed a measure of global ruminative thinking style (Rumination Scale; Martin, Tesser, & McIntosh, 1993) and found that it consisted of one factor that was related to the uncontrollability and distractibility of thoughts, and a second factor that was related to cognitive rehearsal and processing. Siegle, Moore, and Thase (2004) undertook a factor analysis on a number of instruments purporting to

measure rumination and found different factor loadings for scales measuring valence-neutral reflection and alternate responses to emotional information, compared with scales measuring rumination on negative information.

Other factor analytic studies on a commonly used measure of rumination (Response Style Questionnaire; Nolen-Hoeksema & Morrow, 1991) suggested rumination is composed of two factors: brooding and reflection (Treynor et al., 2003; Schoofs et al., 2010). Brooding was associated with more depression concurrently and over time, whereas reflection was associated with more concurrent depression but less depression over time (Treynor et al., 2003). These differential relationships between aspects of rumination and depressive symptoms have been replicated in other studies and highlight a maladaptive brooding aspect of rumination and an adaptive reflective aspect among adults and adolescent samples (Armey et al., 2009; Burwell & Shirk, 2007; Joorman, Dkane, & Gottlib, 2006; Marroquin, Fontex, Scilletta, & Miranda, 2010; Schoofs et al., 2010). Brooding also mediated the relationship between perfectionism and psychological distress (O'Connor, O'Connor, & Marshall, 2007), was associated with suicidal ideation, and mediated the relationship between self-criticism and subsequent suicidal ideation (O'Connor & Noyce, 2008). Taku, Cann, Tedeschi, and Calhoun (2009) reported positive associations between brooding and reflection (described as "*intrusive*" versus "*deliberate*" rumination respectively) with posttraumatic growth, but recent reflection on the negative event was the stronger predictor of the extent of current posttraumatic growth. However as noted above, the only study that investigated brooding and reflection in NSSI reported contradictory results as only reflection was positively related to NSSI (Hoff & Muehlenkamp, 2009).

These studies suggest aspects of ruminative thinking can have differential impacts on emotional states and psychological outcomes. Therefore, beyond merely focusing on

rumination as a unitary construct, it may be useful to explore how individuals ruminate when faced with stressful situations and life events as a means of extending understanding of the role of rumination in the processes that underlie self-injurious behaviour. In relation to adolescent NSSI, such an investigation could be useful as age-related differences have been reported on the impact of different aspects of rumination on psychological health and well-being.

Verstraeten, Vasey, Raes, and Bijttebier (2010) reported a relatively more maladaptive relationship between brooding and depressive symptoms and a more adaptive relationship between reflection and depression among children and early adolescents aged 9-13 years. Although this was generally in accord with the literature, there was a significant interaction between reflection and age. Further examination of the interaction revealed the protective effect of reflection only applied to older participants in the study. These findings suggest there may be developmental differences in the types of rumination adolescents engage and their impact on emotional experience with concomitant differences in their contribution in adolescent NSSI.

3.5 Emotion Regulation in Adolescence

A discussion on emotion regulation in adolescent NSSI would be incomplete without considering changes in the use of cognitive reappraisal, expressive suppression and rumination during adolescence. This section, therefore, briefly explores the limited research in this area. As will be seen, these studies are consistent with the notion that adolescence represents a period of transition and is associated with changes in emotion regulation (Gross, 2013; Zeman et al., 2006). Moreover, at least for reappraisal and rumination, studies show these age-related differences influence adolescents' emotional experience and, by extension, are expected to be relevant in NSSI.

3.5.1 Cognitive reappraisal

In regard to cognitive reappraisal, several studies reported age-related differences in the frequency, effectiveness and sophistication of its application. Gullone et al. (2010) found that among 9-15 year olds, there was a negative relationship between reappraisal and age which suggests older participants were using the emotion regulation process less frequently than younger participants. However, in a slightly older sample of 10-18 year olds, a quadratic pattern was reported; with 10-12 year olds reporting the highest use of cognitive reappraisal followed by 16-18 year olds, and 13-15 year olds reported the lowest scores (Gullone & Taffe, 2012). It ought to be noted that Gresham and Gullone (2012) in a separate study among 10-18 year olds reported a nonsignificant relationship between age and reappraisal. This may be due to the quadratic pattern in scores with the decreasing trend from early- to mid-adolescence cancelling the effect of increases in cognitive reappraisal in later years. However, the findings from the first two studies suggest the presence of developmental changes in use of cognitive reappraisal across adolescence, with mid-adolescence (i.e. approximately 13-15 years) representing a critical turning point. Up to this point, reappraisal use is expected to decrease, with a subsequent increasing trajectory thereafter.

An experimental study by Silvers et al. (2012) highlights age-related differences in the effectiveness of reappraisal. In that study, participants (aged 10-23 years) were presented with a series of neutral and aversive images, and instructed to look at the pictures as well as to engage in reappraisal. In both instances, participants rated the strength of their negative emotional reaction to the pictures on a four-point scale. The authors reported that across all ages, reappraisal resulted in lower negative affect compared with passively looking at the aversive images. Additionally, there were greater reductions in negative affect with age.

A recent brain imaging study undertaken by McRae et al. (2012) is of interest and suggests increasing effectiveness of reappraisal in regulating negative affect among older adolescents may be due to brain maturation. The researchers examined activation of brain areas among 10-22 year olds when engaging in cognitive reappraisal. The authors found a significant linear trend with age on the activation of putative areas thought to support cognitive reappraisal among adults (e.g. left ventrolateral prefrontal cortex). According to McRae et al., these regions service verbal working memory and may reflect generation of alternative interpretations of negative stimuli.

McRae et al. (2012) contended that effective cognitive reappraisal may also require perspective taking and the capacity to represent one's mental state or make attributions in regard to another's mental state. A quadratic pattern of activation of brain areas that service perspective taking and mental state attributions (e.g. medial prefrontal cortex) was found – with a decreasing trend from early- to mid-adolescence followed by an increase into adulthood. While reasons for the initial decrease in activation is unclear, the findings provide some indication of increasing sophistication in reappraisal from mid-adolescence onward – with increasing ability to generate alternative interpretations based on stimuli alone (via maturation in the left ventrolateral prefrontal cortex), together with increasing ability to also reinterpret social and interpersonal cues through understanding another person's perspective (via maturation in the medial prefrontal cortex).

3.5.2 Expressive suppression

In regard to expressive suppression, age was also negatively related to frequency of its use among 9-15 year olds (Gullone et al., 2012), and suggests older adolescents within this sample were less likely to engage in expressive suppression. However, among samples of older adolescents aged 10-18 years, there were no significant age

differences (Gresham & Gullone, 2012; Gullone & Taffe, 2012). As with cognitive reappraisal, there appear to be changes in frequency of its use occurring in early- to mid-adolescence as reported by Gullone et al. (2012), with stability in the use of suppression to regulate emotions from mid-adolescence onward. No published studies were found for age-related differences in the relationship between expressive suppression and emotional experience.

3.5.3 Rumination

Research with 8-13 year olds (Hampel & Petermann, 2005) and 10-17 year olds (Jose & Brown, 2008) suggests rumination increases with age. As stated in the preceding section, Verstraeten et al. (2010) found age-related differences in the relationship between rumination and depressive symptoms. Results reported by Jose and Brown (2008) also hint at differential outcomes on depression according to age. Examining a statistically significant four way interaction of gender, age, stress and rumination, the authors reported higher depressive symptoms in the context of greater rumination and stress among girls aged 10-12 years and boys aged 15-17 years. The effects of rumination and stress on depression were not evident in other age groups. Moreover, for girls at all ages, rumination mediated the relationship between stress and depression. However, it was a significant mediator only among boys aged 13 years and above.

3.6 Conclusion

The literature reviewed thus far suggests emotion regulation is a pertinent area of inquiry in relation to NSSI. Gross' model provides a useful framework for this purpose as it identifies different ways emotions may be evoked, maintained and modified. Cognitive reappraisal, expressive suppression, and rumination are three emotion regulation processes that have strong empirical support for their impact on emotional

experience, and associations with mental health problems such as depression and anxiety among adults and adolescents. Research on each of these emotion regulation processes and their associations with NSSI shows they play a role in at least the severity of the behaviour, although there were more robust findings in regard to rumination than cognitive reappraisal and expressive suppression.

Several gaps in the existing research are apparent. Firstly, while useful and interesting research has been undertaken on how these emotion regulation processes may be implicated in NSSI, their theoretical foundations are not always obvious. The literature reviewed thus far indicates that adolescents engage in NSSI as a means of regulating distressing emotions. Koole (2009) differentiates emotion regulation from emotional sensitivity, and observed that the former is concerned with the offset of emotional experience. Therefore, there is a primary emotional response (e.g. distress) which is registered and subsequently regulated. The emotion regulation processes employed in response may not always serve intended goals and may have the opposite effect of amplifying unwanted emotions rather than down-regulating these emotions. That emotion regulation processes act on a pre-existing emotion suggests a *distress x emotion regulation process* interaction may better characterise the operation of these processes in NSSI. This is implied in Gross' process model of emotion regulation and in the early studies on cognitive reappraisal and expressive suppression (see Gross & John, 2003) and is specifically proposed in the Emotional Cascade Model. While several studies on rumination and emotional inexpressivity in NSSI have explored this interaction with positive findings, it remains to be seen whether it also extends to cognitive reappraisal and expressive suppression.

Secondly, most studies have focused on the role of these emotion regulation processes on NSSI severity and, in particular, its frequency. Findings in regard to how

reappraisal and suppression may be implicated in NSSI severity are mixed, although evidence for the role of rumination in NSSI is relatively more robust. Knowledge of their contribution in NSSI onset is, however, limited. Preliminary findings in regard to cognitive reappraisal and expressive suppression suggest they are not related to first episode NSSI among adolescents. Whether rumination is implicated in NSSI onset is unclear. Given there are few empirically supported preventive interventions, improving knowledge on the predictors of NSSI onset is likely to be useful.

Thirdly, the state of research on rumination suggests it has different aspects each of which has different impacts on psychological health and well-being. This is particularly important as some kinds of ruminative thinking may have beneficial consequences such as in posttraumatic growth. Preliminary findings suggest further enquiry would be promising and provide a more nuanced understanding on the role of rumination in NSSI.

Finally, few studies have examined these emotion regulation processes in adolescent NSSI. This represents a significant gap in the literature particularly when NSSI typically begins during early adolescence and longer histories of self-injurious behaviours are associated with increased likelihood of the behaviour persisting into adulthood, as well as increased vulnerability to suicidal behaviours. The lack of longitudinal studies is especially pertinent for this population and limits understanding of the trajectory of NSSI and its associated risk factors. As use of different emotion regulation strategies are affected by changes in development, how these changes may impact on NSSI is an important consideration when designing interventions for this population.

CHAPTER FOUR

RESEARCH AIMS AND GENERAL METHODOLOGY

The preceding chapters highlight the importance of longitudinal research in the study of NSSI among adolescents. As discussed, previous research suggests emotion regulation processes such as cognitive reappraisal, expressive suppression, and rumination may be implicated in the processes underlying NSSI. The review of the literature identified several areas for further investigation including (i) the potential for a *distress x process* interaction based on extant theoretical models, (ii) the extent to which these emotion regulation processes are implicated in first episode NSSI, and (iii) the impact of developmental changes occurring during adolescence on NSSI onset and severity. Current research on rumination further suggests that the role of rumination in NSSI may be more nuanced than previously conceptualised.

Within the broad research questions described below, the research program undertaken as part of the Doctor of Psychology (Clinical) degree aimed to address these issues. The studies reported in this thesis focused on the following questions:

1. In what ways are the emotion regulation processes of cognitive reappraisal, expressive suppression and ruminative thinking generally related to NSSI?
2. How do these emotion regulation processes impact on NSSI onset and maintenance?

Question 1 was addressed through all three studies whereas Question 2 was addressed through Study 2 (see Chapter 6) and Study 3 (see Chapter 7). In pursuing these questions, the three studies built on the notion that stressful situations and life events, as well as emotional distress act as triggers for NSSI. They adopted a *stress x diathesis* approach which acknowledges that individual vulnerabilities are manifested in the presence of acute life stressors. Accordingly, they included and controlled for acute life stress as indexed by a measure of adverse life events experienced by adolescents, and for distress as indexed by a measure of psychological well-being.

The current chapter describes the general methodology for the research reported in this thesis. It provides information on sample recruitment, as well as participation and retention rates. It also describes the measures used in the studies and their psychometric properties. General descriptive statistics for the full sample and participants with lifetime NSSI history are also reported in this chapter. Attrition analyses and data analytic strategies will be discussed, as well as the approach used to account for missing data.

4.1 Participants

With ethical approval from Monash University and The University of Queensland Human Research Ethics Committees, and educational departments responsible for access to students, 115 schools in New South Wales, Northern Territory, Queensland, South Australia, Tasmania and Victoria were contacted during 2010 to participate in a broader study investigating how adolescents cope with emotional problems. Both single-sex and co-educational schools were approached with the aim of obtaining an even gender distribution. However, of the 41 schools which agreed to participate, there were more all-girl schools than all-boy schools (all-girl schools = 11; all-boy schools = 4; co-educational schools = 26). Consequently, females as well as individuals from

metropolitan areas and suburbs of higher socioeconomic status (Australian Bureau of Statistics, ABS, 2013a) were over-represented in the sample.

Parents/guardians of students in the first four years of high school ($n = 14,481$) were provided information on the study⁷. Of these, 3,117 provided consent for their child's participation. The majority of parents/guardians ($n = 10,722$) did not respond, and a further 1,002 declined participation. Reasons for parental nonresponse and failure to provide consent were not recorded. In all cases, parents/guardians and students were informed they could withdraw from the study at any time.

At the initial wave of data collection, 2,639 students completed questionnaires (see Figure 1 for details of reasons for student nonparticipation). Of these, two students were over 18 years old and their completed questionnaires were excluded from analyses. The final sample at the initial wave of the study was 2,637. Data collection for Time 2 commenced during 2011 (mean follow-up from baseline = 11.7 months). Of the 2,328 participants at Time 2, 84.7% ($n = 1,973$) also participated at Time 1 with the remaining 355 participating in the study for the first time. At the completion of the final wave of data collection during 2012 (mean follow-up from Time 2 = 11.2 months), questionnaires from 1,984 students were received from a potential pool of 2,880 students with parent/guardian consent. Among these students, 71.8% ($n = 1,424$) had also completed questionnaires in the two preceding waves. A further 7.7% ($n = 152$) participated for the first time.

⁷ In New South Wales, Northern Territory, Tasmania and Victoria high school begins in Year 7. Consequently, in acknowledgement of the multiwave design of the broader study, explanatory statements were sent to parents/guardians of students in Years 7-10. In Victoria, Year 11 students were also asked to participate. At the time of data collection, in Queensland and South Australia, high school began in Year 8. Therefore, participation was sought for students in Years 8-10.

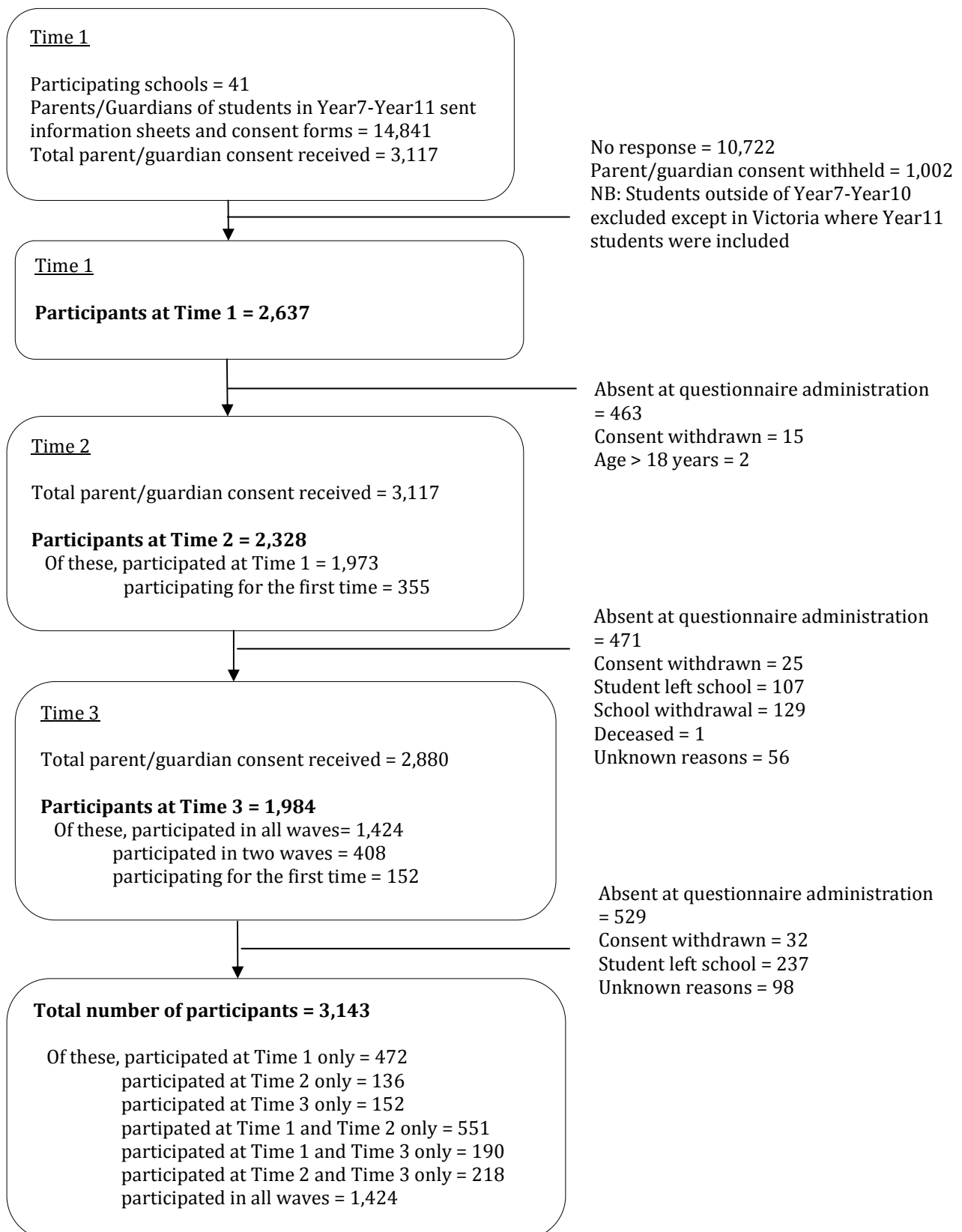


Figure 1. Recruitment and participation in each wave

The overall parental consent rate at baseline (21.0%) was lower than recent studies using school-based recruitment (49.5%-78.0%; Bilsky et al., 2013; Felton, Cole, & Martin, 2013; Rayner, Schniering, Hutchinson, Rapee, & Taylor, 2013). Comparing participation of eligible students at questionnaire administration showed comparable rates of 68.9% to 84.6%. Reasons for nonparticipation primarily related to students being absent from school on the day of questionnaire administration, and students no longer attending the school (see Figure 1). One school misunderstood the longitudinal design of the study and withdrew participation from Time 2. Students who left their school were followed up but declined to participate in subsequent waves.

Of students joining the study for the first time at Time 1 and Time 2 ($n = 2,992$), 20.3% did not participate in subsequent study waves. The overall retention rate (approx. 80%) is therefore comparable to similar school-based longitudinal studies (78.0%-95%; Allen, Manning, & Meyer, 2010; Bilsky et al., 2013; LaGrange et al., 2011; Rayner et al., 2013), as well as studies examining suicidality (Boergers & Spirinto, 2003).

Across the three waves, a total of 3,143 students completed questionnaires. Given the over-representation of all-girl schools, the majority of participants in the study were therefore female (Time 1 = 68.0%, Time 2 = 70.8%, Time 3 = 72.1%). Examination of demographic data showed, 89.2% were born in Australia and 2.5% identified as Aboriginal, Torres Strait Islander or both (national figures: 75% born in Australia; 3% Indigenous; ABS, 2013b). Mean age at the initial wave was 13.9 years ($SD = .99$), with mean age at subsequent waves increasing incrementally by one year (Time 2 = 14.9 years, $SD = .96$; Time 3 = 15.8 years, $SD = .96$). Lifetime prevalence of NSSI increased across the three waves (Time 1 = 8.1%, $n = 254$; Time 2 = 9.0%, $n = 283$; Time 3 =

10.1%, $n = 316$), reflective of first episode NSSI during the study period and new participants at subsequent waves reporting a history of NSSI.

Among the total sample, 555 participants reported ever engaging in NSSI. Mean age of onset ranged from 12-14 years, with most participants reporting they had engaged in NSSI in the twelve months preceding data collection (Table 1). Reported frequency of NSSI ranged from one to 300 times. Cutting and hitting oneself were the most common forms of NSSI although a range of methods and multiple methods were reported.

Table 1

Descriptive statistics of participants with NSSI history at each wave

	<u>Time 1</u> (<i>n</i> = 254)	<u>Time 2</u> (<i>n</i> = 283)	<u>Time 3</u> (<i>n</i> = 316)
Gender (female)	183 (72.0%)	226 (79.9%)	254 (80.4%)
Age at first NSSI	12.49 (SD = 2.66)	13.60 (SD = 1.81)	14.13 (SD = 1.48)
Last NSSI			
In last 12 mths	155 (61.0%)	194 (68.6%)	208 (65.9%)
> 12 mths	86 (33.9%)	86 (30.4%)	105 (33.2%)
Missing	13 (5.2%)	3 (1.1%)	3 (.9%)
Frequency			
1 time or less	67 (26.4%)	102 (36.0%)	103 (32.6%)
2 times	42 (16.5%)	49 (17.3%)	54 (17.1%)
3 times	30 (11.8%)	33 (11.7%)	40 (12.7%)
4 times or more	94 (37.0%)	81 (28.6%)	93 (29.4%)
Missing	21 (8.3%)	18 (6.4%)	26 (8.2%)
Method ^a			
Cutting	157 (61.8%)	196 (69.3%)	223 (70.6%)
Hitting	50 (19.7%)	35 (12.4%)	35 (11.1%)
Scratching/ Pinching	21 (8.3%)	33 (11.7%)	37 (11.7%)
Burning	12 (4.7%)	24 (8.5%)	29 (9.2%)

^a multiple methods were reported

4.2 Measures

4.2.1 NSSI

NSSI was measured with Part A of the Self-Harm Behaviour Questionnaire (SHBQ; Gutierrez, Osman, Barrios, & Kopper, 2001), which assesses NSSI, and suicide attempts, threats and ideation. Part A focuses specifically on NSSI. Respondents were asked if they have ever engaged in self-injurious behaviours and if so, to indicate the nature of the behaviour, its frequency and duration (e.g. when did you *first* harm yourself and when did you *last* harm yourself). Respondents were also requested to indicate if they have ever told anyone about their self-injurious behaviour, if they have required medical care following their behaviour, and the seriousness of the injury. NSSI was defined for respondents as “hurt yourself on purpose without trying to kill yourself”. To ensure that reported self-injurious behaviour met the definition of NSSI, respondents who indicated they engaged in self-injury with intent to kill themselves (e.g. “*I wanted to die*”), or where method of self-injury was ambiguous (e.g. overdose, suffocation), were not classified as engaging in NSSI ($n = 22$).

The SHBQ was selected as it includes a scoring system (see Gutierrez et al., 2001) that allows for various aspects of NSSI (frequency, recency, duration and medical seriousness) to be considered in the derivation of a composite NSSI score that reflected the overall severity of the behaviour. The structure of the SHBQ was validated among adolescents; and Part A had excellent reliability ($\alpha=.96$) and convergent validity (Muehlenkamp, Cowles, & Gutierrez, 2009). Alphas for the present study were high ($\alpha=.88-.93$), with moderate stability coefficients ($r=.54-.67$).

The composite NSSI severity score was used in Study 1 and Study 3. First episode NSSI in Study 2 was defined as any NSSI occurring within the period of the study. Accordingly, it was operationalised as (i) any reported NSSI 12- and 24-months from

baseline (i.e. at Time 2 and Time 3, respectively), (ii) no prior episode of NSSI in the previous study waves, and (iii) the reported NSSI occurred within the previous 12-months. This last criterion was included to account for participants joining the study for the first time who had engaged in NSSI in the past.

4.2.2 Cognitive reappraisal and expressive suppression

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) assesses the use of cognitive reappraisal and expressive suppression. In the 10-item questionnaire, six items measured cognitive reappraisal (e.g. “When I want to feel more positive emotion, I change the way I’m thinking about the situation” and “When I want to feel less negative emotion, I change the way I’m thinking about the situation”). The remaining four items measured expressive suppression (e.g. “When I am feeling positive emotions, I am careful not to express them” and “When I am feeling negative emotions, I make sure not to express them”). Each scale was designed to tap into both positive and negative emotions. Respondents were asked the extent to which they agreed or disagreed with these items on a 7-point scale (1 = strongly disagree; 7 = strongly agree), and total scores represent their tendency to engage in each of these emotion regulation processes.

In the initial validation, the two scales showed good internal consistency ($\alpha = .79$ for the Cognitive Reappraisal subscale, and $\alpha = .73$ for the Expressive Suppression subscale) and good test-retest reliability ($r = .69$; Gross & John, 2003). In the present sample, the Cognitive Reappraisal subscale showed high reliability ($\alpha=.81-.88$) while reliability for the Expressive Suppression subscale was sound ($\alpha=.71-.76$). Stability coefficients were low to moderate (Cognitive Reappraisal, $r=.39-.50$; Expressive Suppression, $r=.45-.59$).

4.2.3 Rumination

The Ruminative Thought Style Questionnaire (RTSQ; Brinker & Dozois, 2009) is a 20-item measure designed to tap into repetitive, recurrent, uncontrollable and intrusive thinking that characterises rumination (e.g. “When I have a problem, it will gnaw on my mind for a long time”, “I tend to replay past events as I would have liked them to happen”, “I find that my mind often goes over things again and again”, “When I have an important event coming up, I can’t stop thinking about it”). Respondents were asked to rate how well each of the items described them on a 7-point scale (1 = not at all; 7 = very well). Item scores on the RTSQ were summed to obtain a total score with higher scores indicating a higher tendency to ruminate. The initial scale showed excellent internal consistency ($\alpha = .87 - .92$), test-retest reliability ($r = .80$), and convergent and divergent validity (Brinker & Dozois, 2009).

For all analyses, the four subscales for the RTSQ identified by Tanner et al. (2013)⁸ were used to examine differential associations of various aspects of ruminative thinking. The first subscale (*Problem-focused Thoughts*; $\alpha=.87-.89$, $r=.48-.59$) describes repetitive, recurrent and uncontrollable thoughts about current problems without satisfactory resolution, and is reflective of a lack of problem-solving ability. It is similar to the reflection aspect of rumination identified in previous research. The second subscale (*Counterfactual Thinking*; $\alpha=.86-.87$, $r=.50-.62$) reflects wishful thinking or a “what if” thinking style concerned with imagined alternatives to reality (analogous to brooding). *Repetitive Thoughts*, the third subscale ($\alpha=.88-.90$, $r=.48-.58$), captures the repetitive, uncontrollable and intrusive nature of rumination without reference to thought content, while the fourth subscale (*Anticipatory Thoughts*; $\alpha=.71-.74$, $r=.36-.47$) refers to thoughts about a future event. While factor correlations were moderate and

⁸ See Appendix A.

ranged from .47-.60, Tanner et al. (2013) indicated discriminant validity, and no multicollinearity.

It is noted that the Anticipatory Thoughts subscale of the RTSQ has similarities with *worry* (defined as “a chain of thoughts and images, negatively affect-laden and relatively uncontrollable”; Borkovec, 1994, p. 8). However, examination of the items comprising the subscale suggests the two constructs are distinguishable. While worry and rumination reflect forms of perseverative thinking (see Segerstrom, Tsao, Alden, & Craske, 2000; McEvoy, Watson, Watkins, & Nathan, 2013; Mahoney, McEvoy, & Moulds, 2012), they have been differentiated according to the temporal focus of thought content. Worry is concerned with the future whereas rumination is typically focused with the past (Watkins, 2008). Specifically, worry thoughts are concerned with uncertain or ambiguous situations that are appraised as having the potential for negative outcomes (Borkovec, 1994; Szabo & Lovibond, 2002; Tallis, Davey, & Capuzzo, 1994) and are therefore associated with anticipation of threat or danger (Berenbaum, Thompson, & Pomerantz, 2007; Vasey & Borkovec, 1992). On the other hand, anticipatory rumination as defined by Tanner et al. (2013), involves thoughts about a future event (e.g. “When I am looking forward to an exciting event, thoughts of it interfere with what I am working on”, “If I have an important event coming up, I can’t stop thinking about it”) where the valence of thought content and the appraisal of future threat or danger is ambiguous. Further distinguishing it from worry, Tanner et al. reported that anticipatory rumination is positively related to productive coping and negatively related to unproductive coping and psychological distress. Anticipatory rumination may therefore reflect a more adaptive form of repetitive future-oriented thoughts.

4.2.4 Stressful situations and adverse life events

The Adolescent Life Events Survey (ALES; Hawton, Rodham, & Evans, 2006) assesses adolescents' experience of stressful situations and adverse life events (e.g. "Have you had problems keeping up with school work?", "Have you or any member of your family had a serious illness or accident?"). Respondents indicated if they had experienced twenty listed stressors and if so, whether it occurred within the past 12 months or more than a year ago. Scores on all items were summed such that higher scores indicated experiencing more stressful situations and life events.

The ALES was used as an indicator of acute life stressors. Incidents over 12 months ago were included in the total score to account for any residual effects these may have had on participants' current psychological state. Reliability for the measure was consistent across the three waves ($\alpha=.75$). Stability coefficients were moderate to high ($r=.58-.70$).

4.2.5 Psychological distress

The General Health Questionnaire (GHQ-12; Goldberg & Williams, 1998) is a 12-item measure of current psychological well-being and functioning. Questions are positively (e.g. "Been feeling reasonably happy all things considered") and negatively (e.g. "Been feeling unhappy and depressing") phrased, with an equal distribution across both valence. Respondents were asked to rate their functioning on a 4-point scale (1 = more so than usual; 4 = much less than usual). Higher scores indicated higher levels of psychological distress experienced "over the past few weeks". The GHQ-12 has been extensively evaluated and showed solid validity and reliability as a screening tool for depression and anxiety disorders among high school students in Australia (Baksheev, Robinson, Cosgrave, Baker, & Yung, 2011; Tait, French, & Hulse, 2003).

The GHQ-12 was used to index psychological distress at any time in a 12-month period. Given the factor structure and psychometric properties of the GHQ-12, and its high correlation with depression, anxiety and negative affectivity, a separate index of depressive symptoms was therefore not used. Alphas for the measure across all waves were high ($\alpha=.89-.90$), with moderate stability coefficients ($r=.40-.48$).

4.3 Procedure

A standard procedure was followed during each wave of data collection. Students were provided with a questionnaire booklet which included the abovementioned measures as well as questions to obtain demographic information (e.g. participant gender and age). Prior to completing the questionnaires, students were notified that they could withdraw from the study at any time and asked to sign a consent form.

The questionnaires took approximately an hour to complete on school grounds. Researchers were present to clarify questions throughout that time. On completion, participants received an information pack with printed materials about depression and other mental health issues, as well as mental health resources in the community.

Each participant generated a unique code for themselves and recorded it on both their consent form and questionnaire booklet. The procedure enabled confidentiality to be protected, yet enabled identification of students in the event responses raised concerns about immediate suicide risk. In accordance with ethical guidelines, participants' names (with their associated unique codes) were documented and kept separate from their completed questionnaire booklets, and stored in a locked archive room accessible only by the research team.

Data collected at each wave were matched according to participants' unique code. Ambiguities were clarified using other information such as participants' school and demographic information.

4.4 Attrition analysis

Of the full sample of 3,143 participants, 45.3% ($n = 1,424$) were present and completed questionnaires at all three waves of data collection. An additional 30.5% ($n = 959$) participated in two waves, while the remaining 24.2% ($n = 760$) participated in only one wave. Analyses were conducted to examine differences among participants who dropped out at Time 1 and Time 2 respectively, as well as differences between participants who joined the study during the final wave (Time 3).

Of students who participated only in the first wave of the study (T1 Only), there were more males than females (see Table 2). Participants were also more likely to be older compared with those who completed all three waves (T1T2T3) and those who missed data collection at Time 2 but participated at Time 3 (T1T3). They were also more likely to have reported more psychological distress and experienced more adverse life events compared with those who participated at Time 3 (T1T3 and T1T2T3). Of note, those who dropped out after the initial wave of the study were more likely to report a history of NSSI compared with all participants at Time 1, and have significantly higher composite scores for NSSI severity. Logistic regressions showed these characteristics were predictive of dropout after Time 1.

Compared with all participants in the second wave, students who participated in the first two waves of the study but not the third (T1T2) differed significantly only in regard to gender ($\chi^2(3) = 13.46, p < .01$) and age ($F(3, 2320) = 9.65, p < .01$). This group was more likely to be male and older compared with the other groups. There were no group differences (i.e. T2 Only, T2T3 and T1T2T3) in regard to reported psychological distress, number of adverse life events, and NSSI at Time 2. Males and older participants were more likely to be absent from data collection after Time 2.

Table 2

Comparison of participants who dropped out after Time 1 (T1 only) with others who participated in subsequent waves on indices at baseline

	<u>T1 only</u>	<u>T1T2</u>	<u>T1T3</u>	<u>All</u>	<u>Difference</u>
Gender					
Male	49.2%	32.9%	27.4%	26.6%	$\chi^2(3) = 84.84, p < .01$
Female	50.9%	67.2%	72.6%	73.4%	
Age	14.10	14.04	13.84	13.84	$F(3, 2633) = 11.65, p < .01$
Psychological Distress	23.65	23.19	22.54	22.41	$F(3, 2492) = 5.26, p < .01$
Adverse Life Events	28.92	28.82	27.21	27.67	$F(3, 2323) = 10.56, p < .01$
NSSI					
NSSI Ever (yes)	16.6%	10.4%	5.8%	8.5%	$\chi^2(3) = 29.26, p < .01$
NSSI Ever (no)	83.4%	89.7%	94.2%	91.5%	
NSSI severity	1.81	1.09	.64	.97	$F(3, 2574) = 8.23, p < .01$

Finally, participants who joined the study at Time 3 (i.e. T3 only) did not significantly differ from other participants who completed questionnaires during the final wave on any of the indices analysed.

4.5 Data analysis

A number of data analytic techniques were used based on specific study aims and research questions. A brief description of these techniques is provided below. Specific details are reported in each of the relevant chapters. In all of these studies, gender was included as a control variable to account for the overrepresentation of female participants.

4.5.1 Study 1

In Study 1, the aim was to test a theoretical model on the roles of cognitive reappraisal, expressive suppression and ruminative thinking in NSSI within a broader context of adverse life events and psychological distress. This model was developed through consideration of the literature reviewed in Chapter 3. As the examination of the model included investigation into indirect pathways and multiple relationships, path analysis utilising structural equation modelling (SEM) techniques was used.

Mean-centred scores were created for each variable to investigate proposed interactions (Kline & Dunn, 2000). Interaction terms were formed using the product of the mean-centred variables. Significant interactions were further probed using simple slopes analyses (Aiken & West, 1991). In brief, the simple slopes analysis examined the regression line characterising the relationship between the independent and dependent variables at different levels (i.e. ± 1 SD) of the moderator variable.

4.5.2 Study 2

Study 2 was concerned with the predictive utility of the emotion regulation processes under investigation in first episode NSSI. Specifically, it examined whether these emotion regulation processes moderated the relationships between both acute stressors and distress and NSSI onset. Given the binary outcome variable, data was analysed using logistic regression. Participants who had never engaged in NSSI were the

control group. As with the first study, examination of interaction terms required that all variables forming the interaction were mean-centred prior to calculating the product of these mean-centred scores. As the study intended to examine age-related differences in how emotion regulation might impact on NSSI risk, participants' age (mean-centred to account for interactions) and the relevant interaction terms were included as predictor variables.

4.5.3 Study 3

Finally, in Study 3, the relationships between changes in cognitive reappraisal, expressive suppression, and ruminative thinking and changes in NSSI severity over time were examined. The final study plotted latent growth curves (LGCs) to model the trajectories of the variables of interest over time and investigated the relationships between them.

LGCs are one way by which change over time may be represented (McArdle, 2009). As illustrated in the bottom half of Figure 2, LGCs assume that for any observed variable (X), change over time may be represented by (i) an unobserved or latent intercept which represents the initial level of the variable, (ii) a latent slope which represents the degree of change in that variable over time, and (iii) a time-specific independent state (e).

The shape of the latent slope is determined by slope loadings (b). Thus, for a hypothesised linear growth pattern, b 's may be specified as 0,1,2 or 1,2,3 or any linear variation. In LGCs, the means and variances of the intercepts and slopes are assumed to be random.

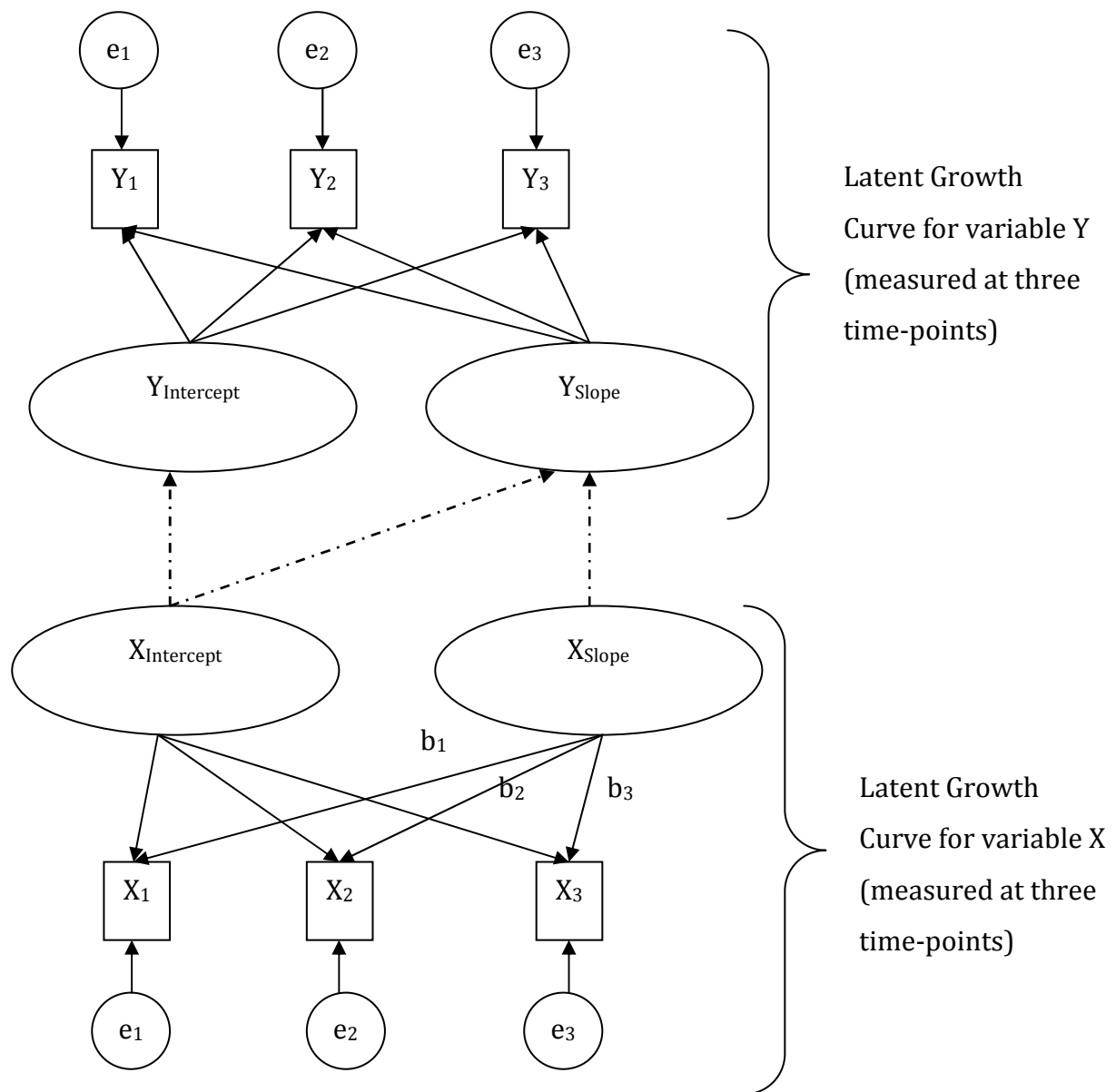


Figure 2. Representation of latent growth curve modelling with two variables

By using LGCs, therefore, it is possible to examine the trajectory of any given variable. Thus, it enables investigation of whether the scores on the variable increase or decrease over time by examining if slopes are positive or negative. It is also possible to explore the nature of the change (i.e. whether change is best characterised as linear,

quadratic, or splines) by specifying a priori slope loadings for b 's and examining goodness-of-fit indices. Finally, LGCs enables examination of the relationships between different variables over time through an investigation of the relationships between their intercepts and slopes.

As an example, Figure 2 depicts the hypothesised relationships of changes in two variables (X and Y) over time. The model proposes that initial level of variable X predicts both initial level of variable Y (as characterised by the $X_{\text{Intercept}} \rightarrow Y_{\text{Intercept}}$ dashed arrow), as well as the extent of change in variable Y over time ($X_{\text{Intercept}} \rightarrow Y_{\text{Slope}}$). Moreover, the model also proposes that changes in X are also related to changes in Y over time as characterised by the $X_{\text{Slope}} \rightarrow Y_{\text{Slope}}$ relationship.

In Study 3, as the focus was the relationship between changes in emotion regulation and NSSI severity over time, the main model tested comprised the emotion regulation process of interest (e.g. cognitive reappraisal) as variable X and composite NSSI severity as variable Y. Gender and LGCs for acute life stressors, psychological distress and participants' age were included as controls.

4.6 Missing data

Missing data included both *item nonresponse* (i.e. data missing for variables within waves) and *wave nonresponse* (i.e. data missing due to dropout or absence from scheduled questionnaire administration; Jelicic, Phelps & Lerner, 2010). Within each wave, data was missing completely at random (MCAR) at Time 1 and Time 3, but not for Time 2 (Time 1: $\chi^2 (384) = 411.95$, *ns*; Time 2: $\chi^2 (213) = 286.52$, $p < .01$; Time 3: $\chi^2 (160) = 134.91$, *ns*). Missing data for each measure accounted for < 10% of cases (except life events at baseline which accounted for 11.8% of cases). Across waves, Little's test indicated data was not MCAR ($\chi^2 (5869) = 6100.12$, $p < .05$). However, attrition analyses

reported above suggested data was at least missing at random (MAR; Acock, 2012; Graham, 2009; Jelicic et al., 2010).

In the cross-sectional analysis reported in Chapter 5, missing data included 130 questionnaires where participants did not attempt at least one of the measures. Taking a conservative approach, these questionnaires (4.9%) were excluded. For the remaining questionnaires ($n = 2,507$) missing data was imputed using Expectation Maximization (EM; Tabachnick & Fidell, 2007). It is a general technique that utilises the observed data to estimate expected values of missing data. The EM algorithm is a two-step iterative technique where the Expectation (E) step estimates initial values for the missing data based on the available data, and the Maximization (M) step utilises maximum-likelihood procedures to update these estimates. The algorithm stops when there is convergence in estimates obtained in the two steps. The criteria for EM were met as in the revised sample data was MCAR and <5% missing (Tabachnick & Fidell, 2007).

For the longitudinal analyses reported in Chapter 6 and Chapter 7, which involved repeated measures of participants at several time-points, Acock's (2012) recommended approach to item nonresponse was to substitute the mean of answered items for each scale where there were at least 60% completed items prior to undertaking analyses using either Multiple Imputation (MI) or Full Information Maximum Likelihood (FIML) to account for wave nonresponse (see also Graham, 2009; Jelicic et al., 2010). This approach was applied to approximately 1% of cases.

MI methods estimate missing values based on a specified imputation model using the available data and generates m number of datasets. Each of these datasets are then analysed and results are compared. FIML, on the other hand, does not impute missing values. Rather it uses the complete data set to maximise the likelihood function of the

missing data. MI was used in Study 2 and FIML was used in Study 3 to handle missing data. The precondition for these two methods (i.e. that data was at least MAR) was satisfied in the current sample. The choice of method was determined by both the data analysis technique and by practical considerations such as the data analysis software used, as explained below. Again, specific details regarding the treatment of missing data for these analyses are described in their relevant chapters.

The logistic regressions undertaken in Study 2 were conducted using IBM SPSS statistical software which includes an inbuilt MI algorithm. Using this feature, missing values were imputed with the Markov Chain Monte Carlo (MCMC) multiple imputation approach. On the other hand, LGCs in Study 3 were plotted using the SEM software AMOS which has an inbuilt FIML algorithm. To access the algorithm, the *Estimate means and intercepts* option was selected when specifying the parameters for the analysis. For both of these studies, analyses with complete cases were also undertaken as comparisons. In both cases, results from the MI and FIML analyses were generally consistent and support the robustness of the findings.

Declaration for Thesis Chapter Five

Declaration by candidate

In the case of Chapter Five, the nature and extent of my contribution to the work was the following:

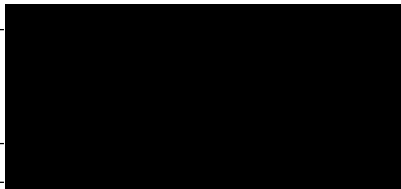
Nature of contribution	Extent of contribution (%)
Generation of ideas, data analysis and write up	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

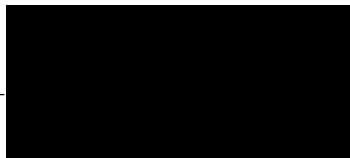
Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Associate Professor Penelope Hasking	Critical revision of manuscript	n/a
Professor Graham Martin OAM	Critical revision of manuscript	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature

	Date 25/07/2014
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Main Supervisor's Signature

	Date 25/07/2014
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CHAPTER FIVE

TESTING A THEORETICAL MODEL OF EMOTION REGULATION IN NSSI

As noted previously, Gross' process model of emotion regulation (Gross, 1998a, 1998b) and the Emotional Cascade Model (Selby & Joiner, 2009) suggest the role of cognitive reappraisal, expressive suppression and rumination in NSSI may be characterised by a *distress x emotion regulation process* interaction. Several studies on rumination and emotional inexpressivity have explored this interaction with regard to NSSI and reported positive findings. It remains to be seen whether such an interaction also extends to cognitive reappraisal and expressive suppression in NSSI.

Study 1 therefore tested a theoretical model of emotion regulation in NSSI that incorporated the above dynamic. Specifically, the model proposed that the relationship between adverse life events and NSSI was mediated by psychological distress, and that emotion regulation moderated these relationships (i.e. between life events and psychological distress, and between psychological distress and NSSI). The manuscript of the following article is reproduced in this chapter⁹.

Article:

Voon, D., Hasking, P., & Martin, M. (2014). The roles of emotion regulation and ruminative thinking in non-suicidal self-injury. *British Journal of Clinical Psychology*, 53, 95 – 113. Five-year impact factor = 2.69.

⁹ Due to the approach to handling missing data in this study (see Chapter 4), total sample = 2,507. Figures illustrating results from simple slopes analyses from the original manuscript were re-formatted and re-numbered.

The roles of emotion regulation and ruminative thoughts in non-suicidal self-injury

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Abstract

Objectives: This study explored how cognitive reappraisal, expressive suppression, and facets of ruminative thinking could be brought together in a model to explain non-suicidal self-injury (NSSI) in the context of experiencing stressful life events and psychological distress. **Methods:** Data from 2,507 participants aged 12-18 years (68% female, mean age 13.93 years) recruited from 41 Australian secondary schools were analysed, including 254 participants with a history of NSSI (72% female, mean age 14.21 years). Participants completed a self-report questionnaire assessing the constructs of interest. **Results:** Although meeting minimum fit indices, our hypothesised model showed poorer fit compared to an empirically derived model. While there was little evidence for the mediating role of psychological distress in NSSI, adverse life events, psychological distress, emotion regulation, and two facets of ruminative thinking (Counterfactual Thinking and Anticipatory Thoughts) had direct, though weak, relationships with NSSI. Among the subsample of adolescents with a history of NSSI, anticipatory rumination moderated the relationship between psychological distress and NSSI, while cognitive reappraisal demonstrated a direct, although weak relationship with NSSI. **Conclusions:** Our observations suggest that, among adolescents, contextual, social and behavioural factors may have a strong influence on NSSI and this may suggest that prevention and treatment efforts for NSSI among adolescents would be better focused on contextual, social and behavioural factors.

Keywords: Non-suicidal self-injury, rumination, emotion regulation

Practitioner Points

- Emotion regulation and repetitively dwelling on current problems and concerns are implicated in NSSI only to the extent they increase or reduce the experience of psychological distress
- Prevention and treatment efforts for NSSI among adolescents would be better focused on contextual, social and behavioural factors than cognitive factors
- The cross-sectional nature of the research suggests interpretations regarding the influence of these psychological factors on NSSI can only be speculative and further research is warranted to establish causality
- Replication with a larger, more representative sample is warranted

Non-suicidal self-injury (NSSI) is deliberately causing damage to the body in the absence of intent to die (Gratz, 2003; Klonsky, 2007; Martin, Swannell, Harrison, Hazell, & Taylor, 2010). Common forms of self-injury include skin cutting, severe scratching, banging or hitting oneself, and burning (Klonsky, 2009; Martin et al., 2010). The 12-month prevalence of NSSI among Australians aged 10 years and above is highest for 18-24 year olds (7.0%) and 10-17 year olds (5.4%; Martin et al., 2010). The intense negative reactions evoked in others, and the shame, guilt and remorse experienced by those who self-injure, may disrupt interpersonal relationships and potentially contribute to greater social isolation and withdrawal leading to deleterious consequences for psychological health and well-being (Gratz, 2003). Improving understanding of the psychological factors and underlying processes for NSSI is important to inform design of prevention, early intervention, and treatment programs for adolescents at-risk of, or engaging in, these behaviours.

Individuals who self-injure experience higher levels of negative emotions, and experience them more frequently (Brown, Williams, & Collins, 2007; Fliege, Lee, Grimm, & Klapp, 2009; Klonsky & Muehlenkamp, 2007). They are also more likely to experience their emotions as overwhelming and uncontrollable, in turn leading to emotional numbness (Horne & Csipke, 2009) and higher levels of psychological distress (Fliege et al., 2009; Hasking et al., 2010; Hasking, Momeni, Swannell, & Chia, 2008). There is consensus that individuals engage in NSSI as a means of emotion regulation (Chapman, Gratz, & Brown, 2006; Gratz, 2003; Klonsky, 2009; Martin et al., 2010); processes that increase, maintain and decrease both positive and negative emotions (Gross, 1998b). Nock and Prinstein's (2004) functional model of NSSI suggests individuals engage in the behaviour to down-regulate emotion ("to stop bad feelings") as well as to create a desirable psychological state ("to feel something, even if it was pain"). Horne and Csipke (2009) observed that NSSI assists individuals to "reconnect with their bodies and to become able to focus on their bodies [and thereby] return

sensation, end disembodiment, release suspension, and relieve the strain on the body experienced as threatening to break under emotional turmoil” (p. 662). NSSI is reinforced through removal of negative emotion (automatic-negative reinforcement) and through achievement of the desired psychological state (automatic-positive reinforcement). How individuals regulate their emotions in the context of stressful situations and life events is critical to understanding NSSI. Previous research suggests that emotion regulation strategies such as cognitive reappraisal and expressive suppression, as well as rumination may be implicated.

Regulating Emotions in the Context of Stress and its Contribution to NSSI

Gross (1998a) suggests that individuals may engage in antecedent-focused emotion regulation strategies (e.g. cognitive reappraisal) aimed at minimising the salience of a situation, or they may engage in response-focused emotion regulation (e.g. expressive suppression) aimed at modulating the emotional response to the situation. The former is related to a greater experience and expression of positive emotion but a lower experience and expression of negative emotion. On the other hand, the latter is associated with lesser experience and expression of positive emotion, and higher experience (but not expression) of negative emotion (Gross & John, 2003).

Negative associations between cognitive reappraisal and NSSI, as well as positive associations between expressive suppression and NSSI, have been reported (Hasking et al., 2010; Williams & Hasking, 2010). However, Martin et al. (2010) found that among individuals aged 10 years or older, those who self-injured were 3.3 times more likely to report difficulty using cognitive reappraisal strategies to regulate emotions compared with those who did not self-injure, with no differences in use of expressive suppression. The apparent conflict may be due to different criterion variables (NSSI severity versus NSSI history) as well as possible confounding of age, as use of expressive suppression decreases

across time for children and adolescents aged 9 to 15 years whereas cognitive reappraisal is stable among this age group (Gullone, Hughes, King, & Tonge, 2010). Nonetheless, taken together, these studies suggest further investigation into the role of cognitive reappraisal and expressive suppression in NSSI is warranted.

Ruminative Thinking and NSSI

Rumination, broadly defined as “a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms” (Nolen-Hoeksema, Wisco, & Lyubormirsky, 2008; p. 400), has also been implicated in NSSI. Studies suggest a higher dispositional tendency to ruminate increases susceptibility to NSSI (Armey & Crowther, 2008), that rumination predicts NSSI at baseline and subsequent NSSI within two months (Bjaraheed & Lundh, 2008), and that it predicts NSSI over and above avoidant and emotion-focused coping styles (Borrill, Fox, Flynn, & Roger, 2009). Selby, Connell, and Joiner (2010) report that in undergraduates, number of painful and provocative life events, and rumination, predict NSSI. There was significant interaction between the two variables; individuals who had experienced more painful and provocative life events and who had a higher tendency to ruminate were more likely to engage in NSSI compared with individuals who ruminated less. The Emotional Cascades Model for dysregulated behaviours such as NSSI (Selby & Joiner, 2009) suggests individuals self-injure to escape from intense emotions (emotional cascades) generated through a cycle of rumination. Ruminating on negative affect generates intense emotional responses as even minute emotional stimuli become amplified over time.

Increasingly, rumination has been conceptualised as a multifaceted and multidimensional construct (Smith & Alloy, 2009). Factor analyses of several measures of ruminative thinking suggest it may be composed of at least two factors (Schoofs, Herman, & Raes, 2010; Segerstrom, Stanton, Alden, & Shortridge, 2003; Siegle, Moore, & Thase, 2004;

Tanner, Voon, Hasking, & Martin, 2013; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). A commonly used measure – the Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991) – was found to comprise a passive comparison of one’s current state with an unachieved standard (“brooding”; e.g. “Think of a recent situation, wishing it had gone better” and “Think, why can’t I handle things better?”), and a purposeful engagement in cognitive problem-solving to alleviate depressed mood (“reflection”; e.g. “Analyse recent events to try to understand why you are depressed” and “Go away by yourself and think about why you feel this way”; Treynor et al., 2003). Studies have found these different facets are differentially associated with psychological outcomes such as depressive symptoms and posttraumatic growth (Armey et al., 2009; Burwell & Shirk, 2007; Joorman, Dkane, & Gottlib, 2006; Marroquin, Fontex, Scilletta, & Miranda, 2010; Taku, Cann, Tedeschi, & Calhoun, 2009; Treynor et al., 2003). Hoff and Muehlenkamp (2009) found that undergraduates who self-injured scored significantly higher on both a brooding and a reflective component, although only reflection predicted NSSI. They suggested that ruminative reflection may increase vulnerability for NSSI as it amplifies depressed mood and contributes to a perception that one’s problems are chronic with no viable alternatives for coping. How one ruminates rather than on what one ruminates about may therefore be a more pertinent area for further enquiry to improve understanding of NSSI.

An Hypothesised Model of the Processes and Mechanisms for NSSI

Previous research shows that difficulties with cognitive reappraisal, expressive suppression and rumination each contribute to heightened experience of negative emotion and are implicated in NSSI. However, the roles of these psychological variables in the processes underlying NSSI are unclear. Given that self-injurers experience higher levels of negative emotion and psychological distress, and that the psychological factors under consideration in this study influence emotional experience, we would expect that their

contribution to NSSI is linked to the experience of psychological distress. We therefore developed and tested a model that hypothesised the relationship between adverse life events and NSSI is mediated by psychological distress, and that these relationships are moderated by cognitive reappraisal, expressive suppression, and ruminative thinking (see Figure 3).

Specifically, we proposed individuals experiencing more adverse life events would experience greater psychological distress when they have a lower tendency to engage in cognitive reappraisal and/or a greater tendency to engage in expressive suppression. Whether individuals engage in NSSI to modulate their distress is influenced by how they regulate the emotions engendered by a state of psychological distress. Use of cognitive reappraisal was expected to reduce distress and therefore reduce NSSI risk and severity, whereas expressive suppression would have the opposite effect. In this regard, use of expressive suppression as a strategy to regulate distress would lead to amplification of distress, thereby providing a trigger for NSSI.

Similar processes would be expected to occur with rumination. Consistent with the concept of stress-reactive rumination (Robinson & Alloy, 2003; Skitch & Abela, 2008), we expected rumination to moderate the relationship between negative life events and psychological distress, such that a higher dispositional tendency for ruminative thinking would contribute to psychological distress in the context of more negative life events. Additionally, as theorised by Selby and Joiner (2009) rumination was expected to amplify distress and therefore increase the likelihood of engaging in NSSI.

Previous research on rumination and NSSI highlights the utility of considering the differential impact of facets of ruminative thinking. The only known study of this is Hoff and Muehlenkamp's (2009) investigation among young adults. As the authors observed, findings from that study were inconsistent with other research that identified an adaptive reflective component and a maladaptive brooding component. While the current study explored the

contribution of different facets of ruminative thinking in NSSI, we refrained from making conjectures about the direction of their contribution. The current study is therefore exploratory in this regard.

Method

Participants

Participants were 12-18 year old high school students recruited as part of a broader study on how adolescents cope with emotional problems. A total of 2,637 participants were recruited from 41 secondary schools in five Australian states/territories. Of these, 130 participants did not complete measures used for this study and were excluded from analysis. The final sample ($N=2,507$) comprised 68% female students (mean age 13.9 years). Of these, 254 participants (10.1%) reported 'ever' engaging in NSSI (72% female, mean age 14.2 years). Common forms of self-injury were cutting (61.8%) and hitting oneself (19.7%). Mean duration of NSSI was two years. Most participants (73%) reported engaging in NSSI 1-5 times, and 13.4% reported needing to see a doctor as a consequence of their self-injury.

Measures

The **Adolescent Life Events Survey (ALES;** Hawton, Rodham, & Evans, 2006) is a 20-item survey assessing negative life events adolescents may have experienced (e.g. "Have you had problems keeping up with school work?", "Have you or any member of your family had a serious illness or accident?"). Respondents indicated if they had experienced the life event listed and, if so, whether it occurred within the past 12 months or more than a year ago. Incidents over 12 months ago were included in the total score to account for any residual effects these may have had on participants' current psychological state. Scores on all items were summed such that higher scores indicated experiencing more negative life events, particularly in the past 12 months. In the present study, the survey showed moderate reliability ($\alpha=.75$; NSSI subgroup $\alpha=.72$).

The **Emotion Regulation Questionnaire (ERQ;** Gross & John, 2003) is a 10-item measure designed to tap into antecedent- and response-focused emotion regulation and includes positive (e.g. “When I want to feel more positive emotion, I change the way I’m thinking about the situation”) and negative items (e.g. “When I want to feel less negative emotion, I change the way I’m thinking about the situation”). Respondents scored on a 7-point Likert scale (1 = “strongly disagree”; 7 = “strongly agree”). Internal consistency for the two scales was good to moderate ($\alpha=.79$ for Cognitive Reappraisal and $\alpha=.73$ for Expressive Suppression) with good test-retest reliability ($r=.69$) (Gross & John, 2003). In the current sample, the Cognitive Reappraisal subscale showed high reliability ($\alpha=.81$; NSSI subgroup $\alpha=.80$) while reliability for the Expressive Suppression subscale was sound ($\alpha=.71$; NSSI subgroup $\alpha=.67$).

The **General Health Questionnaire (GHQ-12;** Goldberg & Williams, 1998) is a 12-item measure used to assess psychological distress. Questions are positively (e.g. “Been feeling reasonably happy all things considered”) and negatively phrased (e.g. “Been feeling unhappy and depressed”), with an equal distribution across both valence, scored on a 4-point Likert scale (1 = “better than usual”; 4 = “much worse than usual”). Scores were summed with higher scores indicating higher levels of psychological distress experienced “over the past few weeks”. The GHQ-12 has been extensively evaluated and showed solid validity and reliability (see Hardy, Sharp, Haynes, & Rick, 1999; Tait, French, & Hulse, 2003). Several studies have found that the scale has a consistent structure measuring “depression and anxiety”, “anhedonia and social dysfunction”, and “loss of confidence” among adults and adolescents (French & Tait, 2004; Makikangas, Feldt, Kinnunen, Tolvanen, Kinnunen, & Pulkkinen, 2006). Further, the GHQ-12 was highly correlated with the Centre for Epidemiological Studies Depression Inventory ($r=.60$), the Depression, Anxiety and Stress Scales ($r=.60$), and the Negative Affectivity Scale ($r=.68$) among Australian adolescents

(Tait et al., 2003). The GHQ-12 is also a valid screening tool for depression and anxiety disorders among high school students in Australia (Baksheev, Robinson, Cosgrave, Baker, & Yung, 2011). Given the factor structure and psychometric properties of the GHQ-12, and its high correlation with depression, anxiety and negative affectivity, a separate index of depressive symptoms was not used in this study. Alphas for the present study were high ($\alpha=.89$; NSSI subgroup $\alpha=.92$).

The **Ruminative Thought Style Questionnaire (RTSQ)** (Brinker & Dozois, 2009) is a 20-item measure of a global ruminative thinking style. Items were designed to tap into repetitive, recurrent, uncontrollable and intrusive thinking that characterises rumination (e.g. “I find that my mind often goes over things again and again”, and “I find that some thoughts come into my mind over and over again throughout the day”). Respondents rated how well each of the items described them on a 7-point scale (1 = “not at all”; 7 = “very well”), and scores were summed such that higher scores indicated a greater tendency to ruminate. The initial scale showed excellent internal consistency ($\alpha=.87$ to $.92$), test-retest reliability ($r=.80$), and convergent and divergent validity (Brinker & Dozois, 2009). The RTSQ was preferred to other measures of rumination such as the Response Styles Questionnaire because its questions are not predicated on being in a sad mood and therefore indexes a more general thinking style (for discussion see Brinker & Dozois, 2009).

To investigate the contribution of different components of ruminative thinking, the four subscales of the RTSQ identified by Tanner et al. (2013) were used. The first subscale (Problem-focused Thoughts; $\alpha=.89$, NSSI subgroup $\alpha=.87$) describes repetitive, recurrent and uncontrollable thoughts about current problems without satisfactory resolution, and is reflective of a lack of problem-solving ability. In this regard it is similar to the reflection aspect of rumination identified in previous research. The second subscale (Counterfactual Thinking; $\alpha=.87$, NSSI subgroup $\alpha=.80$) reflected wishful thinking or a “what if” thinking

style concerned with imagined alternatives to reality and is thus analogous to brooding. Repetitive Thoughts, the third subscale ($\alpha=.89$, NSSI subgroup $\alpha=.89$), captures the repetitive, uncontrollable and intrusive nature of rumination without reference to thought content; while the fourth subscale (Anticipatory Thoughts; $\alpha=.71$, NSSI subgroup $\alpha=.75$) refers to thoughts about a future event. While factor correlations were moderate and ranged from .47 - .60, Tanner et al. indicated that there was no multicollinearity and there was discriminant validity.

The **Self-Harm Behaviour Questionnaire (SHBQ;** Gutierrez, Osman, Barrios, & Kopper, 2001) is a four-part questionnaire that assesses NSSI, and suicidal attempts, threats and ideation. Part A focuses specifically on NSSI and respondents were asked if they have ever engaged in self-injurious behaviours, and if so, to indicate the nature of the behaviour, its frequency and duration. Respondents reported ever having told anyone about their behaviour, whether they required medical care following their behaviour, and the medical severity of the injury. The SHBQ was selected as it included a scoring system allowing for frequency, recency, duration and severity to be considered in the derivation of a composite NSSI score reflecting the overall severity of the behaviour (see Gutierrez et al., 2001). The SHBQ has excellent internal consistency ($\alpha=.95$) and convergent validity with a range of validated measures of self-harm (Gutierrez et al., 2001) and has promising validity for use with adolescents (Muehlenkamp, Cowles, & Gutierrez, 2009). Internal consistency in the current sample was excellent ($\alpha=.94$).

Procedure

With ethical approval from Monash University and the University of Queensland Human Research Ethics Committees, schools in five Australian state/territory jurisdictions were contacted to participate in the study. Of the 115 schools contacted 41 agreed to participate. Explanatory statements and consent forms were distributed to 14,841

parents/guardians of students in Years 7-10 in participating schools; 3,117 students gained parental/guardian consent. Students with consent were informed they could withdraw at any time. To protect confidentiality and yet enable identification in the event responses raised concerns about immediate risk, a unique code was derived for each participant. The questionnaire was completed on school grounds, taking approximately one hour to complete, and researchers were present to clarify questions throughout that time. On completion, participants received an information pack with printed materials about depression and other mental health issues, as well as mental health resources in the community.

Data Screening and Analysis

For the full sample, all variables had < 5% missing values except for the ALES (10%)¹⁰. Missing data was completely at random (Little's MCAR test, $\chi^2(384) = 411.95$, *ns*) and were imputed using Expectation Maximisation (Tabachnick & Fidell, 2007). Data was screened for univariate and multivariate outliers, and for distribution normality. One hundred and twenty five cases (5%) were identified as univariate outliers. Tabachnick and Fidell (2007) indicated that this was to be expected for very large sample sizes, and examination of the 5% trimmed mean showed that the effects of all outliers were low except on the SHBQ. For these reasons, and given that high SHBQ scores were the focus of the study, univariate outliers were retained for analysis. Thirty-two cases (1%) were identified as multivariate outliers (Mahalanobis distance $p < .001$) and retained; Studentised Residual and Cook's Distance values indicated they were within acceptable limits and the outliers did not unduly affect the results. The Kolmogorov-Smirnov and Shapiro-Wilk tests of normality for each measure were statistically significant and indicate that assumptions of normality were not met. Examination of the Normal Q-Q Plots showed that the most severe departures from normality of distribution were for the SHBQ, GHQ-12 and ALES. The omnibus test of

¹⁰ AUTHOR'S NOTE: N = 2,507 as data of participants who did not attempt at least one of the measures were excluded ($n = 130$).

multivariate normality developed by DeCarlo (1997), based on Small's test, was significant suggesting the assumption of multivariate normality was not met. However, transformations of the data did not substantially improve the distribution. Curran, West, and Finch (1996) suggest that the impact of multivariate non-normality is attenuated by a reasonable model and large sample size. Tabachnick and Fidell (2007) report that maximum likelihood methods of estimation work well with sample sizes of 2,500 or greater when normality assumptions are violated. However, the results should be interpreted with caution. Given that the sample size was 2,507, the analyses proceeded using "bootstrapping" with 2,000 samples to account for the univariate and multivariate non-normality.

Of 254 participants who reported ever engaging in NSSI, twelve cases (5%) were identified as univariate outliers although examination of the 5% trimmed mean also showed that their effects were weak. Only one case was identified as a multivariate outlier and retained. Assumptions of distribution normality were also not met. Analyses for this subsample also utilised bootstrapping methods with 2,000 samples.

Interaction terms were created using mean-centred scores for each variable (Kline & Dunn, 2000). The analysis was undertaken using maximum likelihood estimation. Apart from the Chi-square goodness-of-fit test and examining the Bollen-Stine bootstrap p-value, additional indices of model fit were assessed. The Bentler-Bonnett Normed Fit Index (NFI) and the Comparative Fit Index (CFI) with a cut-off score of $> .95$, and the Standardised Root-Mean-Square (SRMR) and Root-Mean-Square Error Approximation (RMSEA) with cut-offs set at $< .08$ and $< .06$ respectively, were used (Hu & Bentler, 1999). Significance tests of indirect effects were undertaken using bootstrap sampling with 2,000 samples and bias-corrected confidence levels set at .95.

While both co-educational and single-sex schools were contacted, with the aim of obtaining an even gender distribution, more all-girl schools (11) participated than all-boy

schools (3). The majority of participants in the sample were therefore female. Given gender differences have been reported particularly in regard to methods of self-injury (see Andover, Primack, Gibb, & Pepper, 2010; Baetens, Claes, Willem, Muehlenkamp, & Bijttebier, 2011), for all analyses, gender was included as a control variable.

Results

As reported in Table 3, all variables were significantly associated with NSSI, with only cognitive reappraisal showing a negative association. Our hypothesised model proposed the relationship between life events and NSSI would be mediated by psychological distress. It also proposed that cognitive reappraisal, expressive suppression and rumination would moderate the relationships between life events and psychological distress, and between psychological distress and NSSI severity.

Using a unitary construct of rumination, the model did not meet any of the recommended cut-offs for goodness-of-fit indices (see Table 4, Model 0). In this study, we were also interested in exploring the differential roles of facets of ruminative thinking in NSSI. Therefore, we included each of the subscales of the RTSQ (Tanner et al., 2013) hypothesising that each would moderate the relationships between life events, psychological distress and NSSI in the same way as the unitary construct in our hypothesised model. This model met recommended cut-offs for all fit indices except the RMSEA and the Bollen-Stine bootstrap p-value (Table 4, Model 1). It explained 18% of the variance in NSSI.

Examination of the modification indices suggested that model fit could be improved by specifying the direct contribution of stressful life events to NSSI and that the psychological variables under consideration (cognitive reappraisal, expressive suppression and ruminative thinking) moderated the relationship between stressful life events and NSSI. The final model (Figure 2, top panel) was the best across all goodness-of-fit indices except the Bollen-Stine

bootstrap p-value which remained statistically significant (see Table 4, Model 2), explaining 6% more of the variance in NSSI ($\Delta\chi^2(7) = 171.45, p < .001$).

As reported in Table 5, all variables except Problem-focused Thoughts and Repetitive Thoughts had direct relationships with NSSI. Each hypothesised path in the original model was statistically significant except the interaction between psychological distress and rumination, yet the strength of these relationships was weak (see Figure 4, bottom panel). Of the empirically specified paths, Stressful Life Events was significantly related to NSSI (see Table 5). The relationship was moderated by Cognitive Reappraisal ($b = -.01, p < .01$), Expressive Suppression ($b = .01, p < .05$), Counterfactual Thinking ($b = .01, p < .001$), and Anticipatory Thoughts ($b = -.01, p < .01$). While statistically significant, all interactions and indirect effects via psychological distress were small to negligible (Stressful Life Events, $\eta_{\text{indirect}} = .02, p < .01$; Cognitive Reappraisal, $\eta_{\text{indirect}} = -.02, p < .01$; Expressive Suppression, $\eta_{\text{indirect}} = .02, p < .01$; Problem-focused Thoughts $\eta_{\text{indirect}} = .01, p < .01$; Repetitive Thoughts $\eta_{\text{indirect}} = .02, p < .01$).

Simple slopes analyses indicated that in all cases the relationship between stressful life events, psychological distress and NSSI was stronger in the presence of less cognitive reappraisal and more expressive suppression (see Figure 5 and Figure 6). The relationship between stressful life events and NSSI was stronger in the context of more Counterfactual Thinking and less Anticipatory Thoughts (see Figure 7, top and middle panels).

Given the majority of the total sample had never engaged in NSSI, we were interested in differentiating between NSSI risk and severity (i.e. frequency, duration, recency and seriousness). We therefore compared the empirically derived model against a subsample of participants who reported ever engaging in NSSI. The model met criteria on most goodness-of-fit indices ($\chi^2(51) = 84.48, p = .002$; CFI = .98; NFI = .96; RMSEA = .05; SRMR = .05; Bollen-Stine bootstrap = .30) explaining 9% of the variance in SHBQ scores. Cognitive

reappraisal and the interaction between psychological distress and Anticipatory Thoughts were the only significant predictors of NSSI (Cognitive Reappraisal, $b = -.06$, $p < .05$; Psychological Distress x Anticipatory Thoughts, $b = .03$, $p < .01$). A simple slopes analysis showed that a lower tendency to engage in anticipatory rumination decreased the risk conferred by high levels of psychological distress (see Figure 7, bottom panel).

Discussion

The current study investigated the role of emotion regulation and ruminative thinking in the processes underlying NSSI. It also explored the differential contribution of facets of rumination (i.e. Problem-focused Thoughts, Counterfactual Thinking, Repetitive Thoughts, and Anticipatory Thoughts). Cognitive reappraisal, expressive suppression, and ruminative thinking were expected to moderate the relationship between adverse life events and psychological distress, which in turn was expected to predict NSSI. The three psychological factors were also expected to moderate the relationship between psychological distress and NSSI. The hypothesised model showed poorer fit compared to an empirically derived model which specified a direct relationship between stressful life events and NSSI, and that this relationship was moderated by emotion regulation and rumination. However, in the final model, the majority of hypothesised paths were statistically significant in the full sample comprising adolescents with and without a history of NSSI. Interaction and indirect effects were weak, suggesting that direct effects of the variables of interest are more relevant. Stressful life events, emotion regulation and rumination had stronger relationships with psychological distress than NSSI. Results indicate that incorporating facets of ruminative thinking allowed for a more nuanced understanding of the role of rumination. Different relationships were found such that problem-focused rumination and repetitive thoughts were related to psychological distress but not NSSI. Counterfactual and anticipatory rumination, on the other hand, were related to NSSI but not psychological distress.

Among a subsample of adolescents with a history of NSSI, only cognitive reappraisal and the interaction between psychological distress and anticipatory rumination were significant predictors of NSSI. Of note, psychological distress was not related to severity of NSSI in this group. The different pattern of relationships found in the full and subsample analyses suggests that processes involved in the initiation of NSSI among adolescents who have never engaged in the behaviour, may be different to those processes modulating severity of NSSI (i.e. frequency, recency, duration and seriousness) among those with a history of self-injury.

Emotion Regulation, Rumination and Psychological Distress in NSSI

Our findings do suggest that how adolescents interpret and respond to acute life stressors may have an impact on their level of psychological distress. Engaging in cognitive reappraisal decreases the amount of distress experienced, whereas suppressing emotional expression and engaging in some forms of rumination would tend to amplify distress. Interestingly, results suggest that thinking repetitively about one's problems (i.e. Problem-focused Thoughts and Repetitive Thoughts) contributes to psychological distress whereas imagining future alternatives (i.e. Anticipatory Thoughts) does not. Frequently ruminating on problems without being able to find solutions and experiencing thought intrusions about current concerns may contribute more to feeling overwhelmed by problems and compounding current difficulties thereby increasing distress. Among adolescents with a history of NSSI, engaging in counterfactual rumination (which involves comparing one's present predicament with how it could have been) had a protective effect on psychological distress. Counterfactual rumination may shift attention from present difficulties, thereby reducing the likelihood of experiencing distress. In all cases, however, the indirect effects of psychological distress in NSSI were small.

The measure of psychological distress used in the current study indexes deterioration in psychological health and well-being. Consistent with the theoretical and empirical literature, findings indicate that it is implicated in adolescents' risk of engaging in NSSI. Serious adverse events such as physical abuse, illness or death among friends and family, and parental separation and divorce, also increase risk of engaging in self-injurious behaviour even though psychological distress may be low or absent. Within these contexts, the decision to engage in NSSI may be influenced by factors other than distress, such as social learning from friends who have engaged in self-injury and the influence of media (Gordon et al., 2010; Nock, 2009; Nock & Prinstein, 2005; O'Connor, Rasmussen, & Hawton, 2009). This is particularly pertinent in relation to NSSI severity which had no apparent relationship to psychological distress. It is possible for adolescents to continue to engage in NSSI in the absence of distress or acute life stressors as the behaviour may be reinforced through repetition (see Gordon et al., 2010). Nock, Prinstein, and Sterba (2009) found that 12-19 year olds with a history of self-injurious behaviour experienced thoughts of NSSI on an average of five times per week. Therefore, adolescents may become overidentified with the behaviour such that they engage in NSSI rather than in alternative and more constructive behaviours (Nock, 2009).

Results hint at a slight protective effect of cognitive reappraisal in NSSI, and that expressive suppression and counterfactual thinking may increase risk (but not severity). Anticipatory rumination also had a slight protective effect in regard to NSSI risk, but it is likely to increase NSSI severity in the context of high levels of psychological distress among adolescents with a history of the behaviour. However, further research is needed to examine the direct effects of these variables on NSSI given the weak relationships in the current study.

Implications

While there was little support found in the current study for the moderating effects of emotion regulation and rumination on adverse life events, psychological distress, and NSSI, findings on the main effects of these variables hint at their role in directly elevating risk for NSSI. Among the entire sample, both emotion regulation strategies play a significant role as identified by Hasking et al. (2010). However, among individuals who have engaged in NSSI, only cognitive reappraisal was related to severity of the behaviour (see Martin et al., 2010). Further investigation to clarify the impact of these emotion regulation strategies on NSSI is warranted given skilling individuals in emotion regulation is one of the key components of Dialectical Behaviour Therapy (Lynch & Cozza, 2009; Miller, Muehlenkamp, & Jacobson, 2009)¹¹. This therapy remains the gold standard treatment for Borderline Personality Disorder (Miller et al., 2009), specifically focussing on NSSI rather than treating it as a peripheral consequence of psychopathology. DBT has been shown to be efficacious in reducing NSSI among adults and adolescents (Lynch & Cozza, 2009).

While intrusive thoughts of NSSI have been reported by adolescents who engage in the behaviour (Nock et al., 2009), we found that a repetitive and recurrent thinking style (i.e. Repetitive Thoughts) does not increase risk or severity of NSSI. Rather, results suggest that engaging in counterfactual rumination, involving passively dwelling on imagined alternatives to reality, but feeling you cannot change may play a role in the processes underlying self-injury, through an increased sense of helplessness and hopelessness. In contrast, anticipatory rumination may be more adaptive and protective. Tanner et al. (2013) reported Anticipatory Thoughts to be the only facet of ruminative thinking positively correlated with productive coping and engaging other social supports. Engaging in anticipatory rumination may assist

¹¹ AUTHOR'S NOTE: Of course, as discussed in Chapter 2, most interventions address the broader phenomenon of self-harm rather than NSSI. Nonetheless, these interventions suggest incorporating a focus on emotion regulation is warranted. DBT is specifically mentioned here given the relatively greater number of evaluations on its efficacy which have largely been positive albeit among adult populations.

individuals in identifying sources of support and finding alternative ways to cope with problems instead of resorting to NSSI. Of note, among adolescents with a history of NSSI, engaging in anticipatory rumination in the context of high psychological distress appears to be counterproductive.

In regard to interventions, our results support suggestions that assisting adolescents to cope with adverse life events and promoting psychological health and wellbeing can reduce the risk of NSSI. Skilling adolescents to appraise their current predicament, and reduce its emotional salience (i.e. cognitive reappraisal) can reduce psychological distress, and therefore possibly reduce both NSSI risk and severity. In comparison with rumination, distraction has been conceptualised as a more adaptive mode of responding to distress in Nolen-Hoeksema's (1991) Response Style Theory, and may be beneficial in breaking the cycle of repetitively dwelling on negative mood and its causes and consequences, thereby improving psychological health and well-being. Mindfulness may also have some utility as both distraction and mindfulness have been reported to be effective (compared with problem-solving) for reducing rumination among adolescents (Hilt & Pollak, 2012). Results suggest that use of these strategies by adolescents with a history of NSSI when they are experiencing high distress may reduce rumination and alleviate NSSI severity. However, all suggestions regarding the roles of emotion regulation and rumination in predicting NSSI, and the resulting treatment implications are necessarily tentative and speculative, given the weak relationships observed in the current sample.

Limitations

Our final model explained only 24% of the variance in NSSI, and relationships between the psychological factors under investigation were weak. This may be due in part to the moderate to high correlations found among facets of rumination, life events and psychological distress. While our *a priori* model was developed based on the theoretical

effects of emotion regulation strategies and rumination on emotional states and extended to include the experience of psychological distress, our final model was empirically derived. Clearly further work is necessary here, and our findings will need to be cross-validated before firm conclusions can be made. Additionally, given the cross-sectional nature of the research, conclusions regarding the influence of these psychological variables over time can only be speculative and further research to establish causality is required. Although 10% of participants reported ever engaging in NSSI and the model was examined with this subsample, results showed that these psychological variables explained less than 10% of the variance in NSSI severity. Despite this, we would argue that research with clinical populations, using our model, may identify ways to improve treatment for adolescents for whom NSSI is entrenched. Finally, the majority of our participants were female. While the study controlled for participants' gender by including it in the analyses, the generalisability of the findings to males is limited and requires further research.

Conclusion

Despite these limitations, the current study is one of only a few to examine the role of both emotion regulation and rumination in NSSI. It is also one of few studies to explore the differential contribution of different facets of ruminative thinking in NSSI. Findings highlight that there are separate and largely discrete psychological factors contributing to NSSI which are additive in their effects. Results show that different processes may be involved in risk of initial engagement in NSSI versus escalation, and that psychological distress is not a necessary condition for increased NSSI severity. Finally, our work suggests contextual, social and behavioural factors may have a stronger influence on NSSI than cognitive factors, in adolescents. These observations suggest that both prevention and treatment efforts for NSSI among adolescents may be better focused on contextual factors rather than cognitive factors.

References

- Andover, M.S., Primack, J.M., Gibb, B.E., & Pepper, C.M. (2010). An examination of non-suicidal self-injury in men: Do men differ from women in basic NSSI characteristics? *Archives of Suicide Research, 14*, 79 – 88. doi: 10.1080/13811110903479086
- Armey, M. F., & Crowther, J. H. (2008). A comparison of linear versus non-linear models of aversive self-awareness, dissociation, and non-suicidal self-injury among young adults. *Journal of Consulting and Clinical Psychology, 76*, 9 - 14. doi: 10.1037/0022-006X.76.1.9
- Armey, M. F., Fresco, D. M., Moore, M. T., Mennin, D. S., Turk, C. L., Heimberg, R. G., et al. (2009). Brooding and pondering: Isolating the active ingredients of depressive rumination with exploratory factor analysis and structural equation modelling. *Assessment, 16*, 315 - 327. doi: 10.1177/1073191109340388
- Baetens, I., Claes, L., Willem, L., Muehlenkamp, J.J., & Bijttebier, P. (2011). The relationship between non-suicidal self-injury and temperament in male and female adolescents based on child- and parent-report. *Personality & Individual Differences, 50*, 527 – 530. doi: 10.1016/j.paid.2010.11.015
- Baksheev, G.N., Robinson, J., Cosgrave, E.M., Baker, K., & Yung, A.R. (2011). Validity of the 12-item General Health Questionnaire (GHQ-12) in detecting depressive and anxiety disorders among high school students. *Psychiatry Research, 187*, 291 – 296. doi: 10.1016/j.psychres.2010.10.010
- Bjärehed, J., & Lundh, L. (2008). Deliberate self-harm in 14-year-old adolescents: How frequent is it, and how is it associated with psychopathology, relationship variables, and styles of emotional regulation? *Cognitive Behaviour Therapy, 37*, 26 - 37.
- Borrill, J., Fox, P., Flynn, M., & Roger, D. (2009). Students who self-harm: Coping style, rumination and alexithymia. *Counselling Psychology Quarterly, 22*, 361 - 372.

- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, 65, 1 - 19. doi: 10.1002/jclp.20542
- Brown, S. A., Williams, K., & Collins, A. (2007). Past and recent deliberate self-harm: Emotion and coping strategy differences. *Journal of Clinical Psychology*, 63, 791 - 803. doi: 10.1002/jclp.20380
- Burwell, R. A., & Shirk, S. R. (2007). Subtypes of rumination in adolescence: Associations between brooding, reflection, depressive symptoms and coping. *Journal of Clinical Child & Adolescent Psychology*, 36(1), 56 - 65. doi: 10.1080/15374410709336568
- Chapman, A. L., Gratz, K. L., & Brown, M. Z. (2006). Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy*, 44, 371 - 394. doi: 10.1016/j.brat.2005.03.005
- Curran, P.J., West, S.G., & Finch, J.F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1, 16 – 29.
- deCarlo, L. T. (1997). On the meaning and use of kurtosis. *Psychological Methods*, 2, 292 - 307.
- Fliege, H., Lee, J., Grimm, A., & Klapp, B. F. (2009). Risk factors and correlates of deliberate self-harm behaviour: A systematic review. *Journal of Psychosomatic Research*, 66, 477 - 493. doi: 10.1016/j.jpsychores.2008.10.013
- French, D.J., & Tait, R.J. (2004). Measurement invariance in the General Health Questionnaire-12 in young Australian adolescents. *European Child & Adolescent Psychiatry*, 13, 1 – 7. doi: 10.1007/s00787-004-0345-7
- Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson.

- Gordon, K.H., Selby, E.A., Anestis, M.D., Bender, T.W., Witte, T.K., Braithwaite, S., Van Orden, K.A., Bresin, K., & Joiner, T.E. (2010). The reinforcing properties of repeated deliberate self-harm. *Archives of Suicide Research, 14*, 329 – 341. doi: 10.1080/13811118.2010.524059
- Gratz, K. L. (2003). Risk factors for and functions of deliberate self-harm: An empirical and conceptual review. *Clinical Psychology: Science and Practice, 10*, 192 - 205. doi: 10.1093/clipsy/bpg022
- Gross, J. J. (1998a). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology, 74*, 224 - 237.
- Gross, J. J. (1998b). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*, 271 - 299.
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*, 348 - 362. doi: 10.1037/0022-3514.85.2.348
- Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: A 2-year follow-up study. *Journal of Child Psychology and Psychiatry, 51*, 567 - 574. doi: 10.1111/j.1469-7610.2009.02183.x
- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. (2001). Development and initial validation of the Self-Harm Behavior Questionnaire. *Journal of Personality Assessment, 77*(3), 475 - 490. doi: 10.1207/S15327752JPA7703_08
- Hardy, G. E., Shapiro, D. A., Haynes, C. E., & Rick, J. E. (1999). Validation of the General Health Questionnaire-12: Using a sample of employees from England's health care

- services. *Psychological Assessment*, 11(2), 159 - 165. doi: 10.1037/1040-3590.11.2.159
- Hasking, P. A., Coric, S. J., Swannell, S., Martin, G., Thompson, H. K., & Frost, A. D. J. (2010). Emotion regulation and coping as moderators in the relationship between personality and self-injury. *Journal of Adolescence*, 33, 767 - 773. doi: 10.1016/j.adolescence.2009.12.006
- Hasking, P., Momeni, R., Swannell, S., & Chia, S. (2008). The nature and extent of non-suicidal self-injury in a non-clinical sample of young adults. *Archives of Suicide Research*, 12, 208 - 218. doi: 10.1080/13811110802100957
- Hawton, K., Rodham, K., & Evans, E. (2006). *By Their Own Young Hand. Deliberate Self-Harm and Suicidal Ideas in Adolescents*. London: Jessica Kingsley.
- Hilt, L.M., & Pollak, S.D. (2012). Getting out of rumination: Comparison of three brief interventions in a sample of youth. *Journal of Abnormal Child Psychology*, 40, 1157 – 1165. doi: 10.1007/s10802-012-9638-3
- Hoff, E. R., & Muehlenkamp, J. J. (2009). Nonsuicidal self-injury in college students: The role of perfectionism and rumination. *Suicide & Life-Threatening Behaviour*, 39, 576 - 587.
- Horne, O., & Csipke, E. (2009). From feeling too little and too much, to feeling more and less? A nonparadoxical theory of the functions of self-harm. *Qualitative Health Research*, 19(5), 655 - 667. doi: 10.1177/1049732309334249
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1 - 55.

- Joormann, J., Dkane, M., & Gotlib, I. H. (2006). Adaptive and maladaptive components of rumination? Diagnostic specificity and relation to depressive biases. *Behavior Therapy, 37*, 269 - 280.
- Kline, T. J. B., & Dunne, B. (2000). Analysis of interaction terms in structural equation models: A non-technical demonstration using the deviation score approach. *Canadian Journal of Behavioural Science, 32*, 127 - 132.
- Klonsky, D. E. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review, 27*, 226 - 239. doi: 10.1016/j.cpr.2006.08.002
- Klonsky, D. E. (2009). The functions of self-injury in young adults who cut themselves: Clarifying the evidence for affect-regulation. *Psychiatry Research, 166*, 260 - 268. doi: 10.1016/j.psychres.2008.02.008
- Klonsky, D. E., & Muehlenkamp, J. J. (2007). Self-injury: A research review for the practitioner. *Journal of Clinical Psychology: In Session, 63*, 1045 - 1056. doi: 10.1002/jclp.20412
- Lynch, T.R., & Cozza, C. (2009). Behaviour therapy for nonsuicidal self-injury. In *Understanding Nonsuicidal Self-Injury: Origins, Assessment, and Treatment*. Nock, M.K. (ed.). pp. 221 – 250. Washington: American Psychological Association.
- Makikangas, A., Feldt, T., Kinnunen, U., Tolvanen, A., Kinnunen, M., & Pulkkinen (2006). The factor structure and factorial invariance of the 12-item General Health Questionnaire (GHQ-12) across time: Evidence from two community-based samples. *Psychological Assessment, 18*, 444 – 451. doi: 10.1037/1040-3590.18.4.444
- Marroquin, B. M., Fontes, M., Scilletta, A., & Miranda, R. (2010). Ruminative subtypes and coping responses: Active and passive pathways to depressive symptoms. *Cognition & Emotion, 24*, 1446 - 1455. doi: 10.1080/02699930903510212

- Martin, G., Swannell, S., Harrison, J., Hazell, P., & Taylor, A. (2010). *The Australian National Epidemiological Study of Self-Injury (ANESSI)*. Brisbane, Australia: Centre for Suicide Prevention Studies.
- Miller, A. L., Muehlenkamp, J. J., & Jacobson, C. M. (2009). Special issues in treating adolescent nonsuicidal self-injury. In M. K. Nock (Ed.), *Understanding nonsuicidal self-injury: Origins, assessment, and treatment* (pp. 251 - 270). Washington DC: American Psychological Association.
- Muehlenkamp, J. J., Cowles, M. L., & Gutierrez, P. M. (2009). Validity of the Self-Harm Behaviour Questionnaire with diverse adolescents. *Journal of Psychopathology and Behavioural Assessment*, 32, 263 - 243. doi: 10.1007/s10862-009-9131-7
- Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, 18(2), 78 - 83.
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behaviour. *Journal of Consulting and Clinical Psychology*, 72, 885 - 890. doi: 10.1037/0022-006X.72.5.885
- Nock, M.K., & Prinstein, M. J. (2005). Contextual features and behavioural functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, 114, 140 -146. doi: 10.1037/0021-843X.114.1.140
- Nock, M.K., Prinstein, M.J., & Sterba, S.K. (2009). Revealing the form and function of self-injurious thoughts and behaviours: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118, 816 – 827. doi: 10.1037/a0016948
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Lorna Prieta earthquake. *Journal of Personality and Social Psychology*, 61, 115 – 121.

- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3, 400 - 424. doi: 10.1111/j.1745-6924.2008.00088.x
- O'Connor, R.C., Rasmussen, S., & Hawton, K. (2009). Predicting deliberate self-harm in adolescents: A six month prospective study. *Suicide & Life-Threatening Behaviour*, 39, 364 – 375.
- Robinson, M. S., & Alloy, L. B. (2003). Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. *Cognitive Therapy and Research*, 27, 275 - 292.
- Schoofs, H., Hermans, D., & Raes, F. (2010). Brooding and reflection as subtypes of rumination: Evidence from confirmatory factor analysis in nonclinical samples using the Dutch Ruminative Response Scale. *Journal of Psychopathology and Behavioural Assessment*, 32, 609 - 617. doi: 10.1007/s10862-010-9182-9
- Segerstrom, S. C., Stanton, A. L., Alden, L. E., & Shortridge, B. E. (2003). A multidimensional structure for repetitive thought: What's on your mind, and how, and how much? *Journal of Personality and Social Psychology*, 85, 909 - 921. doi: 10.1037/0022-3514.85.5.909
- Selby, E. A., & Joiner, T. E. (2009). Cascades of emotion: The emergence of Borderline Personality Disorder from emotional and behavioural dysregulation. *Review of General Psychology*, 13, 219 - 229. doi: 10.1037/a0015687
- Selby, E. A., Connell, L. D., & Joiner, T. E. (2010). The pernicious blend of rumination and fearlessness in non-suicidal self-injury. *Cognitive Therapy and Research*, 34, 421 - 428. doi: 10.1007/s10608-009-9260-z

- Siegle, G. J., Moore, P. M., & Thase, M. E. (2004). Rumination: One construct, many features in healthy individuals, depressed individuals, and individuals with lupus. *Cognitive Therapy and Research*, 28, 645 - 668.
- Skitch, S. A., & Abela, J. R. Z. (2008). Rumination in response to stress as a common vulnerability factor to depression and substance misuse in adolescence. *Journal of Abnormal Child Psychology*, 36, 1029 - 1045. doi: DOI 10.1007/s10802-008-9233-9
- Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical Psychology Review*, 29, 116 - 128.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (Fifth Edition ed.). New York: Harper Collins.
- Tait, R. J., French, D. J., & Hulse, G. K. (2002). Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. *Australian and New Zealand Journal of Psychiatry*, 37(3), 374 - 381. doi: 10.1046/j.1440-1614.2003.01133.x
- Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2009). Intrusive versus deliberate rumination in posttraumatic growth across US and Japanese samples. *Anxiety, Stress and Coping*, 22, 129 - 136. doi: 10.1080/10615800802317841
- Tanner, A., Voon, D., Hasking, P., & Martin G. (2013). Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire. *Cognitive Therapy and Research*. DOI: 10.1007/s10608-012-9492-1
- Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, 27, 247 - 259.

Williams, F., & Hasking, P. (2010). Emotion regulation, coping and alcohol use as moderators in the relationship between non-suicidal self-injury and psychological distress. *Prevention Science, 11*, 33 - 41. doi: 10.1007/s11121-009-0147-8

Table 3

Means, standard deviations and intercorrelations (full sample) between variables of interest

	Mean (SD)			1.	2.	3.	4.	5.	6.	7.	8.
	NSSI	no NSSI									
1. NSSI	10.86 (2.79)										
2. Cognitive Reappraisal	23.86 (6.69)	28.93 (6.07)	$p < .001$	-.25*							
3. Expressive Suppression	16.40 (5.24)	13.67 (4.82)	$p < .001$	.17**	-.05*						
4. Psychological Distress	29.70 (7.75)	22.04 (5.47)	$p < .001$	.37**	-.32**	.31**					
5. Stressful Life Events	34.00 (5.70)	27.46 (4.65)	$p < .001$	.38**	-.24**	.17**	.46**				
6. Problem Focused Thoughts	22.86 (7.08)	17.15 (7.04)	$p < .001$	.23**	-.18**	.32**	.50**	.43**			
7. Counterfactual Thinking	21.98 (5.14)	18.47 (6.27)	$p < .001$	.17**	.01	.20**	.33**	.34**	.61**		
8. Repetitive Thoughts	22.09 (4.96)	18.78 (5.65)	$p < .001$	.17**	-.01	.15**	.41**	.36**	.62**	.63**	
9. Anticipatory Thoughts	10.23 (2.79)	9.64 (2.98)	$p < .01$	.06**	.09**	.10**	.23**	.20**	.50**	.55**	.52**

* $p < .05$; ** $p < .01$ (two-tailed)

Table 4

Goodness-of-fit indices for each model tested with full sample

	χ^2	df	<i>p.</i>	NFI	CFI	SRMR	RMSEA	Bollen-Stine <i>p</i> -value
Model 0	706.98	16	< .01	.90	.90	.04	.13	< .01
Model 1	756.93	57	< .01	.97	.97	.04	.07	< .01
Model 2	585.48	50	< .01	.98	.98	.04	.06	< .01

Model 0 = hypothesised model with unitary construct of rumination.

Model 1 = hypothesised model with facets of ruminative thinking.

Model 2 = hypothesised model with facets of ruminative thinking, and direct contribution to NSSI of stressful life events and interaction with emotion regulation and rumination.

Table 5

Standardised regression coefficients of direct effects in final model

	<u>Psychological Distress</u>	<u>NSSI</u>
Psychological Distress		.14***
Stressful Life Events	.20***	.21***
Cognitive Reappraisal	-.22***	-.11***
Expressive Suppression	.17***	.07***
Problem-focused Thoughts	.19***	<i>n.s</i>
Counterfactual Thinking	<i>n.s</i>	.07**
Repetitive Thoughts	.18***	<i>n.s</i>
Anticipatory Thoughts	<i>n.s</i>	-.05*

* $p < .05$, ** $p < .01$, *** $p < .001$

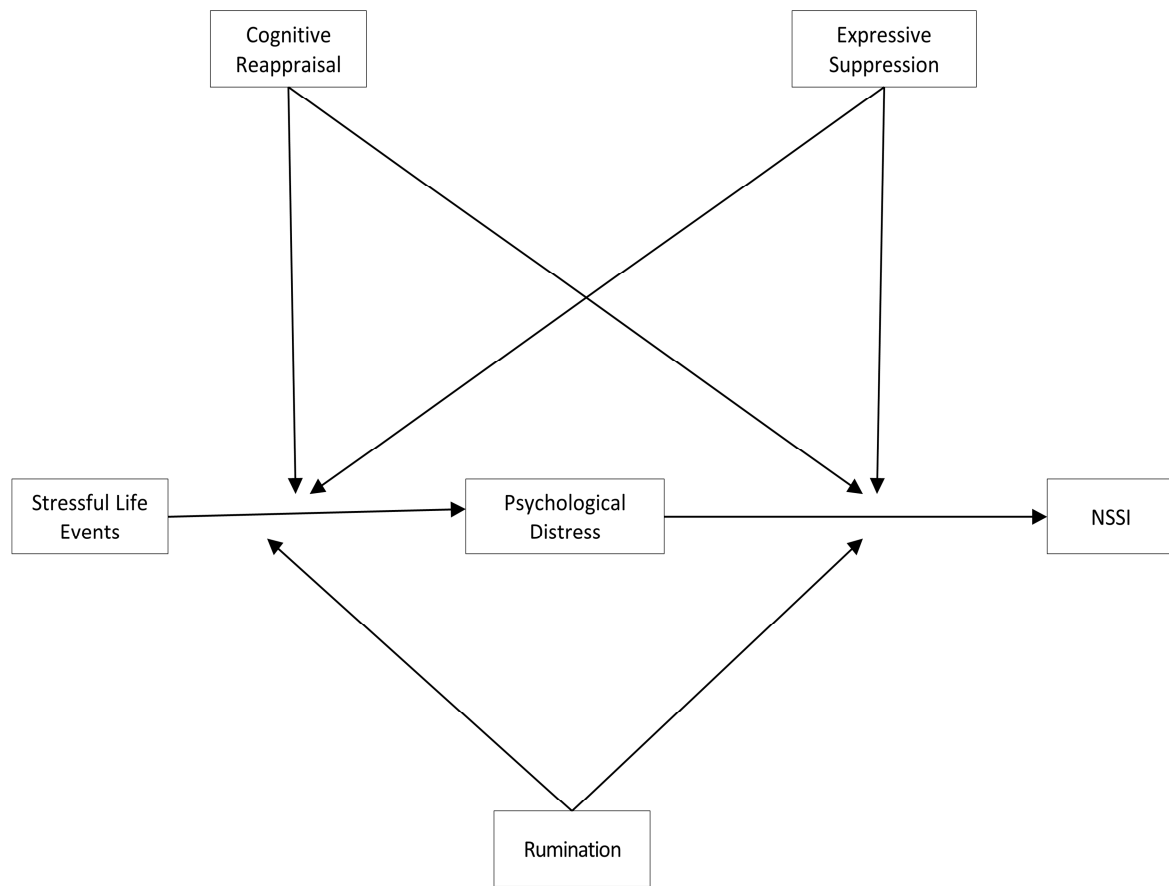
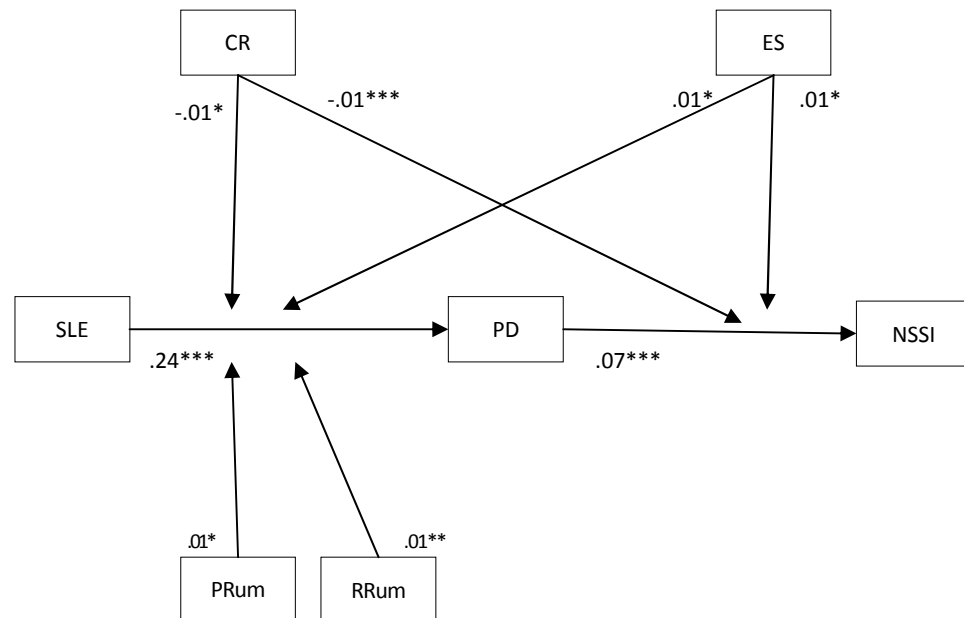
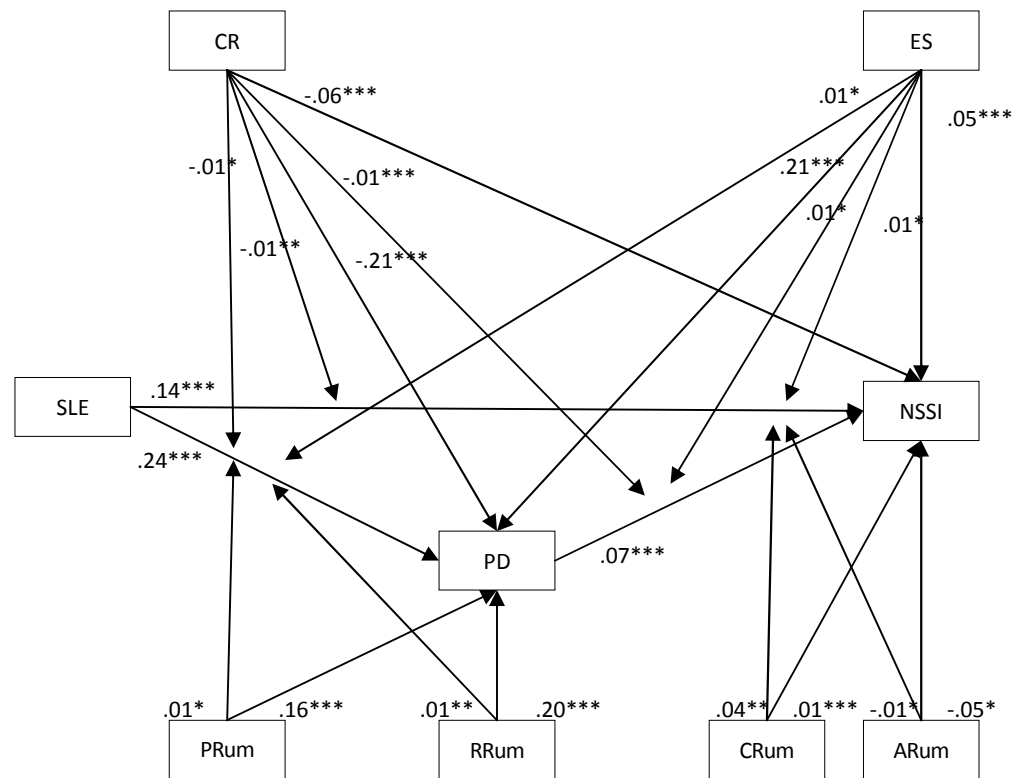


Figure 3. A theoretical model for the role of cognitive reappraisal, expressive suppression and ruminative thinking in the processes underlying NSSI



ARum = Anticipatory Thoughts; CR = Cognitive Reappraisal; CRum = Counterfactual Thinking; ES = Expressive Suppression; NSSI = Nonsuicidal Self-injury; PRum = Problem-focused Thoughts; RRum = Repetitive Thoughts; PD = Psychological Distress; SLE = Stressful Life Events. Unstandardised parameters are shown. Correlations not reported.

* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 4. Final model (top) and significant hypothesised paths in final model (bottom)

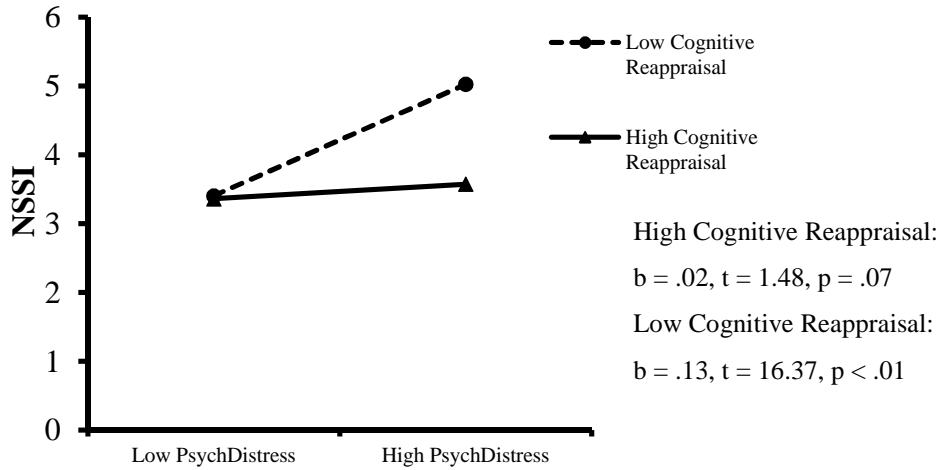
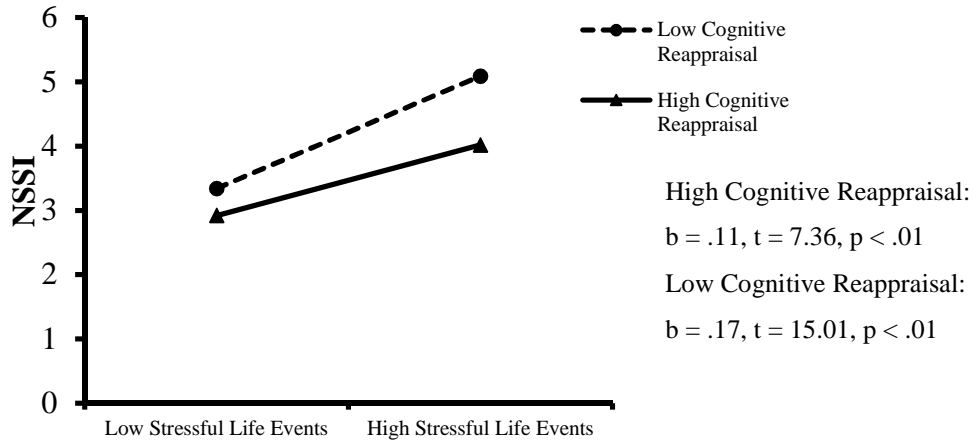


Figure 5. Simple slopes analysis for the interactions of cognitive reappraisal with stressful life events (top) and psychological distress (bottom) in NSSI

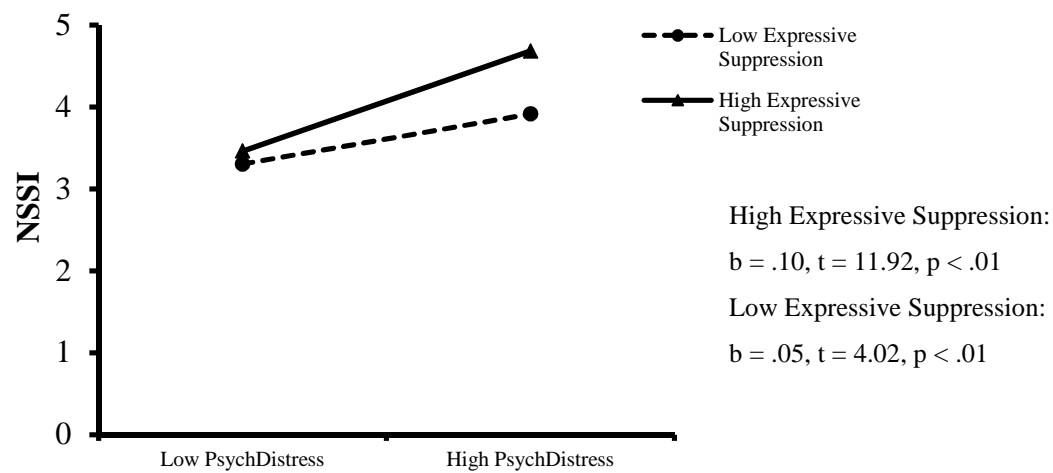
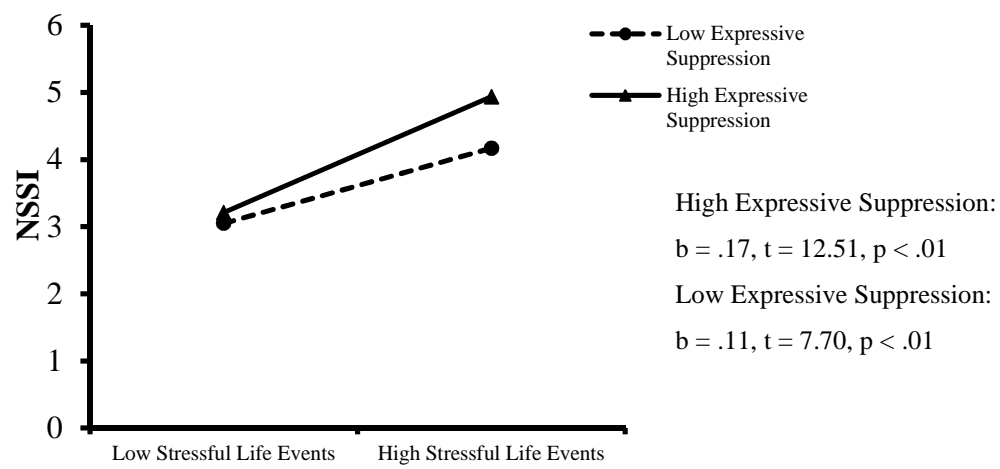


Figure 6. Simple slopes analysis for the interactions of expressive suppression with stressful life events (top) and psychological distress (bottom) in NSSI

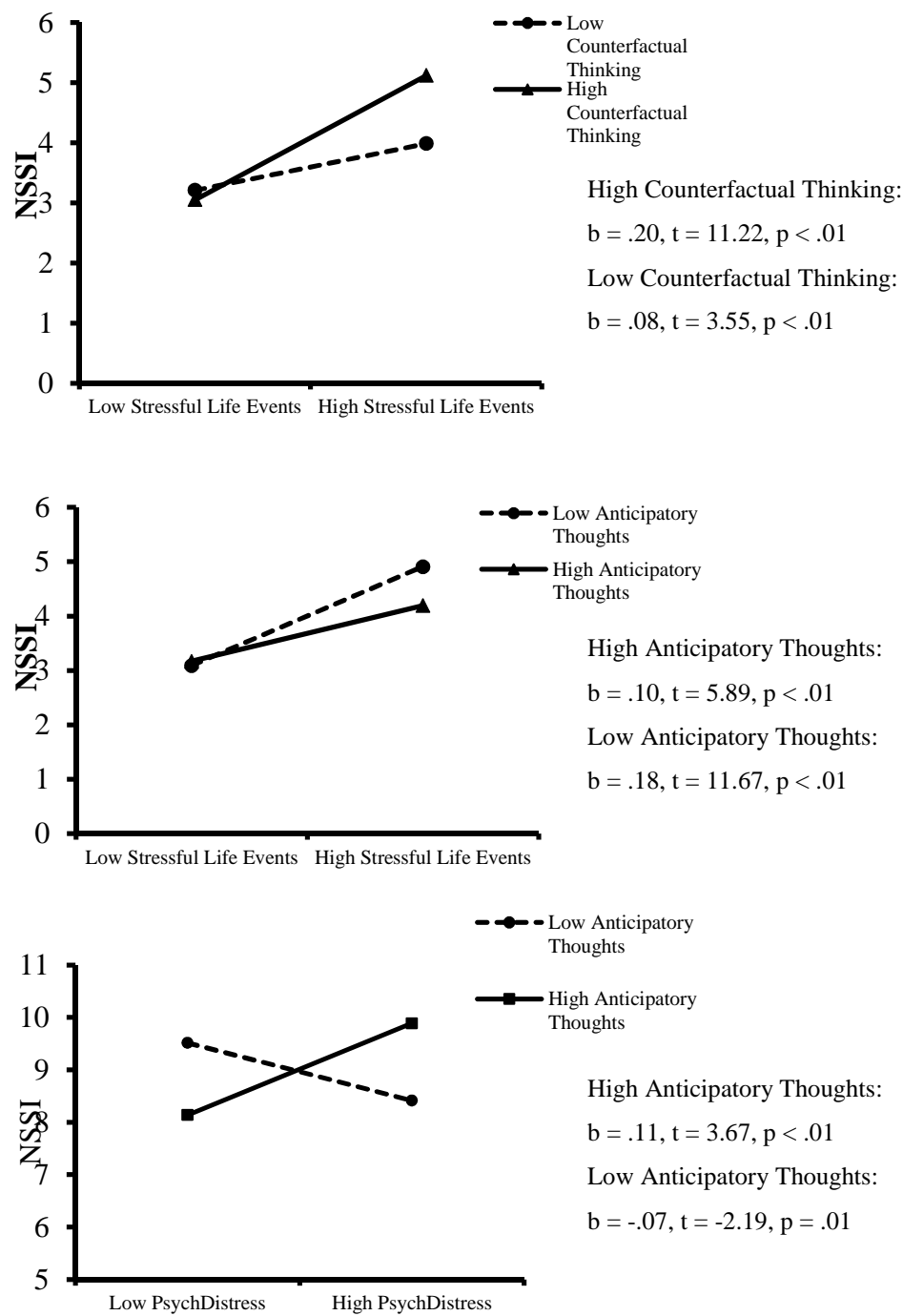


Figure 7. Simple slopes analysis for the interactions of counterfactual and anticipatory rumination with stressful life events in NSSI (top and middle) among the full sample, and subsample analysis of the anticipatory rumination x psychological distress interaction in NSSI (bottom)

Declaration for Thesis Chapter Six

Declaration by candidate

In the case of Chapter Six, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Generation of ideas, data analysis and write up	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Associate Professor Penelope Hasking	Critical revision of manuscript	n/a
Professor Graham Martin OAM	Critical revision of manuscript	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature		Date 25/07/2014
Main Supervisor's Signature		Date 25/07/2014

CHAPTER SIX

EMOTION REGULATION PROCESSES IN FIRST EPISODE NSSI

Findings from the first study suggest the emotion regulation processes of interest may play different roles depending on what is being assessed. Cognitive reappraisal, expressive suppression and two facets of ruminative thinking (counterfactual and anticipatory rumination) were significantly related to NSSI in the full sample analysis and therefore were relevant when assessing the presence of NSSI. On the other hand, only cognitive reappraisal and anticipatory rumination were significantly related to NSSI in the analysis among participants with NSSI history. This suggests these processes are likely to be more relevant to severity of the behaviour. In this regard, findings from Study 1 were consistent with preliminary findings reported by Andrews and colleagues (2013, *in press*) highlighting different processes may be involved in NSSI onset and maintenance.

Regression coefficients of the emotion regulation processes under investigation were lower than the coefficients for adverse life events and psychological distress. This led to the tentative conclusion that social, contextual and behavioural factors (such as the presence of acute stressors, distress and NSSI-specific vulnerabilities discussed in Chapter 2) may be more relevant when designing prevention and treatment for adolescent NSSI. However, the cross-sectional nature of the study precludes firm conclusions in this regard and further research is warranted.

The second study extended the enquiry on the roles of cognitive reappraisal, expressive suppression and rumination in adolescent NSSI and focuses specifically on the onset of the behaviour. Using a prospective design in examining the relationship of

emotion regulation and the occurrence of first episode NSSI, the study addressed one of the limitations noted in previous research. As stated in Chapter 1, the current study reported in this chapter also examined whether developmental changes as reflected in age-related differences in emotion regulation use might also have an impact. In doing so, it adds to the existing literature on adolescent NSSI.

Although findings from Study 1 hint that direct and main effects of emotion regulation processes are stronger than interaction effects in explaining NSSI, the second study examined the extent to which proposed *distress* x *process* interactions were implicated in behaviour onset. The manuscript of the following article is reproduced below.

Article:

Voon, D., Hasking, P., & Martin, M. (*in press*). Emotion regulation in first episode adolescent non-suicidal self-injury: What difference does a year make? *Journal of Adolescence*. Five-year impact factor = 2.82.

**Emotion regulation in first episode adolescent non-suicidal self-injury: What difference
does a year make?**

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Abstract

We examined the roles of cognitive reappraisal, expressive suppression, and rumination in first episode non-suicidal self-injury (NSSI) among adolescents, and the impact of age-related differences in emotion regulation use. Adverse life events and psychological distress played a significant role in NSSI onset. Being male and less use of cognitive reappraisal contributed to NSSI risk but only in regard to 12-month incidence; this effect was not observed when predicting 24-month incidence. Neither expressive suppression nor rumination was related to NSSI onset in our sample. Age-related differences in emotion regulation were found, but did not modify the above relationships. Findings hint at the possible impact of developmental changes in adolescents' cognitive-emotional processing and their subsequent risk of NSSI. Results support further investigation into prevention and early intervention initiatives aimed at assisting adolescents cope with acute life stressors to prevent/delay first episode NSSI.

Keywords: Non-suicidal self-injury, rumination, emotion regulation, longitudinal, adolescents

Non-suicidal self-injury (NSSI) is the deliberate damage to the body in the absence of fatal intent (Nock, 2009). It is distinguished from suicide where self-inflicted harm is intended to be fatal (Klonsky, May, & Glenn, 2013; Nock, 2012) and other self-harm behaviours, such as substance use, where physical damage to the body is unintended (Nock, 2009). NSSI typically first occurs between 12 and 14 years of age (Jacobson & Gould, 2007), with lifetime prevalence among adolescents estimated at 12.5% to 25.6% (Muehlenkamp, Claes, & Plener, 2012; Swannell, Martin, Page, Hasking, & St. John, 2014). It is associated with poorer physical health and well-being (Martin, Swannell, Harrison, Hazell, & Taylor, 2010), and a range of internalising and externalising disorders (Bjärehed, Wangby-Lundh, & Lundh, 2012; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Additionally, adolescents with longer NSSI histories are potentially at a higher risk of suicide (Howe-Martin, Murrell, & Guarniccia, 2012), over and above psychopathology and a range of psychosocial factors (see Hamza, Stewart, & Willoughby, 2012; Whitlock et al., 2013). Research on NSSI as a discrete construct is therefore important. Predictors of behaviour onset are not well understood, and are therefore particularly worthy of investigation if prevention efforts are to succeed.

Emotion Regulation and NSSI

There is general consensus that NSSI is motivated by seeking relief from emotional distress (Klonsky, 2009; Nock & Prinstein, 2004; Nock, Prinstein, & Sterba, 2009), and is indicative of a maladaptive response to acute stressors (Andrews, Martin, Hasking, & Page, *in press*; Borrill, Fox, Flynn, & Roger, 2009; Williams & Hasking, 2010). As such, how adolescents regulate their emotions when faced with stressful situations and life events is pertinent in the aetiology of the behaviour.

Emotion regulation refers to the processes involved in initiating, maintaining and modifying emotional experience (Gross 1998a, 1998b) and includes cognitive reappraisal,

expressive suppression, and rumination (see Aldao, Nolen-Hoeksema, & Schweizer, 2010; Webb, Miles, & Sheeran, 2012). Cognitive reappraisal refers to changing one's interpretation of emotionally salient stimuli (e.g. interpreting a remark as benign/neutral instead of insulting/personal), whereas expressive suppression refers to the suppression of emotional behaviour (e.g. masking expressions of joy in the company of a friend who is feeling sad). Rumination is defined as "a tendency to repetitively think about the causes, situational factors, and consequences of one's negative emotional experience – in other words continuously thinking about and focusing attention on emotionally relevant stimuli (Selby & Joiner, 2009; at p. 220).

Previous research suggests each of these emotion regulation processes are implicated in NSSI. Difficulties with cognitive reappraisal distinguished self-injurers from non-self-injurers (Martin et al., 2010). Increasing expressive suppression is related to increasing NSSI severity among 18-30 year olds (Hasking, Momeni, Swannell, & Chia, 2008). Both of these processes predict continuation of NSSI among adolescents (Andrews, Martin, Hasking, & Page, 2013). Finally, increased tendency to engage in rumination is related to increased frequency of NSSI episodes (Hilt, Cha, & Nolen-Hoeksema, 2008; Bjärehed & Lundh, 2008). Specific mechanisms for the contribution of these emotion regulation processes in NSSI are unclear. However, a recent cross-sectional study on adolescent NSSI (Voon, Hasking, & Martin, 2014) suggests these emotion regulation processes may moderate the impact of acute life stressors and psychological distress; although, clearly, further research is warranted.

While previous findings show these emotion regulation processes are salient in NSSI, to our knowledge few studies have specifically examined their contribution in first episode NSSI and the extent they may modulate the impact of risk factors such as adverse life events and distress. Preliminary findings are mixed regarding the role of cognitive reappraisal and expressive suppression in NSSI onset (Andrews et al., *in press*; Tatnell, Kelada, Hasking, &

Martin, 2014). Whether a tendency to engage in ruminative thinking predicts NSSI onset is also unclear.

Age-related Differences in Adolescent Emotion Regulation

Adolescence is characterised by changes in brain regions which are implicated in cognitive functioning in general and emotion regulation in particular. Giedd (2008) observed that neural systems responsible for the ability to control behavioural and emotional impulses, as well as the regulation of emotion (i.e. “executive function”) tend to mature at different rates, with increases in cortical matter in these areas peaking late in the second decade (i.e. 10-20 years old). This has implications for cognitive-emotional processing and explains how adolescents may have close to adult levels of logic and reasoning, yet have different capacities for applying them when making decisions under conditions of stress and emotional arousal (Steinberg, 2005). Studies report the ability to apply logical decision-making under conditions of low emotional arousal is evident across adolescence, but applying them under conditions of high emotional arousal tends to develop later in adolescence (Albert & Steinberg, 2008; Steinberg, 2005; Zelazo & Carlsson, 2010).

Accordingly, use of emotion regulation processes under investigation are also subject to change across age-groups. Research suggests adolescents’ use of cognitive reappraisal tends to decrease from early to mid-adolescence, followed by an increase in reappraisal from mid-adolescence onwards (Gullone, Hughes, King, & Tonge, 2010; Gullone & Taffe, 2012). Additionally, effectiveness of reappraisal in reducing negative emotion increases with age (Silvers et al., 2012). Age-related differences have also been reported for expressive suppression and rumination. Engaging in expressive suppression decreases from early to mid-adolescence and stabilises thereafter (Gullone et al., 2012; Gullone & Taffe, 2012); while engaging in rumination continually increases with age across adolescence (Hampel & Petermann, 2005; Jose & Brown, 2008). As far as we are aware, no studies have examined

whether these age-related differences in emotion regulation have an impact on adolescents' risk of first episode NSSI. Such knowledge would be beneficial in the development of targeted preventive interventions.

Study Aims and Hypotheses

The current study seeks to extend previous research and examines (i) the role of cognitive reappraisal, expressive suppression and rumination in first episode NSSI among adolescents, and (ii) whether there are age-related differences in how these emotion regulation processes feature in NSSI onset. In regard to the first question, given NSSI is a response to acute stressors and emotional distress, we specifically explored how the relationships between adverse life events, psychological distress and NSSI are moderated by these emotion regulation processes.

Broadly, as NSSI is related to experience of emotional distress, and as reappraisal reduces experience of emotional distress including depressive and anxious symptoms (see Betts, Gullone & Allen, 2009; Hughes, Gullone, Dudley, & Tonge, 2010; Hughes, Gullone, & Watson, 2011; Gross & John, 2003), we expect greater use of cognitive reappraisal to be associated with lower risk of first episode NSSI. Further, we also expected cognitive reappraisal to moderate the impact of adverse life events and psychological distress such that weaker relationships between these triggers and NSSI are expected among individuals with more frequent engagement in reappraisal. Conversely we expected greater use of expressive suppression and rumination to be associated with higher risk of first episode NSSI, and that there will be stronger relationships between adverse life events and psychological distress and NSSI among individuals with more frequent engagement in these emotion regulation processes. As no other studies have reported age-related differences in the relationship between emotion regulation and NSSI, we refrain from making any hypotheses on this matter; consequently, the study is exploratory in this regard.

Method

Participants

Participants were Australian high school students¹² enrolled in participating schools ($n = 41$: co-educational schools, $n = 26$; all-girl schools, $n = 11$; all-boy schools $n = 4$), and recruited as part of a broader study on how adolescents cope with emotional problems. Explanatory statements were distributed to parents/guardians of students in their first four years of high school, of whom 3,117 consented to their children's participation. Of these, 463 students were absent and 15 students declined to participate on the day of questionnaire administration. Two students who participated were >18 years old and were excluded from the final sample. There were 2,637 participants (68.0% female, mean age = 13.9 years, SD age = .99, age range = 12-18 years) at baseline.

At the second wave of data collection 12-months from baseline (Time 2), the initial pool of eligible students with parent/guardian consent were retained ($n = 3,117$). Of these, 471 students were absent and 25 students declined to participate on the day of questionnaire administration. Other reasons for non-participation at Time 2 included students having transferred from the school ($n = 107$) and one school withdrew from the study ($n = 129$). One student was deceased, while the remainder had no reason recorded for their non-participation. There were therefore 2,328 participants (70.7% female, mean age = 14.9 years, SD age = .96, age range = 12-19 years) at Time 2.

The final wave of data collection occurred 24-months from baseline (Time 3). Of the 2,880 eligible students with parent/guardian consent, 529 students were absent and 32 declined to participate on the day of questionnaire administration. A further 237 had left the

¹² In Australia, most adolescents begin high school at approximately 12-13 years of age (Grade 7) and complete their secondary education at approximately 17-18 years of age (Grade 12). We recruited from students in the first four years of high school to account for the multiwave design of the study. Students who left school during the period of the study were followed up, but declined to participate in the study.

school. There were 1,984 participants (71.2% female, mean age = 15.8 years, SD age = .96, age range = 13-20 years) at Time 3.

In total, 3,143 students participated in the study. Of participants at baseline, 82.1% were retained and completed questionnaires during at least one other data collection wave. Of the 355 participants who joined the study for the first time at Time 2, 61.4% ($n = 218$) continued their participation at Time 3. Participation rates (68.9%-84.6%) were consistent with other school-based studies (e.g. Bilsky et al., 2013; Felton, Cole, & Martin, 2013; Rayner, Schniering, Hutchinson, Rapee, & Taylor, 2013). Retention rates are consistent with longitudinal studies examining suicidality (Boergers & Spirinto, 2003).

Measures

The **Self-Harm Behaviour Questionnaire – Part A (SHBQ;** Gutierrez, Osman, Barrios, & Kopper, 2001) was used to assess NSSI. Respondents indicated if they have ever engaged in NSSI, and if so, to describe how they injured themselves, their motivation for engaging in the behaviour, how many times they have done so, when they *first* injured themselves, and when they *last* injured themselves. NSSI was defined for respondents as “hurt yourself on purpose without trying to kill yourself”. As NSSI is characterised by lack of fatal intent, respondents who indicated they engaged in self-injury with intent to kill themselves (e.g. “*I wanted to die*”), or where method of self-injury was ambiguous (e.g. overdose, suffocation), were not classified as engaging in the behaviour ($n = 22$).

Respondents were also asked if they have told anyone of their behaviour, whether they required medical care as a consequence of their NSSI, and the medical severity of the injury. A composite score is calculated from these responses to reflect overall severity of the behaviour (Gutierrez et al., 2001). The SHBQ has excellent internal consistency ($\alpha=.95$), including in adolescent samples (Gutierrez et al., 2001; Muehlenkamp, Cowles, & Gutierrez,

2009). Alphas for the present study were high ($\alpha=.88-.93$), with moderate stability coefficients ($r=.54-.67$).

As we were interested in predictors of first episode NSSI among adolescents we focused on incident NSSI (i.e. NSSI occurring within the period of the study) rather than the continuous measure of severity. Participants were deemed to have engaged in NSSI for the first time if (i) they reported engaging in NSSI either at Time 2 or Time 3, and (ii) their last engagement in NSSI was less than 12 months ago.

The **Emotion Regulation Questionnaire** (Gross & John, 2003) consists of six items measuring cognitive reappraisal (e.g. “I control my emotions by changing the way I think about the situation I’m in”) and four items measuring expressive suppression (e.g. “I control my emotions by not expressing them”). The psychometric properties for the subscales were good to moderate (internal consistency: $\alpha=.79$ for Cognitive Reappraisal and $\alpha=.73$ for Expressive Suppression; test-retest reliability: $r=.69$; Gross & John, 2003). In the present study, the Cognitive Reappraisal subscale showed high internal consistency ($\alpha=.81-.88$), with low to moderate stability coefficients ($r=.39-.50$). The Expressive Suppression subscale showed sound internal consistency ($\alpha=.71-.76$), with low to moderate stability coefficients ($r=.45-.59$).

The **Ruminative Thought Style Questionnaire (RTSQ;** Brinker & Dozois, 2009) is a measure of a global ruminative thinking style. The initial scale showed excellent internal consistency ($\alpha=.87-.92$), and had a high stability coefficient ($r=.80$) (Brinker & Dozois, 2009). Tanner, Voon, Hasking, and Martin (2013) reported the RTSQ comprised four subscales. The first (Problem-focused Thoughts; $\alpha=.87-.89$, $r=.48-.59$) describes repetitive, recurrent and uncontrollable thoughts about current problems without satisfactory resolution, and is reflective of a lack of problem-solving ability. The second subscale (Counterfactual Thinking; $\alpha=.86-.87$, $r=.50-.62$) reflected wishful thinking or a “what if” thinking style

concerned with dwelling on the past and imagined alternatives. The third subscale (Repetitive Thoughts; $\alpha=.88-.90$, $r=.48-.58$), captures the repetitive, uncontrollable and intrusive nature of rumination without reference to thought content; while the fourth subscale (Anticipatory Thoughts; $\alpha=.71-.74$, $r=.36-.47$) refers to thoughts about a future event. These subscales were used in the present study to obtain a more nuanced understanding of how rumination may be implicated in first episode NSSI.

The **Adolescent Life Events Survey (ALES;** Hawton & Rodham, 2006) assesses negative life events adolescents may have experienced (e.g. “Have you had problems keeping up with school work?”). Respondents indicated if they had experienced the listed event and, if so, whether it occurred within the past 12 months or more than a year ago. Higher scores indicated experiencing more negative life events, particularly in the past 12 months. Internal consistency for the measure was consistent across the three waves ($\alpha=.75$). Stability coefficients were moderate to high ($r=.58-.70$).

The **General Health Questionnaire (GHQ;** Goldberg & Williams, 1998) was used to assess psychological distress. Higher scores indicated higher levels of psychological distress experienced “over the past few weeks”. The GHQ has been extensively evaluated and showed solid validity and reliability as a screening tool for depression and anxiety disorders among high school students in Australia (Baksheev, Robinson, Cosgrave, Baker, & Yung, 2011). Internal consistency for the present study was high ($\alpha=.89-.90$), with moderate stability coefficients ($r=.40-.48$).

Procedure

Questionnaire administration was conducted on school grounds during school hours. To ensure privacy, each student was seated at a separate desk. Researchers informed students at commencement of the administration session that the information gathered was confidential and that they could withdraw from the study at any time. Researchers remained present

throughout the administration period to clarify questions. Students took approximately one hour to complete the questionnaires, and received an information pack with printed materials about depression and other mental health issues as well as mental health resources in the community.

To protect confidentiality and yet enable identification in the event responses raised concerns about immediate suicide risk, each student was asked to provide a unique code for themselves which was recorded by students in both their questionnaire booklet and consent form. This limit to confidentiality was clearly outlined in information sheets for students and their parents. Only the consent form contained participants' names and was collected and stored separately from the questionnaire booklet.

Data Analyses

Attrition analyses showed males and older adolescents were more likely to be absent from subsequent data collection. Psychological distress, adverse life events and a history of NSSI at baseline predicted attrition after Time 1. Participants who joined at Time 3 were not significantly different from others who had also participated in previous waves. These analyses indicate data was at least missing at random (MAR). In other words, the probability of missing values on any variable is likely, at the least, to be related to participants' gender and age (for discussion of MAR see Acock, 2012).

Of the 3,143 participants, 45.3% ($n = 1,424$) participated in each wave of the study, and 30.5% ($n = 959$) participated in two waves of the study. Within each wave, missing data for each measure accounted for < 10% of cases (except life events at baseline which accounted for 11.8% of cases). For approximately 1% of cases, after determining coefficient alphas for each scale were sufficiently high ($\alpha > .70$), at least 60% of items had been answered, and factor loadings on scales were sufficiently similar, missing items were substituted with the average of answered items (Acock, 2012).

For missing data, including wave nonresponse and scales where $< 60\%$ of items were answered, we used the Markov Chain Monte Carlo (MCMC) multiple imputation technique (Acock, 2012). This technique imputes missing values based on an imputation model, and subsequent values based on the predictive distribution of the observed values. To strengthen the assumption of MAR, the imputation model included all measures of interest as well as participants' gender and age at each wave of data collection as auxiliary variables (Acock, 2012). As planned analyses required examination of interaction effects, product terms from raw scores (Enders, Baraldi, & Cham, 2014) were also entered into the imputation model (Graham, 2009). We used the MCMC to impute 40 datasets (Graham, Olochowski, & Gilreath, 2007) and results from analysis of the imputed datasets were pooled following Rubin's (1987) approach. Where results between the datasets are similar we report results from imputed data.

We conducted preliminary analyses to examine changes in the use of cognitive reappraisal, expressive suppression and rumination in our sample of adolescents over time. To ensure a similar number of participants within each cell for the ANOVAs, participants were aggregated into three groups based on their ages at Time 1 (12-13 years, $n = 1,235$; 14 years, $n = 975$; ≥ 15 years, $n = 932$). Next, we conducted two logistic regressions with NSSI incidence at Time 2 and Time 3, respectively, as criterion variables. For both these analyses, participants who have never engaged in NSSI were used as the control group. All variables except gender were centred and product terms of centred variables computed post-imputation to examine interaction effects (Enders et al., 2014).

In each of the logistic regressions, Step 1 included participants' gender and age at baseline, as well as reported number of adverse life events and level of psychological distress in the previous 12-months. Scores for cognitive reappraisal, expressive suppression and each subscale of ruminative thinking, in the previous 12-months, were entered in Step 2. Two-way

interactions between adverse life events and psychological distress, and each of the emotion regulation processes of interest were entered at Step 3. To test the impact of age on the above relationships, we next entered two-way interactions between these emotion regulation processes and age (Step 4), followed by three-way interactions (life events x emotion regulation x age, and distress x emotion regulation x age; Step 5).

Results

Descriptive Statistics

Lifetime prevalence of NSSI increased across the three waves (Time 1 = 8.1%, $n = 254$; Time 2 = 9.0%, $n = 283$; Time 3 = 10.1%, $n = 316$). Among participants with NSSI history ($n = 555$), mean age of onset ranged from 12-14 years. The majority (61.0%-68.6%) had engaged in the behaviour in the 12-months prior to data collection. Reported frequency ranged from one to 300 times, with roughly one third of participants (26.4%-36.0%) indicating they engaged in the behaviour once, and an additional third (28.6%-37.0%) reporting at least four times. Cutting (61.8%-70.6%) and hitting (11.1%-19.7%) were the most common forms of NSSI although a range of methods (e.g. pinching/scratching and burning) and multiple methods were reported. One hundred and thirty-seven (137) participants reported engaging in NSSI for the first time during the study period (Time 2 Incidence = 84; Time 3 Incidence = 53).

As reported in Table 6, the distribution of each variable at baseline was similar for complete cases and imputed datasets, and indicates successful imputation. Intercorrelations among predictors at baseline were $< .61$. Given variance inflation factor < 5 , multicollinearity was not of concern (O'Brien, 2007).

Preliminary Analyses

For each ANOVA, assumptions of sphericity were violated and we report results using the Greenhouse-Geisser adjustment. Among all age groups (see Table 7), there were

significant differences in the use of each emotion regulation process across the three waves [cognitive reappraisal, $F(2, 5864) = 72.93, p < .001$; expressive suppression, $F(2, 5978) = 76.15, p < .001$; problem-focused thoughts, $F(2, 6139) = 24.89, p < .001$; counterfactual thinking, $F(2, 6054) = 81.03, p < .001$; repetitive thoughts, $F(2, 6060) = 52.69, p < .001$; anticipatory thoughts, $F(2, 6107) = 13.76, p < .001$]¹³. Scores on cognitive reappraisal tended to decrease with time, while scores on expressive suppression and scores on each facet of ruminative thinking showed an increasing trend. Simple contrasts showed significant differences between scores at Time 1 and Time 3.

In relation to age-related differences in emotion regulation use, there were consistent results between both complete cases and imputed datasets only for the rumination facets of problem-focused, repetitive, and anticipatory thoughts. There were significant age differences for problem-focused ($F(2, 3139) = 4.04, p < .05$) and repetitive ($F(2, 3139) = 10.62, p < .001$) thoughts. Problem-focused thoughts increased with age and significant group differences were found between 12-13 year olds and those aged 15 and above. Repetitive thoughts also increased with age and scores among 12-13 year olds were significantly different from both of the other age groups. Age-related differences on anticipatory thoughts, on the other hand, were nonsignificant.

There were significant age-related differences in use of cognitive reappraisal among the imputed dataset ($F(2, 3139) = 22.24, p < .001$) but not in the complete case analysis. Cognitive reappraisal decreased with age and differences between each age-group were significant. Expressive suppression and counterfactual thinking both showed significant group differences in complete case analyses but not the imputed datasets (expressive suppression, $F(2, 1371) = 4.11, p < .05$; counterfactual thinking, $F(2, 1359) = 5.62, p < .01$).

¹³ The main effect of time was consistent in analyses with complete cases and imputed datasets except for reappraisal where it was not statistically significant ($F(2, 2690) = 1.56, n.s.$) in complete case analysis.

For both of these emotion regulation processes, participants aged 15 years and above had significantly higher scores compared with 12-13 year olds.

Predictors of First Episode NSSI at 12-months from Baseline (Time 2)

At Step 1, being male ($b = 1.24$, $OR = 3.44$, $95\% CI = 1.71 - 6.91$, $p < .01$), and experiencing more adverse life events ($b = .11$, $OR = 1.11$, $95\% CI = 1.06 - 1.17$, $p < .001$) and higher psychological distress ($b = .04$, $OR = 1.04$, $95\% CI = 1.00 - 1.08$, $p < .01$) each increased risk of first episode NSSI. Including scores on the emotion regulation processes of interest in the previous 12-months at Step 2 significantly improved the model ($\chi^2(6) = 14.13$, $p < .05$). Cognitive reappraisal was the only emotion regulation process that was significantly related to NSSI onset, with greater use of cognitive reappraisal reducing risk of first episode NSSI ($b = -.05$, $OR = .96$, $95\% CI = .92 - 1.00$, $p < .05$). Expressive suppression, problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts did not significantly predict first episode NSSI at Time 2. None of the interaction terms were significant.

Predictors of First Episode NSSI at 24-months from Baseline (Time 3)

Findings from analyses with complete cases and imputed datasets were generally consistent and the latter is reported from our examination of first episode NSSI at Time 3 (Table 8, right column). Gender did not emerge as a significant predictor at Step 1; whereas experiencing more adverse life events ($b = .12$, $OR = 1.12$, $95\% CI = 1.07 - 1.18$, $p < .001$), and higher psychological distress ($b = .07$, $OR = 1.07$, $95\% CI = 1.03 - 1.16$, $p < .001$) in the previous 12-months each increased risk of first episode NSSI at Time 3. However, in this instance, frequency of engagement in cognitive reappraisal, expressive suppression and rumination in the previous 12-months were nonsignificant predictors of first episode NSSI at Time 3. While pooled parameter estimates from the imputed datasets suggest the inclusion of

interaction effects significantly improved the model, none of the interactions emerged as significant predictors in subsequent steps.

Discussion

We examined the contribution of cognitive reappraisal, expressive suppression and rumination in first episode NSSI, and in particular the extent to which they moderated the impact of acute life stressors and psychological distress on NSSI onset. We also investigated whether there were age-related differences in how these emotion regulation processes might contribute to risk of NSSI onset. Results showed experiencing more adverse life events and higher psychological distress were robust predictors of first episode NSSI occurring at Time 2 and Time 3. Being male and lower use of cognitive reappraisal contributed to NSSI risk but only in regard to first episode NSSI at Time 2. Frequency of cognitive reappraisal use at baseline predicted first episode NSSI at Time 2; but frequency of use at Time 2 did not predict first episode NSSI at Time 3. Expressive suppression and ruminative thinking were unrelated to first episode NSSI in our sample. While preliminary analyses suggest there were age-related differences in all but anticipatory rumination among adolescents of various age groups (12-13 years, 14 years, and ≥ 15 years), results from the main analyses showed they have no impact on how these emotion regulation processes were related to first episode NSSI.

Findings are consistent with the broad literature which highlights NSSI is one way by which adolescents respond to acute life stress and emotional distress. Our results also showed that increased use of adaptive emotion regulation strategies that reduce negative emotional experience (i.e. cognitive reappraisal) has a modest contribution in reducing risk of future NSSI, whereas use of emotion regulation strategies that tend to enhance negative emotional experience (i.e. expressive suppression and rumination) may have minimal impact on NSSI risk.

The lack of significant results in regard to expressive suppression and rumination is surprising given previous literature on their associations with NSSI. It may be that the current study was unable to capture the contexts in which participants used these emotion regulation processes (i.e. to regulate negative emotion), and therefore obscured their contributions in first episode NSSI. Future research would therefore benefit from focusing on how adolescents respond specifically to negative emotions rather than emotions generally.

Interestingly, we found a different pattern of relationships for gender and cognitive reappraisal in regard to first episode NSSI occurring Time 2 and Time 3. While the reasons for this difference are unclear, we speculate it may be reflective of broader changes in cognitive-emotional processing during adolescence as previously discussed. Specifically, younger adolescents are more prone to inflate anticipated rewards from risky decisions, and have less developed cognitive control over emotionally driven impulses (Albert & Steinberg, 2011; Steinberg, 2005). They are also less skilled in applying logic and reasoning in the context of high emotional arousal, which becomes more evident in later adolescence (approximately 14-17 years old; Zelazo & Carlson, 2012). This may account for the different relationships for cognitive reappraisal as, at Time 2, participants were younger and have greater affective sensitivity in decision-making. Those who are more prone to engage in reappraisal are perhaps more able to reduce affective cues when making risky decisions. By Time 3, however, most of our cohort are likely more proficient in “hot executive function” (i.e. less affected by emotional arousal when making risky decisions), and therefore emotion regulation processes are less likely to make a significant impact over and above adverse life events and distress. Naturally these speculations will require more rigorous testing in future research as the current study did not specifically examine the presence of these changes and their influence on participants’ decisions to engage in NSSI for the first time.

Although the above observations require further research, they do provide some explanation for the different pattern of relationships between Time 2 and Time 3 incidence while the contribution of age remained nonsignificant. Increased affective sensitivity and inflation of the anticipated reward value of risky decisions is linked to puberty rather than chronological age, and has been observed to peak during early adolescence followed by a gradual decline (Albert & Steinberg, 2011; Steinberg, 2005). This could also account for the differential contribution of gender between the two time-points as pubertal onset occurs later for boys than girls (Lenroot et al., 2007). Hence a significant gender difference was found at Time 2; whereas, by Time 3, it is likely these gender differences will have stabilised. These observations ought to be considered alongside findings by Patton and colleagues (2007) which showed the effect of interactions between pubertal stage and sex on self-harm (cf. NSSI) was nonsignificant, and that risk of self-harm was higher at later pubertal stages. Again, the study did not specifically examine the impact of puberty on cognitive-emotional processing and emotion regulation, and further research could therefore be potentially useful in illuminating the underlying dynamics of adolescent NSSI.

Implications

Despite mixed results, the current research does provide useful guidance on early identification and preventive interventions for adolescents. It suggests adolescents experiencing many acute life stressors and high levels of psychological distress are likely to be at-risk of NSSI. As none of the interactions effects tested were statistically significant, findings suggest that regardless of number of acute life stressors, level of psychological distress and age, skilling adolescents in cognitive reappraisal (i.e. how they might interpret events to reduce their emotional salience) is likely to provide some benefit in preventing, or delaying, first time occurrence of NSSI. Importantly, greater use of cognitive reappraisal is likely to have a “one-size-fits-all” effect as it does not ameliorate the effects of adverse life

events and psychological distress on NSSI in the present sample. Moreover, given the nonsignificant relations between expressive suppression and rumination, the current study suggests such interventions are likely to have more utility than interventions aimed at reducing maladaptive emotion regulation. Clearly, further investigations are required given the lack of evidence for effective preventive interventions for NSSI (Ougrin, Tranah, Leigh, Taylor, & Asarnow, 2012).

Limitations

Our recommendations should be considered in light of the predominantly female sample. Further research to replicate findings among a more representative sample is warranted. In our current sample, age of first episode NSSI was generally later than the typical age of onset reported in the literature. We were able to capture NSSI onset primarily from 14 years and above, rather than the 12-14 year range. Future research would benefit from considering a younger sample. Our study also relied on self-reports of adolescents' emotion regulation use and NSSI which limits our findings due to potential reporting inaccuracies and misinterpretation of questions by respondents. Furthermore, reported tendencies on the use of the emotion regulation processes under investigation do not necessarily translate to their actual impact on emotional experience. Other research designs including experimental designs and experience sampling methods are required to enable firmer conclusions.

Conclusion

To our knowledge, this is one of few investigations into factors specifically related to the onset of adolescent NSSI. It is a unique attempt at accounting for developmental influences in emotion regulation. While there were null findings on the effects of age, nonetheless, results hint that underlying cognitive-emotional processes may play a role. Our findings suggest further investigation into interventions aimed at supporting adolescents in

coping with acute life stressors to prevent/delay first episode NSSI is warranted. They also suggest targeted interventions aimed at building capacity in the use of cognitive reappraisal may be promising, particularly for younger adolescents.

References

- Acock, A. (2012). What to do about missing values. In H. Cooper (Ed.), *APA Handbook of Research Methods in Psychology*. Washington, DC: American Psychological Association.
- Albert, A. & Steinberg, L. (2011). Judgement and decision making in adolescence. *Journal of Research on Adolescence*, 21, 211 – 224. doi: 10.1111/j.1532-7795.2010.00724.x
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30, 217 - 237.
- Andrews, T., Martin, G., Hasking, P., & Page, A. (2013). Predictors of continuation and cessation of non-suicidal self-injury. *Journal of Adolescent Health*, 53, 40-46. doi: 10.1016/j.jadohealth.2013.01.009
- Andrews, T., Martin, G., Hasking, P., & Page, A. (*in press*). Predictors of onset for non-suicidal self-injury within a community-based sample of adolescents. *Prevention Science*. doi: 10.1007/s11121-013-0412-8
- Baksheev, G. N., Robinson, J., Cosgrave, E. M., Baker, K., & Yung, A. R. (2011). Validity of the 12-item General Health Questionnaire (GHQ-12) in detecting depressive and anxiety disorders among high school students. *Psychiatry Research*, 187, 291 - 296. doi: 10.1016/j.psychres.2010.10.010
- Betts, J., Gullone, E., & Allen, J. S. (2009). An examination of emotion regulation, temperament, and parenting style as potential predictors of adolescent depression risk status: A correlational study. *British Journal of Developmental Psychology*, 27, 473 - 485. doi: 10.1348/026151008X314900
- Bilsky, S.A., Cole, D.A., Dukewich, T.L., Martin, N.C., Sinclair, K.R., Tran, C.V., Roeder, K.M., Felton, J.W., Tilghman-Osborne, C., Weitlauf, A.S., & Maxwell, M.A. (2013). Does supportive parenting mitigate the longitudinal effects of peer victimization on

- depressive thoughts and symptoms in children? *Journal of Abnormal Psychology*, 122, 406 – 419. doi: 10.1037/a0032501
- Bjärehed, J., & Lundh, L. (2008). Deliberate self-harm in 14-year-old adolescents: How frequent is it, and how is it associated with psychopathology, relationship variables, and styles of emotional regulation? *Cognitive Behaviour Therapy*, 37, 26 - 37.
- Bjärehed, J., Wangby-Lundh, M., & Lundh, L. (2012). Nonsuicidal self-injury in a community sample of adolescents: Subgroups, stability, and associations with psychological difficulties. *Journal of Research on Adolescence*, 22, 678 – 693. doi: 10.1111/j.1532-7795.2012.00817.x
- Boergers, J., & Spirinto, A. (2003). Follow-up studies of child and adolescent suicide attempters. In R.A. King & A. Apter (Eds.), *Suicide in Children and Adolescents*. NY: Cambridge University Press.
- Borrill, J., Fox, P., Flynn, M., & Roger, D. (2009). Students who self-harm: Coping style, rumination and alexithymia. *Counselling Psychology Quarterly*, 22, 361 - 372.
- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, 65, 1 - 19. doi: 10.1002/jclp.20542
- Enders, C. K., Baraldi, A. N., & Cham, H. (2014). Estimating interaction effects with incomplete predictor variables. *Psychological Methods*, 19, 39 – 55. doi: 10.1037/a0035314
- Felton, J.W., Cole, D.A., & Martin, N.C. (2013). Effects of rumination on child and adolescent depressive reactions to a natural disaster: The 2010 Nashville Flood. *Journal of Abnormal Psychology*, 122, 64 – 73. doi: 10.1037/a0029303
- Giedd, J. N. (2008). The teen brain: Insights from neuroimaging. *Journal of Adolescent Health*, 42, 335 – 343. doi: 10.1016/j.jadohealth.2008.01.007

- Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson.
- Graham, J.W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549 – 576. doi: 10.1146/annurev.psych.58.110405.085530
- Graham, J.W., Olchowski, A.E., & Gilreath, T.D. (2007). How many imputations are really needed? Some practical clarification of multiple imputation theory. *Prevention Science*, 8, 206 – 213. doi: 10.1007/s11121-007-0070-9
- Gross, J. J. (1998a). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, 74, 224 – 237.
- Gross, J. J. (1998b). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2, 271 – 299.
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348 - 362. doi: 10.1037/0022-3514.85.2.348
- Gullone, E. & Taffe, J. (2012). The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA): A psychometric evaluation. *Psychological Assessment*, 24, 409 – 417. doi: 10.1037/a0025777
- Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: A 2-year follow-up study. *Journal of Child Psychology and Psychiatry*, 51, 567 - 574. doi: 10.1111/j.1469-7610.2009.02183.x
- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. (2001). Development and initial validation of the Self-Harm Behavior Questionnaire. *Journal of Personality Assessment*, 77(3), 475 - 490. doi: 10.1207/S15327752JPA7703_08

- Hampel, P. & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, 34, 73 – 83. doi: 10.1007/s10964-005-3207-9
- Hamza, C.A., Stewart, S.L., & Willoughby, T. (2012). Examining the link between nonsuicidal self-injury and suicidal behaviour: A review of the literature and an integrated model. *Clinical Psychology Review*, 32, 482 – 495. doi: 10.1016/j.cpr.2012.05.003
- Hasking, P., Momeni, R., Swannell, S., & Chia, S. (2008). The nature and extent of non-suicidal self-injury in a non-clinical sample of young adults. *Archives of Suicide Research*, 12, 208 - 218. doi: 10.1080/13811110802100957
- Hawton, K., & Rodham, K. (2006). *By Their Own Young Hand. Deliberate Self-Harm and Suicidal Ideas in Adolescents*. London: Jessica Kingsley.
- Hilt, L. M., Cha, C. B., & Nolen-Hoeksema, S. (2008). Nonsuicidal self-injury in young adolescent girls: Moderators of the Distress-Function relationship. *Journal of Consulting and Clinical Psychology*, 76, 63 - 71. doi: 10.1037/0022-006X.76.1.63
- Howe-Martin, L. S., Murrell, A. R., & Guarnaccia, C. A. (2012). Repetitive nonsuicidal self-injury as experiential avoidance among a community sample of adolescents. *Journal of Clinical Psychology*, 68(7), 809 - 828. doi: 10.1002/jclp.21868
- Hughes, E. K., Gullone, E., & Watson, S. D. (2011). Emotional functioning in children and adolescents with elevated depressive symptoms. *Journal of Psychopathology and Behavioural Assessment*, 33, 335 - 345. doi: 10.1007/s10862-011-9220-2
- Hughes, E.K., Gullone, E., Dudley, A., & Tonge, B. (2010). A case-control study of emotion regulation and school refusal in children and adolescents. *Journal of Early Adolescence*, 30, 691 – 706. Doi: 10.1177/0272431609341049

- Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behaviour among adolescents: A critical review of the literature. *Archives of Suicide Research, 11*, 129 - 147. doi: 10.1080/13811110701247602
- Jose, P.E., & Brown, I. (2008). When does gender difference in rumination begin? Gender and age differences in the use of rumination by adolescents. *Journal of Youth and Adolescence, 37*, 180 – 192. doi: 10.1007/s10964-006-9166-y
- Klonsky, E. D. (2009). The functions of self-injury in young adults who cut themselves: Clarifying the evidence for affect-regulation. *Psychiatry Research, 166*, 260 - 268. doi: 10.1016/j.psychres.2008.02.008
- Klonsky, E. D., May, A. M., & Glenn, C. R. (2013). The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. *Journal of Abnormal Psychology, 122*, 231 – 237. Doi: 10.1037/a0030278
- Lenroot, R. K., Gogtay, N., Greenstein, D. K., Wells, E. M., Wallace, G. L., Clasen, L. S., Blumenthal, J. D., Lerch, J., Zijdenbos, A. P., Evans, A. C., Thompson, P. A., & Giedd, J. N. (2007). Sexual dimorphism of brain developmental trajectories during childhood and adolescence. *Neuroimage, 36*, 1065 – 1073. doi: 10.1016/j.neuroimage.2007.03.053
- Martin, G., Swannell, S., Harrison, J., Hazell, P., & Taylor, A. (2010). *The Australian National Epidemiological Study of Self-Injury (ANESSI)*. Brisbane, Australia: Centre for Suicide Prevention Studies.
- Muehlenkamp, J. J., Claes, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child and Adolescent Psychiatry and Mental Health, 6*(10), 1 - 9.
- Muehlenkamp, J. J., Cowles, M. L., & Gutierrez, P. M. (2009). Validity of the Self-Harm Behaviour Questionnaire with diverse adolescents. *Journal of Psychopathology and Behavioural Assessment, 32*, 263 - 243. doi: 10.1007/s10862-009-9131-7

- Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, 18(2), 78 - 83.
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behaviour. *Journal of Consulting and Clinical Psychology*, 72, 885 – 890. Doi: 10.1037/0022-006X.72.5.885
- Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviours: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118, 816 - 827. doi: 10.1037/a0016948
- Nock, M.K. (2012). Future directions for the study of suicide and self-injury. *Journal of Clinical Child & Adolescent Psychology*, 41, 255 – 259. doi: 10.1080/15374416.2012.652001
- Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E. E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, 144, 65 - 72. doi: 10.1016/j.psychres.2006.05.010
- O'Brien, R.M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41, 673 – 690. Doi: 10.1007/s11135-006-9018-6
- Ougrin, D., Tranah, T., Leigh, E., Taylor, L., & Asarnow, J. R. (2012). Practitioner review: Self-harm in adolescents. *Journal of Child Psychology and Psychiatry*, 53, 337 – 350. doi: 10.1111/j.1469-7610.2012.02525.x
- Rayner, K.E., Schniering, C.A., Hutchinson, D.M., Rapee, R.M., & Taylor, A. (2013). Adolescent girls' friendship networks, body dissatisfaction, and disordered eating: Examining selection and socialization processes. *Journal of Abnormal Psychology*, 122, 93 – 104. doi: 10.1037/a0029304

- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. doi: 10.1002 / 9780470316696
- Patton, G. C., Hemphill, S. A., Beyers, J. M., Bond. L., Toumbourou, J. W., McMorris, B. J., & Catalano, R. F. (2007). Pubertal stage and deliberate self-harm in adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 46, 508 – 514. doi: 10.1097/chi.0b013e31803065c7
- Selby, E. A., & Joiner, T. E. (2009). Cascades of emotion: The emergence of Borderline Personality Disorder from emotional and behavioural dysregulation. *Review of General Psychology*, 13, 219 - 229. doi: 10.1037/a0015687
- Silvers, J. A., McRae, K., Gabrieli, J. D. E., Gross, J. J., Remy, K. A., & Ochsner, K. N. (2012). Age-related differences in emotional reactivity, regulation and rejection sensitivity in adolescence. *Emotion*, 12, 1235 - 1247. doi: 10.1037/a0028297
- Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*, 9, 69 – 74. doi: 10.1016/j.tics.2004.12.005
- Swannell, S., Martin, G., Page, A., Hasking, P., & St John, N. (2014). Prevalence of non-suicidal self-injury (NSSI) in non-clinical samples; Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior*, 44, 273 – 303.
- Tanner, A., Voon, D., Hasking, P., & Martin, G. (2013). Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire. *Cognitive Therapy and Research*, 37, 633 - 646. doi: 10.1007/s10608-012-9492-1
- Tatnell, R., Kelada, L., Hasking, P., & Martin, G. (2014). Longitudinal analysis of adolescent NSSI: The role of intrapersonal and interpersonal factors. *Journal of Abnormal Child Psychology*, 42, 885 – 896. doi: 10.1007/s10802-013-9837-6

- Voon, D., Hasking, P., & Martin, G. (2014). The roles of emotion regulation and ruminative thinking in non-suicidal self-injury. *British Journal of Clinical Psychology, 53*, 95 – 113. doi: 10.1111/bjc.12030
- Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin, 138*, 775 - 808. doi: 10.1037/a0027600
- Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Abrams, G.B., Barriera, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health, 52*, 486-492.
- Williams, F., & Hasking, P. (2010). Emotion regulation, coping and alcohol use as moderators in the relationship between non-suicidal self-injury and psychological distress. *Prevention Science, 11*, 33 - 41. doi: 10.1007/s11121-009-0147-8
- Zelazo, P.D., & Carlson, S.M. (2012). Hot and cool executive function in childhood and adolescence: Development and Plasticity. *Child Development Perspectives, 6*, 354 – 360. doi: 10.1111/j.1750-8606.2012.00246.x

Table 6

Comparison of mean baseline scores in complete cases and imputed data and interitem correlations at baseline

	Mean (SD)		2.	3.	4.	5.	6.	7.	8.
	<u>Complete</u>	<u>Imputed</u>							
1. Adverse Life Events	28.27 (5.36)	28.21	.42**	-.23	.11	.36**	.28**	2.9**	.14
2. Psychological Distress	22.86 (6.29)	22.80		-.31*	.22	.44**	.30**	.34**	.17
3. Cognitive Reappraisal	28.36 (6.48)	29.55			.15	-.11	.04	.10	.19
4. Expressive Suppression	13.99 (4.98)	14.67				.30**	.21**	.23*	.18
5. Problem-focused Thoughts	17.73 (7.30)	18.02					.58**	.60**	.48**
6. Counterfactual Thinking	18.81 (6.31)	19.04						.61**	.52**
7. Repetitive Thoughts	19.07 (5.72)	19.59							.52**
8. Anticipatory Thoughts	9.70 (2.99)	9.95							-
NSSI Ever	10.2% ^a	10.3%							

* $p < .05$ ** $p < .01$

^a Percentage based on complete cases

Table 7

Mean scores on cognitive reappraisal, expressive suppression, and rumination by time and age-group (complete cases and imputed datasets)^a

	<i>Complete</i>			<i>Imputed</i>		
<i>Cognitive Reappraisal</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>
12-13 years	28.93	29.13	28.34	30.39	29.73	28.50
14 years	28.55	29.04	28.78	29.36	28.58	28.46
≥ 15 years	28.04	28.18	28.37	28.63	27.44	28.46
Time:	$F(2, 2690) = 1.56, n.s.$			$F(2, 5864) = 72.93, p < .001$		
Time x Age:	$F(4, 2690) = 1.84, n.s.$			$F(4, 5864) = 13.63, p < .001$		
Age:	$F(2, 1373) = 1.95, n.s.$			$F(2, 3139) = 22.24, p < .001$		
	<i>Complete</i>			<i>Imputed</i>		
<i>Expressive Suppression</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>

12-13 years	13.66	14.53	15.30	14.75	14.95	15.38
14 years	13.54	15.05	15.40	14.28	14.93	15.35
≥ 15 years	14.59	15.37	15.86	14.97	14.95	15.68

Time: $F(2, 2688) = 69.40, p < .001$ $F(2, 5978) = 76.15, p < .001$

Time x Age: $F(4, 2688) = 1.67, n.s.$ $F(4, 5978) = 2.89, p < .05$

Age: $F(2, 1371) = 4.11, p < .05$ $F(2, 3139) = 2.16, n.s.$

	<i>Complete</i>			<i>Imputed</i>		
<i>Problem-focused Thoughts</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>
12-13 years	16.45	17.44	17.94	17.54	18.17	18.52
14 years	17.62	18.27	18.64	18.14	18.34	18.74
≥ 15 years	18.20	18.83	18.88	18.53	18.47	19.11

Time: $F(2, 2638) = 16.40, p < .001$ $F(2, 6139) = 24.89, p < .001$

Time x Age: $F(4, 2638) = .83, n.s.$ $F(4, 6139) = 1.76, n.s.$

Age: $F(2, 1355) = 6.54, p < .05$ $F(2, 3139) = 4.04, p < .05$

	<i>Complete</i>			<i>Imputed</i>		
<i>Counterfactual Thinking</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>
12-13 years	17.84	19.71	20.67	18.66	20.06	20.25
14 years	18.63	20.11	20.49	18.91	19.97	20.19
≥ 15 years	19.70	20.78	21.04	19.68	20.10	20.34

Time: $F(2, 2603) = 93.58, p < .001$ $F(2, 6054) = 81.03, p < .001$

Time x Age: $F(4, 2603) = 4.41, p < .001$ $F(4, 6054) = 5.13, p < .001$

Age: $F(2, 1359) = 5.62, p < .01$ $F(2, 3139) = 2.49, n.s.$

	<i>Complete</i>			<i>Imputed</i>		
<i>Repetitive Thoughts</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>
12-13 years	17.98	19.60	20.24	19.02	20.03	20.04
14 years	19.42	20.39	21.05	19.88	20.30	20.55

≥ 15 years	20.22	21.53	21.61	20.05	20.42	20.84
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Time:	$F(2, 2642) = 83.64, p < .001$	$F(2, 6060) = 52.69, p < .001$
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Time x Age:	$F(4, 2642) = 2.42, p < .05$	$F(4, 6060) = 2.91, p < .05$
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Age:	$F(2, 1366) = 21.13, p < .001$	$F(2, 3139) = 10.62, p < .001$
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	<i>Complete</i>			<i>Imputed</i>		
<i>Anticipatory Thoughts</i>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>	<u>Time 1</u>	<u>Time 2</u>	<u>Time 3</u>
12-13 years	9.54	9.67	9.80	9.99	9.97	9.89
14 years	9.59	10.01	9.98	9.89	9.90	10.00
≥ 15 years	9.75	10.12	10.17	9.96	9.82	10.10

Time:	$F(2, 2641) = 10.28, p < .001$	$F(2, 6107) = 13.76, p < .001$
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Time x Age:	$F(4, 2641) = .64, n.s.$	$F(4, 6107) = 2.41, n.s.$
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Age:	$F(2, 1341) = 2.75, n.s.$	$F(2, 3139) = .18, n.s.$
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^a Greenhouse-Geisser corrections reported due to violations of sphericity assumptions.

Table 8

Predictors of first episode NSSI at 12- and 24-months from baseline^{a, b}

	12-month incidence			24-month incidence		
	<i>b</i>	<i>OR (95% CI)</i>	$\Delta\chi^2$ step	<i>b</i>	<i>OR (95% CI)</i>	$\Delta\chi^2$ step
Step 1						
Gender	1.24**	3.44 (1.7 – 6.91)		.35	1.42 (.77 – 2.61)	
Age	-.08	.93 (.73 – 1.18)		-.02	.98 (.76 – 1.27)	
Adverse Life Events	.11***	1.11 (1.06 – 1.17)		.12***	1.12 (1.07 – 1.18)	
Psychological Distress	.04*	1.04 (1.00 – 1.08)		.07***	1.07 (1.03 – 1.12)	
Step 2						
			$\chi^2 (6) = 14.13^*$			$\chi^2 (6) = 5.69$
Cognitive Reappraisal	-.05*	.96 (.92 – 1.00)		-.02	.99 (.94 – 1.03)	
Expressive Suppression	.04	1.04 (.99 – 1.10)		.04	1.04 (.98 – 1.10)	
Problem-focused Thoughts	.02	1.02 (.97 – 1.06)		-.01	.99 (.94 – 1.04)	
Counterfactual Thinking	.03	1.03 (.97 – 1.08)		.04	1.04 (.97 – 1.11)	
Repetitive Thoughts	.02	1.02 (.96 – 1.08)		-.00	1.00 (.93 – 1.07)	
Anticipatory Thoughts	-.07	.93 (.84 – 1.04)		.04	1.04 (.92 – 1.18)	
Step 3						
			$\chi^2 (12) = 9.30$			$\chi^2 (12) = 10.38$
Cognitive Reappraisal x Life Events	.01	1.01 (1.00 – 1.01)		.00	1.01 (1.00 – 1.01)	
Expressive Suppression x Life Events	.01	1.01 (1.00 – 1.02)		-.00	1.01 (.99 – 1.01)	

Problem-focused Thoughts x Life Events	.00	1.00 (.99 – 1.01)	-.00	1.00 (.99 – 1.01)
Counterfactual Thinking x Life Events	-.00	1.00 (.99 – 1.01)	-.01	.99 (.97 – 1.00)
Repetitive Thoughts x Life Events	-.00	1.00 (.99 – 1.01)	.01	1.00 (.99 – 1.02)
Anticipatory Thoughts x Life Events	-.02	.99 (.97 – 1.00)	.02	1.02 (.99 – 1.04)
Cognitive Reappraisal x Distress	-.00	1.00 (.99 – 1.00)	-.00	1.00 (.99 – 1.01)
Expressive Suppression x Distress	.00	1.00 (.99 – 1.00)	-.01	1.00 (.99 – 1.00)
Problem-focused Thoughts x Distress	-.00	1.00 (.99 – 1.01)	-.00	1.00 (.99 – 1.01)
Counterfactual Thinking x Distress	-.00	1.00 (.99 – 1.01)	.00	1.00 (.99 – 1.01)
Repetitive Thoughts x Distress	.00	1.00 (.99 – 1.01)	.00	1.00 (.99 – 1.02)
Anticipatory Thoughts x Distress	-.01	1.00 (.99 – 1.02)	.00	1.00 (.99 – 1.02)

Step 4

$\chi^2(6) = 9.74$

$\chi^2(6) = 13.62^*$

Cognitive Reappraisal x Age	.01	1.01 (.98 – 1.05)	-.02	.98 (.93 – 1.03)
Expressive Suppression x Age	.04	1.04 (.99 – 1.10)	-.02	.98 (.92 – 1.04)
Problem-focused Thoughts x Age	-.00	1.00 (.95 – 1.05)	.03	1.03 (.97 – 1.09)
Counterfactual Thinking x Age	.03	1.03 (.97 – 1.09)	-.07	.93 (.86 – 1.00)
Repetitive Thoughts x Age	.02	1.02 (.96 – 1.08)	-.02	.98 (.90 – 1.07)
Anticipatory Thoughts x Age	-.04	.96 (.86 – 1.07)	-.01	.99 (.86 – 1.14)

Step 5

$\chi^2(12) = 17.36$

$\chi^2(12) = 22.63^*$

Cognitive Reappraisal x Life Events x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Expressive Suppression x Life Events x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)

Problem-focused Thoughts x Life Events x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Counterfactual Thinking x Life Events x Age	.00	1.00 (.99 – 1.00)	-.00	1.00 (.99 – 1.00)
Repetitive Thoughts x Life Events x Age	-.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Anticipatory Thoughts x Life Events x Age	-.00	1.00 (.99 – 1.01)	.00	1.00 (.99 – 1.01)
Cognitive Reappraisal x Distress x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Expressive Suppression x Distress x Age	-.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Problem-focused Thoughts x Distress x Age	.00	1.00 (.99 – 1.00)	-.00	1.00 (.99 – 1.00)
Counterfactual Thinking x Distress x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Repetitive Thoughts x Distress x Age	.00	1.00 (.99 – 1.00)	.00	1.00 (.99 – 1.00)
Anticipatory Thoughts x Distress x Age	.00	1.00 (.99 – 1.01)	.00	1.00 (.99 – 1.01)

* $p < .05$; ** $p < .01$; *** $p < .001$

^a Similar patterns found in complete case analysis. Findings from analyses with imputed datasets reported.

^b For each of the logistic regressions reported (i.e. 12- and 24-month incidence), the predictor variable refers to scores from the preceding 12-months. Hence, for 12-month incidence (i.e. Time 2 incidence), predictor variable scores were at Time 1 (i.e. baseline); for 24-month incidence (i.e. Time 3 incidence), predictor variable scores were at Time 2.

Declaration for Thesis Chapter Seven

Declaration by candidate

In the case of Chapter Seven, the nature and extent of my contribution to the work was the following:

Nature of contribution	Extent of contribution (%)
Generation of ideas, data analysis and write up	80%

The following co-authors contributed to the work. If co-authors are students at Monash University, the extent of their contribution in percentage terms must be stated:

Name	Nature of contribution	Extent of contribution (%) for student co-authors only
Associate Professor Penelope Hasking	Critical revision of manuscript	n/a
Professor Graham Martin OAM	Critical revision of manuscript	n/a

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the candidate's and co-authors' contributions to this work.

Candidate's Signature

	Date 25/07/2014
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Main Supervisor's Signature

	Date 25/07/2014
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CHAPTER SEVEN

CHANGE IN EMOTION REGULATION AND THE IMPACT ON CHANGE IN NSSI

SEVERITY OVER TIME

The picture emerging thus far indicates NSSI is related to experience of many stressful situations and life events, and to a lesser extent, high psychological distress. While the emotion regulation processes of interest may be relevant in distinguishing self-injurers from non-self-injurers, less use of cognitive reappraisal was related to future onset of NSSI over and above the presence of acute life stressors and distress. However, the protective effect of reappraisal in first episode NSSI was restricted to younger adolescents, which highlights the difference a year makes in the transition from Time 2 (Mean age = 14.9 years, SD = .96) to Time 3 (Mean age = 15.8 years, SD = .96). Whether a tendency to use cognitive reappraisal is also protective in regard to NSSI severity remains to be seen. Certainly, in Study 1, results suggest that less use of reappraisal was related to increased severity of NSSI as reflected in the composite SHBQ score. However, previous researchers have noted that findings from cross-sectional studies do not always translate longitudinally (see Andrews et al., *in press*; Glenn & Klonsky, 2011), particularly when previous NSSI is taken into account.

Thus, rather than examining whether cognitive reappraisal, expressive suppression and rumination predicted future NSSI severity, the study reported in this chapter takes a relatively more dynamic view and focuses on the notion of change. Specifically, it examined whether changes in the emotion regulation processes of interest contributed to changes in NSSI severity. Such a perspective is arguably more useful as most interventions are geared toward increasing adaptive emotion regulation

as discussed in Chapter 2. Further, by focusing on changes in emotion regulation use and NSSI over time, such an approach implicitly takes into account the developmental changes occurring during adolescence. As will be seen, the models tested in Study 3 included age as a covariate, as well as accounting for the relationship between age and emotion regulation. However, due to limitations in sample size, it was not possible to test for interaction effects between these variables and their impact on NSSI severity. Therefore, the study did not purport to investigate age-related differences specifically. However, in the interest of completeness, post hoc analyses were undertaken among three groups of adolescents (12-13 year olds, 14 year olds, > 15 year olds) to determine if significant pathways could be replicated. These results are reported and discussed following the article below.

The analyses reported in the following study were slightly different from the previous two studies. Of note, following helpful feedback from anonymous reviewers, suicide history was included as a control variable. Analyses were also undertaken on each domain of the composite NSSI severity score (i.e. frequency, duration, medical seriousness) at the request of reviewers. The manuscript of the following paper is reproduced below.

Article:

Voon, D., Hasking, P., & Martin, G. (*in press*). Change in emotion regulation strategy use and its impact on adolescent non-suicidal self-injury: A three-year longitudinal analysis using latent growth modelling. *Journal of Abnormal Psychology*. Five-year impact factor = 5.92.

**Change in emotion regulation strategy use and its impact on adolescent non-suicidal
self-injury: A three-year¹⁴ longitudinal analysis using latent growth modelling**

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¹⁴ AUTHOR'S NOTE: The title of this paper is a misnomer and refers to the three years of the research commencing in 2010 and concluding in 2012. References to the time period within the paper should properly refer to the three time-points which constituted the research, and that data reflected changes in emotion regulation and NSSI severity over two years.

Abstract

This longitudinal study examines the extent to which changes in the use of cognitive reappraisal, expressive suppression, and rumination impact on frequency, duration, and medical severity of non-suicidal self-injury (NSSI) among adolescents. Data from 3,143 predominantly female high school students recruited from 41 Australian secondary schools, were analysed using latent growth curve modelling. Significant differences in the psychological factors, between the 555 participants with a history of NSSI, and non-self-injurers, were reported at baseline. Self-injurers experienced significantly greater accumulation of life stressors over time compared with non-self-injurers. After controlling for adverse life events, psychological distress and other emotion regulation strategies, use of cognitive reappraisal at baseline was associated with less severe NSSI presentations, and slower growth in medical severity of NSSI over time. Findings indicate that while both cohorts have similar emotion regulation trajectories, adolescents who self-injure start off at a disadvantage and have a propensity to engage in less helpful processes that tend to heighten negative emotional states. Results recommend increasing focus on improving adolescents' frequency and skills in use of cognitive reappraisal in efforts to reduce NSSI among this population.

Keywords: Non-suicidal self-injury, rumination, emotion regulation, longitudinal

Non-suicidal self-injury (NSSI) is deliberately causing damage to the body in the absence of intent to die (Nock, 2009). Typically, it first occurs during adolescence (Hankin & Abela, 2011; Jacobson & Gould, 2007; Nock, 2009) and may persist into adulthood (Martin, Swannell, Harrison, Hazell, & Taylor, 2010). International estimates suggest prevalence rates from 12.5% - 23.6% among adolescents, which have remained unchanged for the past decade (Muehlenkamp, Claes, & Plener, 2012; Swannell, Martin, Page, Hasking & St John, 2014). The intense negative reactions evoked in others, and the shame, guilt and remorse experienced by individuals who self-injure may disrupt personal relationships and potentially contribute to deleterious consequences for psychological health and well-being (Bjärehed & Lundh, 2008; Gratz, 2003; Martin et al., 2010). NSSI is a risk factor for suicide (Andover, Morris, Wren, & Bruzzese, 2012; Guan, Fox, & Prinstein, 2012; Klonsky, May, & Glenn, 2013; Whitlock et al., 2013), and suicide risk increases with longer histories of self-injury (Howe-Martin, Murrell, & Guarnaccia, 2012; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Given the potential severity of NSSI and the adverse consequences it is now included in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.) as a condition worthy of further research (American Psychiatric Association, 2013). Yet, adolescent NSSI remains poorly understood, and further research in this area is required to inform the development of prevention, early intervention, and treatment programs.

NSSI and emotional distress

Functional accounts of NSSI (see Klonsky, 2009; Nock, Prinstein, & Sterba, 2009) converge with the coping literature (see Borrill, Fox, Flynn, & Roger, 2009; Williams & Hasking, 2010) and emphasise that, rather than a general deficit in coping skills, NSSI is specifically related to coping with emotional distress. Individuals with a history of NSSI tend to experience more frequent and negative emotion (Fliege, Lee, Grimm, & Klapp, 2009; Klonsky & Muehlenkamp, 2007), are more likely to experience their emotions as

overwhelming and uncontrollable (Horne & Csipke, 2009), and are more likely to report psychological distress (Hasking, Momeni, Swannell, & Chia, 2008). Importantly, individuals who have engaged in numerous episodes of NSSI report feeling more soothed, relieved and calmer after a self-injury episode (Gordon et al., 2010; Kakhnovets et al., 2010); emphasising the reinforcing properties of the behaviour. How individuals regulate their emotions is therefore pertinent in the study of NSSI.

Cognitive reappraisal, expressive suppression, and rumination in emotion regulation

Emotion regulation refers to a set of responses involved in initiating, maintaining and modifying the occurrence, intensity, duration and expression of emotions (Gross, 1999). Gross' process model of emotion regulation posits that emotional responses are elicited when individuals attend to features of a person-situation transaction and ascribe personal meanings to these features. An emotional response comprises physiological, experiential and/or behavioural components and may be modulated to determine the final (outward) shape of the emotional response. Emotion regulation processes may, therefore, be antecedent-focused (before an emotional response is elicited) or response-focused (after the emotional response has registered).

Cognitive reappraisal and expressive suppression are two processes which have been operationalised within Gross' model (Gross & John, 2003; Gullone, Hughes, King, & Tonge, 2010). Cognitive reappraisal is an antecedent-focused strategy aimed at reducing the emotional salience of a situation through cognitive change (e.g. interpreting a friend's nonresponse to a greeting as slight vs that s/he did not hear you). On the other hand, expressive suppression is a response-focused strategy involving the inhibition of emotional expression (e.g. smiling and stating it is fine when a friend declines an invitation instead of expressing disappointment). Cognitive reappraisal has a more positive impact on affective, cognitive and social domains compared with expressive suppression (John & Gross, 2004).

Among adolescents, a preference for expressive suppression over cognitive reappraisal distinguishes individuals with depressive symptomatology from nonclinical matched controls (Betts, Gullone, & Allen, 2009; Hughes, Gullone, & Watson, 2011).

Previous research found cognitive reappraisal was negatively correlated with NSSI, and expressive suppression positively correlated among adolescents (Hasking et al., 2010; Voon, Hasking, & Martin, 2014), and young adults aged 18-30 years (Williams & Hasking, 2010). Martin et al. (2010) reported self-injuring individuals, aged 10 years and above, were 3.3 times more likely than non-injurers to report difficulty using cognitive reappraisal as an emotion regulation strategy, but reported no differences in the use of expressive suppression. Conversely, Hasking et al. (2008) reported significant group differences according to NSSI history among 18-30 year olds on expressive suppression but not cognitive reappraisal. These discrepant findings may be due to different criteria under investigation, Hasking et al. (2008) investigating NSSI severity, Martin et al. (2010) focusing on NSSI history. Different processes may be implicated for risk of initial engagement in NSSI versus escalation (Andrews, Martin, Hasking, & Page, 2013; Andrews, Martin, Hasking, & Page, *in press*).

A third emotion regulation process is rumination (Aldao, Nolen-Hoeksema, & Schweitzer, 2010), “a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms” (Nolen-Hoeksema, Wisco, & Lyubormirsky, 2008; p. 400). Regarding the previous example, rumination might involve persistently dwelling on the fact that a friend had declined an invitation, wondering why s/he has done so and questioning the implications for the friendship. Rumination is increasingly recognised and researched as a critical risk factor in a range of negative psychological outcomes including psychopathology (see Aldao et al., 2010). Selby and Joiner (2009) theorised that individuals engage in dysregulated behaviours, such as NSSI, as a means to escape from intense emotions generated through a

cycle of rumination. Within their Emotional Cascades Model ruminating on negative affect generates “emotional cascades”; even minute emotional stimuli become amplified over time, particularly when the cycle of rumination lasts for an extended length of time. Thus, some upsetting events may trigger NSSI while others do not depending on how much individuals ruminate on these events.

Among adults, a higher dispositional tendency to ruminate confers increased susceptibility to NSSI (Armey & Crowther, 2000), and is a significant independent predictor of NSSI in contrast to avoidant and emotion-focused coping styles (Borrill et al., 2009). Selby, Connell, and Joiner (2010) reported that individuals experiencing more painful and provocative life events and also having greater ruminative dispositions, were more likely to self-injure compared with those less prone to engage in rumination. The few studies with adolescent samples also indicate strong associations with NSSI (Hilt, Cha, & Nolen-Hoeksema, 2008). Of note is the predictive value of rumination on NSSI at both baseline and prospectively after two months (Bjärehed & Lundh, 2008).

Increasingly, rumination has been conceptualised as a multifaceted and multidimensional construct (see Tanner, Voon, Hasking, & Martin, 2013). Hoff and Muehlenkamp (2009) found that undergraduate self-injurers scored significantly higher on two aspects of rumination (brooding and reflection) compared with controls, although only reflection predicted NSSI. More recently, Voon et al. (2014), using subscales of a measure of general ruminative thinking style (see Tanner et al., 2013), reported differential contributions among facets of ruminative thinking in adolescent NSSI; engaging in comparisons of one’s present with what one had hoped it would be (i.e. counterfactual rumination) and thinking persistently in anticipation of an upcoming event/situation (i.e. anticipatory rumination) were each related to NSSI, whereas repetitive thinking and problem-focused thoughts were not. While anticipatory rumination might be conceptually similar to worry, it might also involve

repetitively thinking about positive future events (e.g., When I am looking forward to an event, thoughts of it interfere with what I am working on). As such the underlying mechanism relating this facet of rumination to NSSI is unclear. However, incorporating these facets of ruminative thinking allows for a more nuanced understanding of the role of rumination in NSSI.

Study aims and hypotheses

Despite the extent of research, few studies have examined these emotion regulation processes in adolescent NSSI. In addition, the majority of studies are cross-sectional which limits understanding of the trajectory of NSSI and its covariates. Adolescence represents a period of transition accompanied by changes in emotion regulation; with increasing use of cognitive compared with behavioural strategies (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). Emotion regulation also becomes more sophisticated and differentiated with time (Zeman et al., 2006), and a range of strategies may be deployed in varying circumstances and for different purposes (Lougheed & Hollenstein, 2012).

Gullone et al. (2010) reported use of cognitive reappraisal over a two year period among 9-15 year olds was largely stable, but expressive suppression exhibited a decreasing linear trend, with older adolescents reporting lower use of the emotion regulation strategies at baseline. Similarly, Gullone and Taffe (2012) reported 10-12 year olds had the highest mean scores in use of cognitive reappraisal, followed by 16-18 year olds, and 13-15 year olds had the lowest mean scores among the three groups. On the other hand, rumination increases with age among adolescent cohorts (Hampel & Petermann, 2005; Jose & Brown, 2008). Together, these studies suggest systematic changes in these emotion regulation processes occur across adolescence. Attempts to understand NSSI during adolescence must therefore take these developmental changes into account.

The current study aimed to investigate the impact of cognitive reappraisal, expressive suppression, and rumination on NSSI over time. Specifically, it examined the extent to which the use of these emotion regulation strategies contributed to a concomitant change in severity (frequency, duration, and medical severity) of NSSI among a cohort of adolescents with a history of the behaviour. Based on the above studies, we assumed systematic change in emotion regulation, and expected decreasing use of cognitive reappraisal and increasing use of expressive suppression and rumination to regulate emotions would be related to increased NSSI severity over time.

Method

Recruitment and Sample

With ethical approval from universities and education jurisdictions controlling access to participants, schools in five Australian state/territories were contacted to participate in a broader study on how adolescents coped with emotional problems. While both single-sex and co-educational schools were initially approached with the aim of obtaining an even gender distribution, of the 41 schools which agreed to participate, there were more all-girl schools than all-boy schools (all-girl schools = 11; all-boy schools = 4; co-educational schools = 26). Because of this, females were over-represented in the sample, as were metropolitan areas and areas of higher socio-economic status (SES; Australian Bureau of Statistics, ABS, 2013a). Most participants were born in Australia (89.2%) and 2.5% identified as Aboriginal, Torres Strait Islander or both (national figures: 75% born in Australia; 3% Indigenous; ABS, 2013b).

For most Australian jurisdictions, high school begins at Grade 7 (approx. 12-13 years old), although some states (e.g. Queensland and South Australia) commence high school at Grade 8 (approx. 13-14 years). In all cases, most students remain in high school until Grade 12 when they are approximately 17-18 years. Explanatory statements and consent forms were distributed to 14,841 parents/guardians of students in Grades 7-11 enrolled in participating

schools; 3,117 provided parental consent. Of students with parental consent, 2,639 students were present during data collection and provided consent at baseline (463 were not present on the day of questionnaire administration; the remainder declined participation). A further 507 students completed questionnaires for the first time in subsequent waves which were undertaken at 12- and 24-months from baseline (355 at Time 2 and 152 at Time 3). Two students at baseline were excluded as they were > 18 years old; yielding a total sample of 3,143 participants who completed questionnaires at least once across the three waves (Time 1, $n = 2,637$; Time 2, $n = 2,328$; Time 3, $n = 1,984$).

Our overall participation rate (21.0%) was lower than recent studies using school-based recruitment, although overall consent rate (76.3%) was comparable to these (49.5%-78.0%; Bilsky et al., 2013; Felton, Cole, & Martin, 2013; Rayner, Schniering, Hutchinson, Rapee, & Taylor, 2013). Of students joining the study for the first time at Time 1 and Time 2 ($n = 2,991$), 20.3% did not participate in subsequent study waves. Our overall retention rate (approx. 80%) is comparable to similar school-based longitudinal studies (78.0%-95%; Allen, Manning, & Meyer, 2010; Bilsky et al., 2013; LaGrange et al., 2011; Rayner et al., 2013). Reasons for attrition included transfer to another school (Time 2 $n = 107$; Time 3 $n = 237$), school withdrew from the study (Time 2 only $n = 129$), student withdrew from the study (Time 2 $n = 25$; Time 3 $n = 32$), deceased (Time 2 only $n = 1$), or not present at questionnaire administration (Time 2 $n = 471$; Time 3 $n = 529$). For the remainder, reason for attrition was not recorded.

Mean age of participants at each wave was 13.9 years ($SD = .99$), 14.9 years ($SD = .96$), and 15.8 years ($SD = .96$) respectively. The majority of participants at each wave were female (Time 1 = 68%, Time 2 = 70.7%, Time 3 = 71.2%). Lifetime prevalence of NSSI increased across the three waves, from 8.1% reporting NSSI at baseline to 10.1% at Time 3. Across the three waves, 555 participants reported a history of NSSI (75.7% female).

Common methods of self-injury were cutting and hitting oneself. Forty-three (7.8%) participants who ever engaged in NSSI reported at least one past suicide incident (cf. 0.4% among non-self-injurers). In the majority of these cases ($n = 35$), suicide incidents occurred prior to the commencement of the study.

Measures

The **Adolescent Life Events Survey (ALES;** Hawton & Rodham, 2006) is a 20-item survey assessing negative life events (e.g. “Have you had problems keeping up with school work?”, “Have you or any member of your family had a serious illness or accident?”). Respondents endorsed the life event, and whether it occurred within the past 12 months or more than a year ago. Incidents over 12 months prior were included in the total score to account for any residual effects on participants’ current psychological state. Scores on all items were summed, higher scores indicating more negative life events, particularly in the past 12 months. Reliability for the measure was consistent across the three waves ($\alpha=.75$). Stability coefficients were moderate to high ($r=.58-.70$).

The **Emotion Regulation Questionnaire (ERQ;** Gross & John, 2003) is a 10-item measure designed to tap into antecedent- and response-focused emotion regulation. It includes positive (e.g. “When I want to feel more positive emotion, I change the way I’m thinking about the situation”) and negative items (e.g. “When I want to feel less negative emotion, I change the way I’m thinking about the situation”). Respondents scored on a 7-point Likert scale (1 = “strongly disagree”; 7 = “strongly agree”). Internal consistency for the two scales was good to moderate ($\alpha=.79$ for Cognitive Reappraisal and $\alpha=.73$ for Expressive Suppression) with good test-retest reliability ($r=.69$; Gross & John, 2003). In the present study, the Cognitive Reappraisal subscale showed high reliability ($\alpha=.81-.88$) while reliability for the Expressive Suppression subscale was sound ($\alpha=.71-.76$). Stability coefficients were low to moderate (Cognitive Reappraisal, $r=.39-.50$; Expressive Suppression, $r=.45-.59$).

The **General Health Questionnaire (GHQ-12;** Goldberg & Williams, 1998) is a 12-item measure used to assess psychological distress. Questions are positively (e.g. “Been feeling reasonably happy all things considered”) and negatively phrased (e.g. “Been feeling unhappy and depressed”), with an equal distribution across both valence. Higher scores indicated higher levels of distress experienced “over the past few weeks”. The GHQ-12 has been extensively evaluated, having solid validity and reliability as a screening tool for depression and anxiety disorders among high school students in Australia (Baksheev, Robinson, Cosgrave, Baker, & Yung, 2011; Tait, French, & Hulse, 2003). Given the factor structure and psychometric properties of the GHQ-12, and its high correlation with depression, anxiety and negative affectivity, a separate index of depressive symptoms was not used in this study. Alphas for the present study were high ($\alpha=.89-.90$), with moderate stability coefficients ($r=.40-.48$).

The **Ruminative Thought Style Questionnaire (RTSQ;** Brinker & Dozois, 2009) is a 20-item measure of a global ruminative thinking style. Items were designed to tap into repetitive, recurrent, uncontrollable and intrusive thinking that characterises rumination (e.g. “I find that my mind often goes over things again and again”, and “I find that some thoughts come into my mind over and over again throughout the day”). Respondents rated how well each of the items described them on a 7-point scale (1 = “not at all”; 7 = “very well”), and scores were summed, higher scores indicating a greater tendency to ruminate. The initial scale showed excellent internal consistency ($\alpha=.87-.92$), test-retest reliability ($r=.80$), and convergent and divergent validity (Brinker & Dozois, 2009). The RTSQ was preferred to other measures of rumination because its questions are not predicated on being in a sad mood and therefore indexes a more general thinking style (see Brinker & Dozois, 2009).

All four subscales of the RTSQ identified by Tanner et al. (2013) were used. The first subscale (Problem-focused Thoughts; $\alpha=.87-.89$, $r=.48-.59$) describes repetitive, recurrent

and uncontrollable thoughts about current problems without satisfactory resolution, and is reflective of a lack of problem-solving ability (similar to the reflection aspect of rumination identified in previous research). The second subscale (Counterfactual Thinking; $\alpha=.86-.87$, $r=.50-.62$) reflected wishful thinking or a “what if” thinking style concerned with imagined alternatives to reality (analogous to brooding). Repetitive Thoughts, the third subscale ($\alpha=.88-.90$, $r=.48-.58$), captures the repetitive, uncontrollable and intrusive nature of rumination without reference to thought content; while the fourth subscale (Anticipatory Thoughts; $\alpha=.71-.74$, $r=.36-.47$) refers to thoughts about a future event. Factor correlations were moderate and ranged from .47-.60, suggesting independent factors are assessed with no multicollinearity (Tanner et al., 2013).

The **Self-Harm Behaviour Questionnaire-Part A (SHBQ-A;** Gutierrez, Osman, Barrios, & Kopper, 2001) was used for this study as it focuses specifically on NSSI. NSSI was defined for participants as hurting themselves on purpose without trying to kill themselves. Participants were asked if they had ever engaged in self-injurious behaviours, and the nature of the behaviour (i.e. “what did you do?” and “why do you think you hurt yourself on purpose?”), its frequency and duration, disclosure of the behaviour, whether they required medical care following their behaviour, and the medical severity of the injury. To further ensure episodes of NSSI met our definition as non-suicidal, methods where intent was ambiguous (e.g. overdose, purging, suffocation) and/or where stated reasons indicated or suggested fatal intent (e.g. “*I wanted to die*”, “*I wanted to kill myself*”, “*I don’t deserve to be here*”, “*Didn’t want to be here anymore*”) were excluded from analyses¹⁵. The composite NSSI score reflects overall severity of the behaviour (see Gutierrez et al., 2001). The structure of the SHBQ was validated among adolescents; and Part A had excellent reliability

¹⁵ We acknowledge that these methods may reflect non-suicidal self-injury, but without directly interviewing participants we could not determine intent with 100% certainty. Fewer than 1% of cases were excluded as a result of this screening, suggesting the majority of participants clearly understood our definition of self-injury as non-suicidal in intent.

($\alpha=.96$) and convergent validity (Muehlenkamp, Cowles, & Gutierrez, 2009). Alphas for the present study were high ($\alpha=.88-.93$), with moderate stability coefficients ($r=.54-.67$). In addition, students were asked whether they had ever tried to end their life as an indicator of previous suicide attempt.

Procedure

Students with parental/guardian consent attended questionnaire administration scheduled during school hours on school grounds. At the commencement of questionnaire administration, students were informed they could withdraw at any time. To protect confidentiality and yet enable identification in the event responses raised concerns about immediate risk, a unique code was derived for each participant. The questionnaire took approximately one hour to complete, and researchers were present to clarify questions throughout that time. On completion, participants received an information pack with printed materials about mental health issues, as well as mental health resources in the community. The same procedure was used at Time 2 and Time 3. Data collected at each wave were matched according to participants' unique code.

Data Analysis

Missing data included both item nonresponse (i.e. data missing for variables within waves) and wave nonresponse (i.e. data missing due to dropout or absence from scheduled questionnaire administration; Jelicic, Phelps & Lerner, 2010). In regard to item nonresponse, for scales with at least 60% completed items, missing items were substituted with the average of answered items (Acock, 2012). Item nonresponse patterns within each wave accounted for < 5% of cases.

Of the full sample, 45.3% ($n = 1,424$) participated in all three waves of the study. An additional 30.5% ($n = 959$) participated in two waves, while the remaining 24.2% ($n = 760$) participated in only one wave. Males and older adolescents were more likely to be absent

from data collection at subsequent time points. Psychological distress, more adverse life events, and history of NSSI recorded at Time 1 also predicted attrition. Participants who joined the study at Time 3 did not significantly differ from others who had participated in previous waves.

Little's test indicated data was not missing completely at random (MCAR; $\chi^2 (5869) = 6100.12, p < .05$). However, attrition analyses suggest data was at least missing at random (MAR; Acock, 2012; Graham, 2009; Jellicic et al., 2010). To account for missing data, full information maximum likelihood (FIML) was used in analyses (Acock, 2012; Graham, 2009; Jellicic et al., 2010).

We pursued our investigation through latent growth curve (LGC) analyses using structural equation modelling. Univariate LGCs were plotted for each variable of interest for self-injuring participants and for participants who never engaged in NSSI in order to record change in each variable over time. The intercepts and slopes represent trajectories of the variables of interest. The intercept is the starting level of the curve, and the slope indicates the functional form of the trajectory (i.e. linear vs nonlinear). For each curve, a constrained linear curve (slope coefficients were set to 0, 1 and 2) and an unspecified curve (where the final slope coefficient was unconstrained) were compared (Curran & Hussong, 2003; Duncan & Duncan, 2004; Hox & Stoel, 2005).

Next, we used LGC analyses to explore the relationships between each variable of interest and NSSI, among the group who self-injured. Gender, age, suicide history, psychological distress¹⁶, and adverse life events were included as control variables. Additionally, we controlled for concurrent and prospective associations among the emotion

¹⁶ As the GHQ assesses psychological distress over the last few weeks we do not intend to make inferences about the temporal relationship between psychological distress and NSSI. Rather, we aimed to control general psychological distress.

regulation processes¹⁷. We also performed bivariate LGC analyses on the subscales of the SHBQ-A. Thus, we analysed the impact of changes in emotion regulation processes on the frequency, duration, and medical severity of NSSI.

For all analyses, in addition to the Chi-square goodness-of-fit test, the Comparative Fit Index (CFI) and Gamma hat ($\hat{\gamma}$) with cut-off scores of $>.95$, and the Root-Mean-Square Error Approximation (RMSEA) with cut-off score of $<.06$ were used (Hu & Bentler, 1999). The CFI was considered as it is a common model fit index used in structural equation modelling; however, Fan and Sivo (2007) suggest it is less reliable than absolute fit indices such as Gamma hat. While the RMSEA is also a common index to assess model fit, it is sensitive to model complexity (i.e. number of variables in the model; for discussion see Fan & Sivo, 2007; Heene, Hilbert, Draxler, Ziegler, & Buhner, 2011). Gamma hat appeared to be less affected by model size (Fan & Sivo, 2007), and was therefore included to further assist with assessing model fit. Given the number of analyses statistical significance was evaluated at $p < .01$. Finally, we undertook a robustness test by comparing results from the full dataset with a subsample of participants who were present at the three study waves.

Results

Comparison of participants with and without a history of NSSI

Means and standard deviations of the variables of interest are reported in Table 9 and correlations are shown in Table 10. Participants with a history of NSSI tend to have higher scores on all variables compared with their non-self-injuring peers, except for cognitive reappraisal where they had lower scores. Patterns of correlations at each time point were

¹⁷ In an effort to further define the inter-relationships among emotion regulation variables, we also explored multivariate LGC analyses which included growth curves from all variables of interest, and latent difference score and auto-regressive cross-lagged approaches (McArdle, 2009; for latent difference score applications see Littlefield, Verges, Wood, & Sher, 2012; applications of auto-regressive cross-lagged approaches see Pearson, Combs, Zapolski, & Smith, 2012). However, the relatively small sample of self-injurers did not provide sufficient power to adequately fit these complex multivariate models. We therefore report on our initial main effects analyses.

similar, with low correlations among most variables. As expected, correlations among the facets of rumination were higher although in the moderate range. The low correlations suggest no multicollinearity (Tabachnick & Fidell, 2007). Comparisons between groups showed the non-NSSI group had more intercorrelations among cognitive emotion regulation processes (i.e. cognitive reappraisal and all aspects of ruminative thinking) which may indicate better integration of these strategies compared with the NSSI group.

In general, fit indices were better for the unconstrained univariate LGCs for self-injurers except for psychological distress, anticipatory thoughts, and NSSI which showed non-significant results on the Chi-square difference test (see Table 11). For non-self-injurers, on the other hand, neither model was superior for cognitive reappraisal, psychological distress or life events. A constrained linear model for anticipatory thoughts had a significantly better fit compared to the unconstrained model.

Comparing intercepts and slopes from the univariate LGCs (see Table 12), self-injurers scored significantly higher on all measures at Time 1 except cognitive reappraisal where they had significantly lower intercepts. Both groups showed significant increases over time on adverse life events, expressive suppression, counterfactual thinking and repetitive thoughts. Cognitive reappraisal and anticipatory thoughts remained stable for both groups. Non-self-injurers also reported increases in psychological distress and problem-focused thoughts (although not significantly different from self-injurers). Those who self-injured additionally reported increases in overall severity of NSSI ($b = 1.11, p < .001$). Examination of the slope coefficients indicated self-injurers had an elevated increase in acute life stressors over time compared with their non-NSSI peers (NSSI group: $ALES_{slope} = 1.45, p < .001$; nonNSSI group: $ALES_{slope} = .77, p < .001$; $t(3141) = 2.62, p < .01$).

Of note is that level of psychological distress experienced over time was not significantly different across groups. While not reaching statistical significance, the direction

of change of cognitive reappraisal is also noteworthy. Among the NSSI subsample, cognitive reappraisal showed a decreasing trajectory over time. Conversely, it showed an increasing trend for participants with no NSSI history (NSSI group: Cognitive Reappraisal_{slope} = $-.26$, *ns*; nonNSSI group: Cognitive Reappraisal_{slope} = $.24$, *ns*).

Results from analyses with a subsample who participated in all study waves were similar. While participants without a history of NSSI also had nonsignificant change in regard to psychological distress, the difference between the groups remained nonsignificant.

The impact of changes in emotion regulation processes on changes in NSSI

Fit indices for models predicting the global NSSI score and each of the subscales were all lower than recommended (CFIs = $.84-.85$; Gamma hat = $.90-.91$; RMSEAs = $.07$). Absolute fit indices were closer to the cut-offs recommended by Hu and Bentler (1998), and approached adequate model fit (see Brown & Cudeck, 1993 on RMSEA). However, our findings below require replication and should be interpreted with caution.

Females reported significant growth in overall NSSI score, which seemed to be driven by an increase in frequency ($\beta = .23$, $p < .01$) and severity over time ($\beta = .41$, $p < .01$). Participants who were older at baseline self-injured more frequently than younger participants ($\beta = .25$, $p < .001$). More adverse life events recorded at baseline was associated with more severe NSSI ($\beta = .36$, $p < .01$).

Of the emotion regulation processes examined, only cognitive reappraisal showed statistically significant relationships with NSSI when controlling for gender, age, suicide history, psychological distress, adverse life events and, concurrent and prospective associations among emotion regulation processes. Higher cognitive reappraisal was associated with lower NSSI scores at baseline, specifically less frequent ($\beta = -.40$, $p < .01$) and less severe NSSI ($\beta = -.39$, $p < .01$). Surprisingly, increased use of cognitive reappraisal at baseline was related to greater growth in frequency of NSSI over time ($\beta = .34$, $p < .01$).

Finally, the increased use of cognitive reappraisal over time was negatively related to medical severity of NSSI over time, but only marginally significant with our revised criterion for significance ($\beta = -.33$, $p = .02$).

Findings regarding cognitive reappraisal were generally replicated in analyses with complete cases (see Table 13). Cognitive reappraisal was not, however, significantly associated with change in any aspect of NSSI. Of control variables, only the relationship of baseline adverse life events and NSSI severity was preserved (i.e. more life stressors at baseline were significantly associated with more serious injuries). Older participants were also more likely to report increased medical severity at baseline. Participants with a history of suicide and more adverse life events at baseline were also more likely to report longer NSSI histories.

Discussion

We investigated changes in the use of emotion regulation strategies (cognitive reappraisal, expressive suppression, and various facets of ruminative thinking) and their impact on NSSI severity (i.e. frequency, duration and medical severity) among a cohort of adolescents with a history of NSSI, over two years. While there were significant differences in the use of cognitive reappraisal, expressive suppression and use of each facet of ruminative thinking at baseline among this cohort compared with their non-injuring peers, overall, their trajectories were not significantly different. The exception was that those who self-injured experienced more adverse life events at baseline, and demonstrated a greater increase in life events over the three years of the study compared with their non-NSSI peers.

Of the emotion regulation variables, only cognitive reappraisal at baseline had a significant association with NSSI severity over and above the influence of gender, age, suicide history, psychological distress, adverse life events and the concurrent and prospective associations between the emotion regulation processes. As expected, higher cognitive

reappraisal was associated with lower frequency and medical severity of NSSI at baseline. Similarly, although only marginally significant, our results also suggest that persistent and increasing use of cognitive reappraisal may have a slight protective effect in reducing medical severity of NSSI over time. The sizes of the associations, however, are small and future research to replicate our findings is warranted.

Nonetheless, findings highlight differential effects of emotion regulation processes on NSSI. Building adolescents' capacity to use cognitive reappraisal may be preventive of frequent and severe NSSI presentations when they occur. Moreover, among those who were already engaging in NSSI, increasing cognitive reappraisal use may assist with reducing the severity of their injuries but not frequency or continuation of the behaviour. Results hint at the possibility that although individuals may engage in NSSI to regulate emotions, the motivation may manifest in different domains (e.g. frequency vs severity) and different interventions may be required for each of these domains. Future NSSI research on domain-specific contributions of different processes may be useful (for a broad integrated model of NSSI see Nock, 2009).

That rumination and expressive suppression were not predictive of NSSI was surprising. Further, while there are differential increases in rumination and expressive suppression between those who self-injured and those who do not, the difference between the groups was not statistically significant. Naturally the failure to predict NSSI could relate to the shared variance between aspects of rumination, expressive suppression and cognitive reappraisal. However while bivariate correlations suggest some degree of overlap in these constructs, there remains significant unique variance that could predict NSSI. An alternative explanation could relate to our measure of rumination. We chose a measure that assessed a general tendency to ruminate rather than a negatively valenced style of rumination. It remains

to be seen whether general rumination is related to NSSI or whether NSSI is specifically related to rumination on negative experiences.

Our findings with regard to female adolescents reporting increasing NSSI severity across the three waves supports the current state of knowledge. Gender differences have been reported in regard to methods of self-injury (Baetens, Claes, Willem, Muehlenkamp, & Bijttebier, 2011; Bjärehed et al., 2012; Sornberger, Heath, Toste, & McLouth, 2012) and onset (Andrews et al., *in press*). Martin et al. (2010) reported that lifetime prevalence of NSSI among females aged 10-17 years was 10.1% (cf. males = 8.8%), with a 12-month prevalence of 6.3% (cf. males = 4.6%). There was only a slight difference among males and females in regard to 4-week prevalence rates (females = 2.4%; males = 2.5%). Our results show that not only is NSSI more likely to be maintained by female adolescents, its severity (i.e. frequency and seriousness) may increase over time. While significant, the association is nonetheless small and the relationship was not found in the complete case analysis, suggesting a need to replicate this finding in future research.

Suicide history did not predict any aspect of NSSI (although in complete case analysis, it was predictive of longer NSSI history at baseline). Although the relationship between NSSI and suicide is somewhat ambiguous, NSSI is likely a risk factor for later suicide behaviour (Whitlock et al., 2013). What is less clear is whether suicide behaviour increases severity of NSSI over time. Our findings are consistent with previous research that indicate while NSSI may be a risk factor for suicide, suicide behaviour does not predict NSSI (for review see Hamza et al. 2012). As the focal point of this study was prediction of NSSI we did not assess whether earlier NSSI predicts subsequent suicide behaviour.

Implications

Results suggest adolescents who engage in NSSI experience more acute life stressors and are more likely to engage in emotion regulation processes that heighten negative

emotional states such as expressive suppression and rumination than more adaptive strategies such as cognitive reappraisal than their peers who do not self-injure. Nonsignificant differences on the mean slopes for these emotion regulation strategies suggest similar developmental trajectories for both cohorts. However, adolescents who self-injure continue to experience more acute life stressors over time than their peers, without the concomitant emotion regulation skills to manage the emotional strain from these stressors. Within this context, adolescents with higher cognitive reappraisal are more likely to have less severe NSSI presentations.

NSSI is primarily used as a means of emotion regulation, with the assumption being that this strategy is used when other emotion regulation techniques are lacking. Our findings support this assertion, but go further to implicate one specific type of emotion regulation in this process. Improving the effective use of cognitive reappraisal may be protective of further escalation of self-injurious behaviour over time. Specifically, given the nonsignificant associations between NSSI and the other emotion regulation processes, our results suggest improving adolescents' skills and capacity to reappraise and reduce the emotional salience of adverse life events is likely to have more utility than interventions to reduce maladaptive emotion regulation use.

Currently there are few interventions for NSSI among adolescents with robust evidence on their efficacy (see Brausch & Girresch, 2012; Washburn et al., 2012). Two promising areas are Cognitive Behavioural Therapy (CBT), and Dialectical Behaviour Therapy (DBT) although lack of randomised controlled trials and lack of specificity in treatment targets (e.g. deliberate self-harm including behaviours with both suicidal and non-suicidal intent vs NSSI) obscure conclusions that can be drawn regarding their efficacy in reducing NSSI. CBT approaches include enhancing problem-solving and emotion regulation skills, as well as cognitive restructuring which focuses on beliefs and appraisals. DBT interventions comprise

a combination of individual therapy and skills training components where participants are taught skills in mindfulness and acceptance, emotion regulation, distress tolerance, interpersonal effectiveness. Importantly, in individual sessions, triggers for target self-harm behaviours, and appropriate cognitive and behavioural skills to cope with these triggers, are identified through chain analysis (for DBT generally, see Koerner & Dimeff, 2007).

A recent evaluation of a pilot DBT program for adolescents reported significant reduction in NSSI over a one-year period among participants (Fleischhaker, Bohme, Sixt, Bruck, Schneider, & Schulz, 2011). While the contributions of specific components of the program to treatment outcome were not specifically evaluated, there is some support that a focus on cognitive, emotional and behavioural triggers plays an important role (Slee, Spinhoven, Garnefski, & Arensman, 2008). Finally, in light of limited empirically supported interventions, several researchers and experts in the field of NSSI have published articles and books that together provide guidelines for clinicians treating NSSI. Among the common strategies recommended are cognitive interventions such as Socratic questioning to address self-derogatory beliefs, as well as beliefs about NSSI (Washburn et al., 2012). Our findings are therefore consistent with current thinking in the field and suggest that maintaining a focus on addressing dysfunctional cognitions in the emotion regulation process may be promising.

Limitations

Our sample is predominantly female and, therefore, generalisability of findings to male adolescents is limited. While the retention rate is comparable to other studies with adolescents, participation rates are below other school-based recruitment studies. The representativeness of our sample is therefore limited. Additionally, less than 50% of our final sample participated across all three waves. To address this we have utilised accepted methodologies for handling missing data. Rather than creating new data where none existed, FIML approaches enable all available data to be used in generating a consistent covariance

matrix which is then analysed (Acock, 2012). Nonetheless, we have also included robustness tests to compare results from FIML analyses with the full sample as well as with participants who completed the three waves only. Findings are generally consistent, although further research is warranted.

When exploring the relationships between emotion regulation strategies and NSSI, none of the models tested demonstrated acceptable model fit. This could be due to low power, but also indicates that a range of factors not considered in this study are likely important in the development and maintenance of NSSI. Future work would benefit from a large sample in which to test numerous, and complex, relationships. Related to this, while we were able to examine change over a three year period and allowed for the shape of the growth function to be freely estimated with the use of unconstrained models, it was not possible to more fully explore non-linear change in the variables of interest given the limited number of time-points in the study. This may also have contributed to lower model fit.

As noted above, the size of the associations between cognitive reappraisal and NSSI are small and therefore further research is required to replicate our findings. Interestingly, Aldao et al. (2010) reported in their meta-analytic review that while cognitive reappraisal had strong associations with affective disorders such as depression and anxiety, its associations with disorders of dysregulated behaviours such as substance use and eating disorders was small. Although NSSI was not considered in this review, following Selby and Joiner (2009), it may share commonalities with substance use and eating disorders as a dysregulated behaviour, and therefore the small effect size may be consistent with previous work.

Finally, our analyses were based on a single unit of time and therefore were less sensitive to piecemeal changes over time. It was also not possible to capture bidirectional influences (e.g. simultaneous influence of NSSI on emotion regulation processes over time), which may illuminate the dynamic processes involved in NSSI. This is particularly true of the

relationship between psychological distress and NSSI, which is likely more dynamic than our measure allowed us to capture. Similarly, while we controlled for both concurrent and prospective covariation among our emotion regulation strategies, additional studies with a larger sample would allow detailed exploration of the complex interactions between these strategies over time. Specifically, a combination of rumination and suppression may increase risk of NSSI or exacerbate severity over time, and the relationships between our variables might best be conceptualised as mediated or moderated. While our attempts to explore these interactions between variables were hampered by sample size, our main effects analysis provides some clues as to which emotion regulation strategies (i.e. cognitive reappraisal) are most salient in predicting NSSI, and can guide future work in this area.

Conclusions

Despite limitations, the current study is, to our knowledge, one of few longitudinal studies on adolescent NSSI. It highlights the similarities and differences in the use of emotion regulation strategies between a cohort of adolescents who have and/or continue to engage in NSSI and their non-NSSI peers. Findings indicate that while both cohorts have similar emotion regulation trajectories, adolescents who self-injure start off at a disadvantage and have a propensity to engage in less helpful processes that tend to heighten negative emotional states. They are also more likely to experience increasing acute life stressors over time than their non-self-injuring peers. Results recommend increasing focus on improving adolescents' frequency and skills in use of cognitive reappraisal in efforts to reduce NSSI among this population.

References

- Acock, A. (2012). What to do about missing values. In H. Cooper (Ed.), *APA Handbook of Research Methods in Psychology*. Washington, DC: American Psychological Association.
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*, 217 - 237.
- Allen, J.P., Manning, N., & Meyer, J. (2010). Tightly linked systems: Reciprocal relations between maternal depressive symptoms and maternal reports of adolescent externalizing behaviour. *Journal of Abnormal Psychology, 119*, 825 – 835. doi: 10.1037/a0021081
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, VA: American Psychiatric Association.
- Andrews, T., Martin, G., Hasking, P., Page, A. (*in press*). Predictors of onset for non-suicidal self-injury within a community-based sample of adolescents. *Prevention Science*. doi: 10.1007/s11121-013-0412-8
- Andrews, T., Martin, G., Hasking, P., & Page, A. (2013). Predictors of continuation and cessation of non-suicidal self-injury. *Journal of Adolescent Health, 53*, 40-46. doi: 10.1016/j.jadohealth.2013.01.009
- Andover, M. S., Morris, B. W., Wren, A., & Bruzzese, M. E. (2012). The co-occurrence of non-suicidal self-injury and attempted suicide among adolescents: Distinguishing risk factors and psychosocial correlates. *Child and Adolescent Psychiatry and Mental Health, 6*(11), 1-7.
- Armey, M. F., & Crowther, J. H. (2008). A comparison of linear versus non-linear models of aversive self-awareness, dissociation, and non-suicidal self-injury among young adults. *Journal of Consulting and Clinical Psychology, 76*, 9 - 14. doi: 10.1037/0022-006X.76.1.9

- Australian Bureau of Statistics. (2013a). *Census of Population and Housing: Socioeconomic Indexes for Areas (SEIFA), Australia 2011*. (ABS cat no. 2033.0.55.001). Canberra: ABS.
- Australian Bureau of Statistics (2013b). *Australian Social Trends, April 2013*. (ABS cat no. 4102.0). Canberra: ABS.
- Baetens, L., Claes, L., Willem, L., Muehlenkamp, J.J., & Bijttebier, P. (2011). The relationship between non-suicidal self-injury and temperament in male and female adolescents based on child- and parent-report. *Personality and Individual Differences*, 50, 527 – 530. doi: 10.1016/j.paid.2010.11.015
- Baksheev, G. N., Robinson, J., Cosgrave, E. M., Baker, K., & Yung, A. R. (2011). Validity of the 12-item General Health Questionnaire (GHQ-12) in detecting depressive and anxiety disorders among high school students. *Psychiatry Research*, 187, 291 - 296. doi: 10.1016/j.psychres.2010.10.010
- Betts, J., Gullone, E., & Allen, J. S. (2009). An examination of emotion regulation, temperament, and parenting style as potential predictors of adolescent depression risk status: A correlational study. *British Journal of Developmental Psychology*, 27, 473 - 485. doi: 10.1348/026151008X314900
- Bilsky, S.A., Cole, D.A., Dukewich, T.L., Martin, N.C., Sinclair, K.R., Tran, C.V., Roeder, K.M., Felton, J.W., Tilghman-Osborne, C., Weitlauf, A.S., & Maxwell, M.A. (2013). Does supportive parenting mitigate the longitudinal effects of peer victimization on depressive thoughts and symptoms in children? *Journal of Abnormal Psychology*, 122, 406 – 419. doi: 10.1037/a0032501
- Bjärehed, J., & Lundh, L. (2008). Deliberate self-harm in 14-year-old adolescents: How frequent is it, and how is it associated with psychopathology, relationship variables, and styles of emotional regulation? *Cognitive Behaviour Therapy*, 37, 26 - 37.

- Borrill, J., Fox, P., Flynn, M., & Roger, D. (2009). Students who self-harm: Coping style, rumination and alexithymia. *Counselling Psychology Quarterly*, 22, 361 - 372.
- Brausch, A.M., & Girresch, S.K. (2012). A review of empirical treatment studies for adolescent nonsuicidal self-injury. *Journal of Cognitive Psychotherapy: An International Quarterly*, 26, 3 – 18. doi: 10.1891/0889-8391.26.1.3
- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, 65, 1 - 19. doi: 10.1002/jclp.20542
- Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (eds.), *Testing Structural Equation Models* (pp. 136 – 162). Newbury Park, CA: Sage.
- Curran, P. J., & Hussong, A. M. (2003). The use of latent trajectory models in psychopathology research. *Journal of Abnormal Psychology*, 112, 526 - 544. doi: 10.1037/0021-843X.112.4.526
- Duncan, T. E., & Duncan, S. C. (2004). An introduction to latent growth curve modeling. *Behavior Therapy*, 35, 333 - 363.
- Fan, X., & Sivo, S. (2007). Sensitivity of fit indices to model misspecification and model types. *Multivariate Behavioral Research*, 42, 509 – 529. doi: 10.1080/00273170701382864
- Felton, J.W., Cole, D.A., & Martin, N.C. (2013). Effects of rumination on child and adolescent depressive reactions to a natural disaster: The 2010 Nashville Flood. *Journal of Abnormal Psychology*, 122, 64 – 73. doi: 10.1037/a0029303
- Fleischhaker, C., Bohme, R., Sixt, B., Bruck, C., Schneider, C., & Schulz, E. (2011). Dialectical Behavioral Therapy for Adolescents (DBT-A): A clinical trial for patients with suicidal and self-injurious behavior and borderline symptoms with a one-year follow-up.

- Child and Adolescent Psychiatry and Mental Health*, 5:3.
<http://www.capmh.com/content/5/1/3>
- Fliege, H., Lee, J., Grimm, A., & Klapp, B. F. (2009). Risk factors and correlates of deliberate self-harm behaviour: A systematic review. *Journal of Psychosomatic Research*, 66, 477 - 493. doi: 10.1016/j.jpsychores.2008.10.013
- Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson.
- Gordon, K. H., Selby, E. A., Anestis, M. D., Bender, T. W., Witte, T. K., Braithwaite, S., Van Orden, K.A., Bresin, K., & Joiner, T.E. (2010). The reinforcing properties of repeated deliberate self-harm. *Archives of Suicide Research*, 14(1), 329 - 341. doi: 10.1080/13811118.2010.524059
- Graham, J.W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549 – 576. doi: 10.1146/annurev.psych.58.110405.085530
- Gratz, K. L. (2003). Risk factors for and functions of deliberate self-harm: An empirical and conceptual review. *Clinical Psychology: Science and Practice*, 10, 192 - 205. doi: 10.1093/clipsy/bpg022
- Gross, J. J. (1999). Emotion regulation: Past, present, future. *Cognition & Emotion*, 13, 551 - 573.
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348 - 362. doi: 10.1037/0022-3514.85.2.348
- Guan, K., Fox, K. R., & Prinstein, M. J. (2012). Nonsuicidal self-injury as a time-invariant predictor of adolescent suicide ideation and attempts in a diverse community sample. *Journal of Consulting and Clinical Psychology*, 80, 842 - 849. doi: 10.1037/a0029429

- Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: A 2-year follow-up study. *Journal of Child Psychology and Psychiatry*, 51, 567 - 574. doi: 10.1111/j.1469-7610.2009.02183.x
- Gullone, E. & Taffe, J. (2012). The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA): A psychometric evaluation. *Psychological Assessment*, 24, 409 – 417. doi: 10.1037/a0025777
- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. (2001). Development and initial validation of the Self-Harm Behavior Questionnaire. *Journal of Personality Assessment*, 77(3), 475 - 490. doi: 10.1207/S15327752JPA7703_08
- Hampel, P. & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, 34, 73 – 83. doi: 10.1007/s10964-005-3207-9
- Hamza, C.A., Stewart, S.L., & Willoughby, T. (2012). Examining the link between nonsuicidal self-injury and suicidal behaviour: A review of the literature and an integrated model. *Clinical Psychology Review*, 32, 482 – 495. doi: 10.1016/j.cpr.2012.05.003
- Hankin, B. L., & Abela, J. R. Z. (2011). Nonsuicidal self-injury in adolescence: Prospective rates and risk factors in a 2½ year longitudinal study. *Psychiatry Research*, 186, 65 - 70. doi: 10.1016/j.psychres.2010.07.056
- Hasking, P., Momeni, R., Swannell, S., & Chia, S. (2008). The nature and extent of non-suicidal self-injury in a non-clinical sample of young adults. *Archives of Suicide Research*, 12, 208 - 218. doi: 10.1080/13811110802100957
- Hasking, P. A., Coric, S. J., Swannell, S., Martin, G., Thompson, H. K., & Frost, A. D. J. (2010). Emotion regulation and coping as moderators in the relationship between

- personality and self-injury. *Journal of Adolescence*, 33, 767 - 773. doi: 10.1016/j.adolescence.2009.12.006
- Hawton, K., & Rodham, K. (2006). *By Their Own Young Hand. Deliberate Self-Harm and Suicidal Ideas in Adolescents*. London: Jessica Kingsley.
- Heene, M., Hilbert, S., Draxler, C., Ziegler, M., & Buhner, M. (2011). Masking misfit in confirmatory factor analysis by increasing unique variances: A cautionary note on the usefulness of cutoff values of fit indices. *Psychological Methods*, 16, 319 – 336. doi: 10.1037/a0024917
- Hilt, L. M., Cha, C. B., & Nolen-Hoeksema, S. (2008). Nonsuicidal self-injury in young adolescent girls: Moderators of the Distress-Function relationship. *Journal of Consulting and Clinical Psychology*, 76, 63 - 71. doi: 10.1037/0022-006X.76.1.63
- Hoff, E. R., & Muehlenkamp, J. J. (2009). Nonsuicidal self-injury in college students: The role of perfectionism and rumination. *Suicide & Life-Threatening Behaviour*, 39, 576 - 587.
- Horne, O., & Csipke, E. (2009). From feeling too little and too much, to feeling more and less? A nonparadoxical theory of the functions of self-harm. *Qualitative Health Research*, 19(5), 655 - 667. doi: 10.1177/1049732309334249
- Howe-Martin, L. S., Murrell, A. R., & Guarnaccia, C. A. (2012). Repetitive nonsuicidal self-injury as experiential avoidance among a community sample of adolescents. *Journal of Clinical Psychology*, 68(7), 809 - 828. doi: 10.1002/jclp.21868
- Hox, J., & Stoel, R. D. (2005). Multilevel and SEM approaches to growth curve modeling. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of Statistics in Behavioural Science* (Vol. 3, pp. 1296 - 1305). Chichester: John Wiley & Sons, Ltd.

- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1 - 55.
- Hughes, E. K., Gullone, E., & Watson, S. D. (2011). Emotional functioning in children and adolescents with elevated depressive symptoms. *Journal of Psychopathology and Behavioural Assessment*, 33, 335 - 345. doi: 10.1007/s10862-011-9220-2
- Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behaviour among adolescents: A critical review of the literature. *Archives of Suicide Research*, 11, 129 - 147. doi: 10.1080/13811110701247602
- Jelicic, H., Phelps, E., & Lerner, R. M. (2010). Why missing data matter in the longitudinal study of adolescent development: Using the 4-H Study to understand the uses of different missing data methods. *Journal of Youth and Adolescence*, 39, 816 - 835. doi: 10.1007/s10964-010-9542-5
- John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, 72, 1301 - 1334.
- Jose, P.E., & Brown, I. (2008). When does gender difference in rumination begin? Gender and age differences in the use of rumination by adolescents. *Journal of Youth and Adolescence*, 37, 180 – 192. doi: 10.1007/s10964-006-9166-y
- Kakhnovets, R., Young, H. L., Purnell, A. L., Huebner, E., & Bishop, C. (2010). Self-reported experience of self-injurious behaviour in college students. *Journal of Mental Health Counseling*, 32, 309 - 323.
- Klonsky, E. D. (2009). The functions of self-injury in young adults who cut themselves: Clarifying the evidence for affect-regulation. *Psychiatry Research*, 166, 260 - 268. doi: 10.1016/j.psychres.2008.02.008

- Klonsky, E. D., May, A. M., & Glenn, C. R. (2013). The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. *Journal of Abnormal Psychology, 122*, 231 - 237. doi: 10.1037/a0030278
- Klonsky, E. D., & Muehlenkamp, J. J. (2007). Self-injury: A research review for the practitioner. *Journal of Clinical Psychology: In Session, 63*, 1045 - 1056. doi: 10.1002/jclp.20412
- Koerner, K., & Dimeff, L.A. (2007). Overview of Dialectical Behaviour Therapy. In Dimeff, L.A. & Koerner, K. (eds.), *Dialectical Behaviour Therapy in Clinical Practice: Applications across disorders and settings* (pp. 1 – 18). New York: The Guilford Press.
- LaGrange, B., Cole, D.A., Jacquez, F., Ciesla, J., Dallaire, D., Pineda, A., Truss, A., Weitlauf, A., Tilghman-Osborne, C., & Felton, J. (2011). Disentangling the prospective relations between maladaptive cognitions and depressive symptoms. *Journal of Abnormal Psychology, 120*, 511 – 527. doi: 10.1037/a0024685
- Littlefield, A.K., Verges, A., Wood, P.K., & Sher, K.J. (2012). Transactional models between personality and alcohol involvement: A further examination. *Journal of Abnormal Psychology, 121*, 778 – 783. doi: 10.1037/a0026912
- Lougheed, J. P., & Hollenstein, T. (2012). A limited repertoire of emotion regulation strategies is associated with internalizing problems in adolescence. *Social Development, 21*, 704 - 721. doi: 10.1111/j.1467-9507.2012.00663.x
- Martin, G., Swannell, S., Harrison, J., Hazell, P., & Taylor, A. (2010). *The Australian National Epidemiological Study of Self-Injury (ANESSI)*. Brisbane, Australia: Centre for Suicide Prevention Studies.
- McArdle, J.J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology, 60*, 577 – 605. doi: 10.1146/annurev.psych.60.110707.163612

- Muehlenkamp, J. J., Claes, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child and Adolescent Psychiatry and Mental Health*, 6(10), 1 - 9.
- Muehlenkamp, J. J., Cowles, M. L., & Gutierrez, P. M. (2009). Validity of the Self-Harm Behaviour Questionnaire with diverse adolescents. *Journal of Psychopathology and Behavioural Assessment*, 32, 263 - 243. doi: 10.1007/s10862-009-9131-7
- Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, 18(2), 78 - 83.
- Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E. E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, 144, 65 - 72. doi: 10.1016/j.psychres.2006.05.010
- Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviours: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118, 816 - 827. doi: 10.1037/a0016948
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3, 400 - 424. doi: 10.1111/j.1745-6924.2008.00088.x
- Pearson, C.M., Combs, J.L., Zapolski, T.C.B., & Smith, G.T. (2012). A longitudinal transactional risk model for early eating disorder onset. *Journal of Abnormal Psychology*, 121, 707 – 718. doi: 10.1037/a0027567
- Rayner, K.E., Schniering, C.A., Hutchinson, D.M., Rapee, R.M., & Taylor, A. (2013). Adolescent girls' friendship networks, body dissatisfaction, and disordered eating:

- Examining selection and socialization processes. *Journal of Abnormal Psychology*, 122, 93 – 104. doi: 10.1037/a0029304
- Selby, E. A., Connell, L. D., & Joiner, T. E. (2010). The pernicious blend of rumination and fearlessness in non-suicidal self-injury. *Cognitive Therapy and Research*, 34, 421 - 428. doi: 10.1007/s10608-009-9260-z
- Selby, E. A., & Joiner, T. E. (2009). Cascades of emotion: The emergence of Borderline Personality Disorder from emotional and behavioural dysregulation. *Review of General Psychology*, 13, 219 - 229. doi: 10.1037/a0015687
- Slee, N., Spinhoven, P., Garnefski, N., & Arensman, E. (2008). Emotion regulation as mediator of treatment outcome in therapy for deliberate self-harm. *Clinical Psychology and Psychotherapy*, 15, 205 – 216. doi: 10.1002/cpp.577
- Sornberger, M.J., Health, N.L., Toste, J.R., & McLouth, R. (2012). Nonsuicidal self-injury and gender: Patterns of prevalence, methods, and locations among adolescents. *Suicide & Life-Threatening Behaviour*, 42, 266 – 278. doi: 10.1111/j.1943-278X.2012.00088.x
- Swannell, S., Martin, G., Page, A., Hasking, P., & St John, N. (2014). Prevalence of non-suicidal self-injury (NSSI) in non-clinical samples; Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior*, 44, 273 – 303.
- Tabachnick, B.G., & Fidell, L.S. (2007). *Using Multivariate Statistics*. Fifth Edition. New York: Harper Collins.
- Tait, R. J., French, D. J., & Hulse, G. K. (2003). Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. *Australian and New Zealand Journal of Psychiatry*, 37, 374 - 381.
- Tanner, A., Voon, D., Hasking, P., & Martin, G. (2013). Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire. *Cognitive Therapy and Research*, 37, 633 - 646. doi: 10.1007/s10608-012-9492-1

- Voon, D., Hasking, P., & Martin, G. (2014). The roles of emotion regulation and ruminative thoughts in non-suicidal self-injury. *British Journal of Clinical Psychology*, 53, 95-113. doi: 10.1111/bjc.12030
- Washburn, J.J., Richardt, S.L., Styer, D.M., Gebhardt, M., Juzwin, K.R., Yourek, A., & Aldridge, D. (2012). Psychotherapeutic approaches to non-suicidal self-injury in adolescents. *Child and Adolescent Psychiatry and Mental Health*, 6:14, 1 – 8.
- Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Abrams, G.B., Barriera, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health*, 52, 486-492.
- Williams, F., & Hasking, P. (2010). Emotion regulation, coping and alcohol use as moderators in the relationship between non-suicidal self-injury and psychological distress. *Prevention Science*, 11, 33 - 41. doi: 10.1007/s11121-009-0147-8
- Zeman, J., Cassano, M., Perry-Parrish, C., & Stegall, S. (2006). Emotion regulation in children and adolescents. *Developmental and Behavioral Pediatrics*, 27, 155 - 168.

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Table 9

Comparison between groups on means (standard deviations) of variables of interest

	NSSI			No NSSI		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Adverse Life Events	32.48 (5.90)	33.88 (6.00)	34.20 (5.99)	27.35 (4.77)	28.04 (4.92)	28.29 (4.94)
Psychological Distress	27.23 (7.66)	27.76 (7.76)	28.31 (7.55)	21.92 (5.51)	22.39 (5.66)	23.05 (5.64)
Cognitive Reappraisal	25.60 (6.99)	25.77 (7.20)	25.26 (7.00)	28.96 (6.21)	29.43 (6.09)	29.36 (6.19)
Expressive Suppression	15.58 (5.09)	16.67 (5.19)	17.09 (5.10)	13.64 (4.88)	14.59 (5.12)	15.11 (5.13)
Problem-focused Thoughts	21.21 (7.56)	21.75 (6.62)	21.78 (7.17)	16.96 (7.01)	17.58 (6.89)	17.68 (6.87)
Counterfactual Thinking	21.19 (5.79)	22.04 (5.26)	22.74 (4.58)	18.29 (6.31)	19.63 (5.90)	20.09 (5.70)
Repetitive Thoughts	21.34 (5.15)	22.50 (4.54)	22.86 (4.40)	18.57 (5.72)	19.75 (5.33)	20.19 (5.12)
Anticipatory Thoughts	10.17 (2.86)	10.55 (2.70)	10.39 (2.75)	9.60 (3.00)	9.78 (2.87)	9.82 (2.78)

Table 10

Correlations at baseline between variables of interest

<u>NSSI</u>	2.	3.	4.	5.	6.	7.	8.	9.
1. NSSI	.33**	.36**	-.31**	.19**	.22**	.10	.12	.01
2. Adverse Life Events	-	.41**	-.18**	.14**	.39**	.21**	.23**	.10
3. Psychological Distress		-	-.40**	.31**	.55**	.30**	.43**	.21**
4. Cognitive Reappraisal			-	-.01	-.26**	-.04	-.10	.00
5. Expressive Suppression				-	.23**	.13**	.10	.05
6. Problem-focused Thoughts					-	.59**	.65**	.48**
7. Counterfactual Thinking						-	.59**	.56**
8. Repetitive Thoughts							-	.48**
9. Anticipatory Thoughts								-
<u>No NSSI</u>	2.	3.	4.	5.	6.	7.	8.	9.
1. NSSI	-	-	-	-	-	-	-	-
2. Adverse Life Events	-	.39**	-.15**	.11**	.34**	.30**	.32**	.20**
3. Psychological Distress		-	-.23**	.26**	.43**	.30**	.36**	.22**
4. Cognitive Reappraisal			-	-.02	-.10**	.07**	.05**	.14**
5. Expressive Suppression				-	.31**	.19**	.14**	.10**
6. Problem-focused Thoughts					-	.58**	.58**	.49**
7. Counterfactual Thinking						-	.61**	.52**
8. Repetitive Thoughts							-	.51**
9. Anticipatory Thoughts								-

** p < .01

Table 11

Comparisons between groups on model fit indices for univariate latent growth curve models

	NSSI					No NSSI				
	χ^2 ^a	CFI	$\hat{\gamma}$	RMSEA	$\Delta\chi^2$	χ^2 ^a	CFI	$\hat{\gamma}$	RMSEA	$\Delta\chi^2$
Adverse life events										
Constrained	8.17, $p=.04$	.99	.99	.06	**	13.36, $p<.01$	.99	1.00	.04	<i>ns</i>
Unconstrained	1.66, $p=.44$	1.00	1.00	.00		9.49, $p<.01$	1.00	1.00	.04	
Psychological distress										
Constrained	3.43, $p=.33$	1.00	1.00	.02	<i>ns</i>	4.42, $p=.22$	1.00	1.00	.01	<i>ns</i>
Unconstrained	2.14, $p=.34$	1.00	1.00	.01		4.13, $p=.13$	1.00	1.00	.02	
Cognitive Reappraisal										
Constrained	15.30, $p<.01$	.93	.99	.09	***	6.96, $p=.07$	.99	1.00	.02	<i>ns</i>
Unconstrained	3.22, $p=.20$	.99	1.00	.03		4.02, $p=.13$	1.00	1.00	.02	
Expressive Suppression										
Constrained	9.00, $p=.03$	.97	.99	.06	**	25.01, $p<.01$	.98	.99	.05	***
Unconstrained	2.11, $p=.35$	1.00	1.00	.01		7.54, $p=.02$	1.00	1.00	.03	

Problem-focused Thoughts

Constrained	16.27, $p < .01$	.94	.99	.09	***	17.41, $p < .01$	.99	1.00	.04	***
Unconstrained	1.98, $p = .37$	1.00	1.00	.00		1.24, $p = .54$	1.00	1.00	.00	

Counterfactual Thinking

Constrained	30.93, $p < .01$	.90	.97	.13	***	30.66, $p < .01$	.98	.99	.06	***
Unconstrained	19.74, $p < .01$	.94	.98	.13		7.49, $p = .02$	1.00	1.00	.03	

Repetitive Thoughts

Constrained	18.84, $p < .01$	.90	.98	.10	***	23.13, $p < .01$	.98	.99	.05	***
Unconstrained	3.39, $p = .18$	.99	1.00	.04		4.58, $p = .10$	1.00	1.00	.02	

Anticipatory Thoughts

Constrained	7.75, $p = .05$	.98	1.00	.05	ns	7.48, $p = .06$	.99	1.00	.02	***
Unconstrained	8.40, $p = .66$	1.00	1.00	.00		20.30, $p < .01$	.97	1.00	.06	

NSSI

Constrained	1.86, $p = .60$	1.00	1.00	.00	ns	-	-	-	-	-
Unconstrained	1.58, $p = .45$	1.00	1.00	.00		-	-	-	-	-

** $p < .01$ *** $p < .001$

^a Constrained $df = 3$; unconstrained $df = 2$

Table 12

Comparison between groups in intercepts and slopes of univariate latent growth curve models

	NSSI	No NSSI	
	Mean (Std. error)	Mean (Std. error)	Difference
Adverse life events			
Intercept	32.53 (.27)***	27.35 (.10)***	$p < .01$
Slope	1.45 (.25)***	.77 (.09)***	$p < .01$
Psychological distress			
Intercept	27.27 (.35)***	21.92 (.12)***	$p < .01$
Slope	.89 (.37)	.58 (.13)***	ns
Cognitive Reappraisal			
Intercept	25.49 (.32)***	29.13 (.11)***	$p < .01$
Slope	-.26 (.37)	.24 (.13)	ns
Expressive Suppression			
Intercept	15.62 (.23)***	13.67 (.10)***	$p < .01$
Slope	1.18 (.25)***	1.04 (.10)***	ns
Problem-focused Thoughts			
Intercept	21.27 (.34)***	16.96 (.15)***	$p < .01$
Slope	.67 (.33)	.71 (.14)***	ns
Counterfactual Thinking			
Intercept	21.22 (.26)***	18.19 (.13)***	$p < .01$
Slope	1.19 (.24)***	1.40 (.12)***	ns
Repetitive Thoughts			

Intercept	21.32 (.24)***	18.49 (.12)***	$p < .01$
Slope	1.33 (.24)***	1.21 (.11)***	<i>ns</i>
Anticipatory Thoughts			
Intercept	10.18 (.13) ***	9.71 (.05) ***	$p < .01$
Slope	.35 (.14)	.02 (.05)	<i>ns</i>
NSSI			
Intercept	6.26 (.27) ***	-	-
Slope	1.11 (.24) ***	-	-

** $p < .01$ *** $p < .001$

Table 13

Standardised regression weights of associations with overall NSSI severity and subscales^a

	Full sample				Complete cases			
	Total score	Frequency	Duration	Severity	Total score	Frequency	Duration	Severity
Gender								
Gender→NSSI _{intercept}	-.16**	-.15	-.11	-.13	-.11	-.13	-.09	-.04
Gender→NSSI _{slope}	.35**	.23**	.13	.41**	.25	.17	-.14	.22
Age								
Age _{intercept} →NSSI _{intercept}	.26	.25**	.07	.17	.16	.10	.05	.25**
Age _{intercept} →NSSI _{slope}	-.17	-.17	.00	-.17	-.16	-.07	.07	-.24
Age _{slope} →NSSI _{slope}	.03	.14	.09	.09	.18	.27	.17	.16
Suicide History								
Suicide History→NSSI _{intercept}	.07	-.08	.02	.14	.06	.11	.18**	.21
Suicide History→NSSI _{slope}	-.05	-.02	-.09	.06	-.02	-.06	-.05	-.15
Adverse Life Events								
Life events _{intercept} →NSSI _{intercept}	.26	.33	.16	.36**	.35**	.27	.28**	.80***

Life events _{intercept} →NSSI _{slope}	-.17	-.02	-.32	-.17	-.13	.13	.37	-.98**
Life events _{slope} →NSSI _{slope}	.03	-.44	.66	-.75	-.28	-.50	-.43	.24
Psychological Distress								
Distress _{intercept} →NSSI _{intercept}	.30**	.36	.23	.20	.18	.28	.01	-.33
Distress _{intercept} →NSSI _{slope}	-.24	-.19	-.19	-.37	-.17	-.06	.16	.48
Distress _{slope} →NSSI _{slope}	.24	.64	-.08	.11	.59	.75	.40	-.01
Cognitive Reappraisal^a								
Reappraisal _{intercept} →NSSI _{intercept}	-.34***	-.40***	-.11	-.39***	-.35***	-.35***	-.12	-.44***
Reappraisal _{intercept} →NSSI _{slope}	.36	.34**	.04	.35	.45	.40	-.23	.40
Reappraisal _{slope} →NSSI _{slope}	-.29**	-.09	-.09	-.33	-.24	-.13	-.03	-.26

** $p < .01$ *** $p < .001$

^a Only cognitive reappraisal significantly contributed to NSSI after controlling for other variables, hence only these results are displayed

Postscript

While age was included as a control variable, the main analyses reported in the above paper did not specifically examine age-related differences in changes in emotion regulation and their impact on NSSI severity. In the interest of completeness, separate post hoc analyses were undertaken to replicate significant findings among different age-groups of participants. Given previous problems with examining interaction effects due to model complexity and sample size, multi-group comparisons were chosen rather than specifying an *age x reappraisal* interaction in the model.

Data Analysis

To retain sufficient power, age groupings were used as there were low numbers of 12 year olds ($n = 148$), and those aged 16 years and above ($n = 129$). This resulted in three groups of adolescents (12-13 year olds, $n = 1,235$; 14 year olds, $n = 975$; > 15 year olds, $n = 932$).

Results

For all age groups, goodness-of-fit indices were below recommended cut-offs (CFIs = .52-.62, RMSEAs = .12, Gamma hat = .82) indicating poor model fit and that interpretations of the findings can only be speculative. Clearly, further research with larger sample sizes is required.

As reported in Table 14, there were group differences in the relationship between cognitive reappraisal and NSSI. While there was a significant negative relation between baseline reappraisal and severity of NSSI among the youngest age group of 12-13 year olds ($\beta = -.60, p < .01$), cognitive reappraisal was unrelated to NSSI severity at baseline among the two older groups.

Table 14

Standardised regression weights of associations with NSSI severity by age group ^a

	<u>12-13 years</u>	<u>14 years</u>	<u>≥ 15 years</u>
Gender			
Gender→NSSI _{intercept}	-.09	-.32***	-.03
Gender→NSSI _{slope}	.23	.74***	.12
Suicide History			
Suicide History→NSSI _{intercept}	.36	-.15	.21
Suicide History→NSSI _{slope}	-.13	.27	-.45
Adverse Life Events			
Life events _{intercept} →NSSI _{intercept}	.51	.04	.36
Life events _{intercept} →NSSI _{slope}	-.35	-.21	-.38
Life events _{slope} →NSSI _{slope}	.44	.29	.19
Psychological Distress			
Distress _{intercept} →NSSI _{intercept}	-.09	.85***	-.11
Distress _{intercept} →NSSI _{slope}	-.00	-.63	.52
Distress _{slope} →NSSI _{slope}	-.14	-.03	-.14
Cognitive Reappraisal^a			
Reappraisal _{intercept} →NSSI _{intercept}	-.60**	-.41	-.15
Reappraisal _{intercept} →NSSI _{slope}	.67	.53	-.04
Reappraisal _{slope} →NSSI _{slope}	-.34	-.24	-.65**

** $p < .01$ *** $p < .001$ ^a Only cognitive reappraisal significantly contributed to NSSI in the original analysis, hence only these results are displayed

For all age groups, use of cognitive reappraisal at baseline was unrelated to changes in NSSI severity. However, increased use of cognitive reappraisal was significantly related to a decrease in NSSI severity over time among the oldest age group of 15 years and over ($\beta = -.65, p < .01$).

Discussion

Findings were somewhat consistent with the results from Study 2 and indicate that less use of cognitive reappraisal is implicated in initial NSSI among adolescents aged 12-13 years but not among older adolescents. Null relationships between change in reappraisal use and NSSI severity among the younger age groups may be reflective of floor effects as reappraisal use is expected to decrease during this period (Gullone et al., 2012; Gullone & Taffe, 2012). Results suggest that among older adolescents (> 15 year olds) who self-injured, increasing cognitive reappraisal use is likely to be beneficial in reducing NSSI severity. Together, findings from the post hoc analyses hint at developmental influences however, given low model fit, these observations are tentative and further research is warranted.

CHAPTER EIGHT

GENERAL DISCUSSION

The set of three empirical studies reported in this thesis aimed broadly to examine (i) how the emotion regulation processes of cognitive reappraisal, expressive suppression and rumination were related to NSSI, and specifically, (ii) their role in NSSI onset and its severity. In regard to the first question, the potential for a *distress x emotion regulation process* interaction, based on extant theoretical models, was tested. Developmental changes in emotion regulation were also taken into account particularly when investigating how these emotion regulation processes were related to first episode NSSI through examination of age-related interactions. In pursuing these questions, the three studies adopted a *stress x diathesis* approach that acknowledges that stressful situations and life events, as well as emotional distress act as triggers for NSSI. They also adopted a nuanced consideration of the role of rumination by exploring how aspects of ruminative thinking may differentially relate to NSSI.

8.1 Research Findings

Study 1 tested a model which proposed the relationship between adverse life events and NSSI was mediated by psychological distress, and that emotion regulation moderated these relationships (i.e. between life events and psychological distress, and between psychological distress and NSSI). As reported in Chapter 5, there was support for some of the proposed interactions (e.g. in regard to life events) but not others (e.g. distress and rumination). Indirect effects via psychological distress were also statistically significant. The relationships between adverse life events, psychological distress and NSSI were stronger in the context of low cognitive reappraisal and high

expressive suppression. Adverse life events were more strongly related to NSSI in the presence of greater tendency to engage in counterfactual rumination (i.e. comparing one's present circumstances with what one hoped it could have been) and a lower tendency for anticipatory rumination (i.e. thinking persistently in anticipation of a future event). Although interaction and indirect effects were statistically significant, they were weak and therefore indicate direct effects of emotion regulation processes in NSSI are more relevant. Even so, the regression coefficients for these direct relationships were $< .06$ and were also weak. These unexpected results may be partly due to the measure of distress used as it indexes psychological deterioration, and the measure of adverse life events which included serious incidents such as physical abuse, parental separation or divorce, illness, and death among friends and family. It remains to be seen if these emotion regulation processes may give rise to stronger effect sizes in the context of negative affective states and daily hassles.

Nonetheless, direct relationships with NSSI were in the expected direction. Adverse life events and psychological distress both showed direct positive relationships with NSSI, and adolescents with low cognitive reappraisal and high expressive suppression were more likely to report more severe NSSI. However, the overall model accounted for only 18% of variance in NSSI scores.

Among the facets of ruminative thinking, it is interesting that counterfactual and anticipatory rumination both had direct relationships with NSSI but problem-focused rumination and the experience of uncontrollable repetitive thoughts did not. Counterfactual rumination was positively related to NSSI while anticipatory rumination had an inverse relationship. Taken together, findings suggest the tendency to dwell on the past rather than the future (as in the case of anticipatory rumination) is related to increased NSSI severity. With null findings on the contribution of problem-focused

rumination (i.e. rumination on present circumstances), findings are consistent with those reported by Selby et al. (2013) regarding temporal orientation of rumination and its relationship with NSSI risk. As noted in Chapter 4, the measure of anticipatory rumination is differentiated from worry in that the former indexes thoughts which may be either positively or negatively valenced whereas worry thoughts are focused on anticipated threat or danger and, as such, are negatively valenced. That high anticipatory rumination was related to lower NSSI severity suggests, to the extent that they are positively valenced, thoughts about the future may be protective and parallels findings on optimism in the NSSI literature (see Tanner et al., *in press*).

Among a subsample of adolescents with a history of NSSI, only the direct relationship between cognitive reappraisal and NSSI was maintained. Additionally, for these adolescents, higher levels of anticipatory rumination decreased risk conferred by high levels of psychological distress, although psychological distress by itself was not related to NSSI. Again, the measure of distress used in the study may account for this anomaly but findings also indicate that among adolescents who self-injured, specific NSSI vulnerabilities such as behavioural reinforcement and overidentification with the behaviour may be involved such that these individuals engage in NSSI even in the presence of minute emotional stimulation. In either case, findings emphasise that future oriented thoughts attenuate the influence of distress on NSSI.

The different results in the full and subsample analyses in Study 1 suggest different processes may be involved in engaging in NSSI in the first place, and in the overall severity of the behaviour. The cross-sectional nature of the study, however, limited conclusions regarding the role of the emotion regulation processes of interest in NSSI onset and its severity. Accordingly, further investigation into their contributions in

first episode NSSI and its severity was undertaken separately in the two subsequent studies.

Study 2 examined the relationships of the three emotion regulation processes with the presence of acute life stressors and psychological distress, and how these relationships contributed to first episode NSSI. Developmental influences were factored into the model by examining whether age moderated these relationships. Experience of adverse life events and psychological distress were significant predictors of prospective NSSI. While cognitive reappraisal was directly protective of first episode NSSI, this effect was observed only in regard to NSSI onset 12-months from baseline and not at 24-months. Although not noted in the article reproduced in Chapter 6, the effect of reappraisal was weak ($r=-.05$). None of the other emotion regulation processes predicted first episode NSSI and there were nonsignificant findings on the moderating effect of age.

Results contradict previous research which found that cognitive reappraisal was unrelated to NSSI onset (Andrews et al., *in press*; Tatnell et al., 2014); although reasons for the different findings are unclear. Given the strong relationships between acute life stressors and psychological distress with NSSI, the inclusion of factors such as coping styles, self-efficacy and perceived social support in these other studies may have obscured the weak effect of reappraisal.

The third and final study focused on the role of cognitive reappraisal, expressive suppression and rumination in NSSI severity among adolescents who self-injured. Specifically, it examined whether changes in emotion regulation were related to changes in NSSI severity. As reported in Chapter 7, adverse life events and psychological distress at baseline and changes in these factors over time were not related to change in NSSI severity. Of the emotion regulation processes of interest, adolescents with more

frequent use of cognitive reappraisal were more likely to report less severe NSSI at baseline which was reflected in less frequent NSSI. However, over time, these adolescents tended to engage in more frequent NSSI, which may be due to greater room for growth. Increases in cognitive reappraisal over time were significantly related to decreasing NSSI severity even when accounting for gender, age, stressful situations and life events, psychological distress, and concurrent and prospective relationships between the three emotion regulation processes of interest. The exact nature of this effect is unclear as nonsignificant findings emerged when specific domains of NSSI severity were examined (i.e. frequency, duration, medical severity). However, compared with the two earlier studies undertaken, the relationship of cognitive reappraisal with NSSI severity was more robust. None of the other emotion regulation processes (i.e. expressive suppression and rumination) were significantly related to NSSI severity over time.

No studies to-date have examined the relationship between changes in emotion regulation with change in NSSI severity, and in this regard, Study 3 is unique. While Selby et al. (2013) investigated the contribution of daily fluctuations in rumination and NSSI frequency, the authors did not specify nor examine change in NSSI. Results from the final study adds to preliminary findings by Andrews et al. (2013) and suggest that not only is cognitive reappraisal critical in the maintenance of NSSI, it also has a significant impact on its severity over a two year period. Findings were consistent with the literature which indicates that reappraisal is an adaptive emotion regulation process associated with lower negative emotions as well as less psychopathology.

Given that main analyses in Study 3 did not specifically examine whether there may be age-related differences (and by implication, developmental influences) in the pathways between cognitive reappraisal and NSSI severity, a post hoc analysis was

undertaken using a multi-group approach. Among participants in the 12-13 years age group, reappraisal was significantly related to NSSI severity at baseline but not changes in severity over time. Among those in the 14 years age group, reappraisal-NSSI relationships were nonsignificant. Finally, among the oldest age group of 15 years and above, while baseline reappraisal was not related to NSSI, greater increases in cognitive reappraisal were related to decreases in NSSI severity over time. However, no firm conclusions can be drawn from these results which require replication as the models tested did not meet minimum criteria for goodness-of-fit indices and lacked sufficient power to test for interaction effects with age.

Interestingly, between-group differences were found among adolescents who self-injured and their non-self-injuring peers on the variables of interest at baseline. Generally, self-injurers were more likely to report a greater number of stressful situations and life events, and more psychological distress, expressive suppression, and rumination. They also recorded lower scores on cognitive reappraisal. Examination of trajectories of these variables showed that the main difference between groups was experience of more stressful situations and life events over time among adolescents who self-injured compared to their non-self-injuring peers. There were nonsignificant between-group differences in the trajectory of the other variables over the study period.

8.2 Cognitive Reappraisal, Expressive Suppression, and Rumination in Adolescent NSSI

In regard to the broad question on the roles of cognitive reappraisal, expressive suppression and rumination in NSSI, results indicate these emotion regulation processes distinguished adolescents with a history of NSSI from their non-self-injuring peers. Adolescents who engage in NSSI are more likely to use emotion regulation processes which tend to heighten negative emotional states rather than those which can

potentially reduce these emotions. From the nonsignificant group differences in the trajectories of these processes across the three time-points, it could be inferred that developmental patterns of emotion regulation among adolescents who self-injured and those who do not are similar. However, self-injurers were more likely to have experienced more incidents of adverse life events over time. Consequently, these adolescents are more vulnerable as they are less prepared to respond effectively to the challenges they experience. This observation is especially pertinent in NSSI onset where acute life stressors and distress increased risk of engaging in NSSI for the first time. Findings are consistent with the general view that adolescent self-injury is associated with deficits in emotion-focused coping and difficulties with emotion regulation. These deficits could, in turn, also contribute to the number of stressors experienced by self-injurers given that these skills are required for successful negotiation of daily life and interpersonal relationships (see Gross, 2013; John & Gross, 2004). Engagement in NSSI itself might also feature in a vicious cycle of disruptive relationships (Gratz, 2003), adding to the number of stressors experienced by adolescents who self-injured.

The two later studies emphasise the different processes implicated in engaging in NSSI in the first place, and in the overall severity of the behaviour. The presence of acute life stressors and distress predicted first episode NSSI but were not significantly associated with changes in NSSI severity. The differential contribution of acute life stressors and distress indicate that adolescents engage in NSSI as a response to emotional distress, whereas these factors are less relevant in the maintenance and escalation of the behaviour despite accumulating incidents of stressful situations and life events over time.

In either case, the extent to which adolescents are proficient in the use of cognitive reappraisal is likely to mitigate both risk of first episode NSSI and its severity over time

while expressive suppression and rumination had no prospective effects. Therefore, adolescent NSSI may be more strongly related to the absence of adaptive emotion regulation rather than the presence of maladaptive emotion regulation which intensify negative emotion.

8.2.1 Cognitive reappraisal and NSSI

Individuals who engage in NSSI tend to experience more frequent and higher levels of negative emotion (Bresin, 2014; Fliege et al., 2009; Klonsky & Muehlenkamp, 2007). A dispositional tendency to use cognitive reappraisal probably circumvents the emotional triggers for the behaviour, and to a lesser extent, may attenuate levels of distress experienced and therefore reduce the likelihood of NSSI and its escalation. While the specific mechanisms are unclear, it is speculated that the ability to attribute positive (or less negative) meanings to one's circumstances is likely to reduce the negative emotional salience of these circumstances and thereby reduce the intensity and duration of negative mood states.

However, the protection conferred by cognitive reappraisal in first episode NSSI applied only to onset at 12-months from baseline when the mean age of participants was 14.9 years, but not at 24-months when mean age of participants was 15.8 years. The differential relationships of reappraisal and NSSI onset suggests it may be influenced by developmental changes in cognitive-emotional processing during adolescence. Previous research showed quadratic trends in reappraisal use during adolescence, with an initial decrease from early- to mid-adolescence followed by a subsequent increase through late adolescence (Gullone et al., 2010; Gullone & Taffe, 2012). Brain imaging studies reported parallel regions that support cognitive reappraisal which mature at different rates (McRae et al., 2012). These may account for reports that among all adolescents, reappraisal was effective in reducing negative affect

but greater reductions were observed among older adolescents (Silvers et al., 2012). Studies on adolescents' decision-making emphasised changes occurring in the 14-17 year period which impact on their ability to make decisions when emotionally aroused (Steinberg, 2005; Zelazo & Carlson, 2012), and that as adolescents mature they are more resistant to affective cues when assessing rewards from risky decisions (Albert & Steinberg, 2011). Together these studies indicate that in the early stages of development adolescents are less effective in using reappraisal to reduce negative emotion, have a lower capacity to engage in decision-making when experiencing high emotional arousal, and have lower resistance to affective cues when making risky decisions. Webb et al. (2012) found that increased use of cognitive reappraisal was related to increased effectiveness in reducing negative affect. Thus, despite achieving smaller reductions in negative affect during the early stages of adolescence, a greater tendency to engage in cognitive reappraisal is likely to be more effective in reducing emotional arousal and facilitates making more adaptive decisions in the early stages of adolescence. Conversely, as adolescents mature in these cognitive-emotional processing capabilities, frequency of reappraisal use confers little benefit as they are more capable of making adaptive decisions when experiencing emotional strain. Naturally, these observations are speculative as none of the studies measured participants' cognitive-emotional development. While age may be a putative index of when these developmental changes occur, they are not age-specific. This could account for the nonsignificant interaction between age and reappraisal in predicting first episode NSSI.

Whether and to what extent these developmental changes influence the impact of cognitive reappraisal on NSSI severity over time is unclear. Results from the post hoc multi-group analysis reported in Chapter 7 suggest they may be implicated as there were differential relationships among the groups. For younger adolescents aged 12-13

years, higher reappraisal was related to lower NSSI severity only at baseline and did not affect change in severity over time. These adolescents may be at risk of more severe NSSI at baseline due to deficits in their cognitive-emotional processing capabilities and increased use of cognitive reappraisal provides a buffer. However, reappraisal had no impact on future NSSI severity among this group, which may be due to naturally occurring developmental maturity among these adolescents over time. Among adolescents aged 15 years and above, nonsignificant relationships between reappraisal and NSSI at baseline were found. This may be reflective of developmental maturation described above. However, while older adolescents may be capable of more sophisticated cognitive-emotional processing, increasing reappraisal is likely to confer additional benefits in reducing NSSI severity. These observations are, naturally, tentative given the limitations to the post hoc analysis, and the overall study design described above.

8.2.2 Expressive suppression and NSSI

Previous research shows expressive suppression increases the experience of negative emotion (Gross & John, 2003; Gross & Levenson, 1993, 1997) and hints that it may be pertinent in NSSI, especially in regard to NSSI severity (Hasking et al., 2008; Hasking et al., 2010). The null findings in the present research on the prospective contribution of expressive suppression were therefore unexpected, and may be due to a lack of specificity. Zeman et al. (2006) noted display rules (i.e. rules regarding emotional expression) are learnt early in development and become more heightened in adolescence with increased awareness of the interpersonal consequences of emotional expressive behaviour. Use of expressive suppression may be adaptive, such as when suppressing expressions of joy in the company of a friend who is feeling sad. Increasing use of expressive suppression may be reflective of these situations, rather than a

tendency to suppress negative emotions per se, with the concomitant amplification of negative emotion states. Thus it may be that the risk associated with increased expressive suppression may only be applicable to an increased tendency to suppress the expression of negative emotions rather than a tendency for expressive suppression generally. Such a view is consistent with perspectives of NSSI as a means to communicate distress (i.e. the social signalling hypothesis described by Nock, 2009) as adolescents who tend to suppress the expression of negative emotions may be unable to make their distress known to others.

However, results do suggest expressive suppression is somehow implicated in NSSI. The current findings that adolescents who self-injured had significantly higher scores on suppression, are in accord with other research that indicates some relationship with NSSI maintenance and severity (Andrews et al., 2013; Hasking et al. 2008; Hasking et al. 2010). Research into the link between suppression and NSSI tends to specify the direction of influence as flowing from suppression to NSSI. Perhaps the relationship between the two has an opposite direction. As NSSI may itself be a form of emotional expression, adolescents who self-injure may be more reluctant to express emotion generally as doing so is associated with a behaviour that attracts both shame and guilt in the perpetrator and stigma from those around them. This observation is, of course, speculative and needs to be tested.

8.2.3 Rumination and NSSI

Similarly, nonsignificant findings in relation to rumination and NSSI may also be obscured by the measure of rumination used which was not specifically predicated on negative emotion states but was intended to measure a global repetitive, intrusive thinking style. According to the Emotional Cascade Model (Selby & Joiner, 2009), rumination predicts dysregulated behaviours such as NSSI only in the context of

negative emotion states. In these circumstances, rumination amplifies the negative emotion through emotional cascades. It remains to be seen whether a tendency to ruminate while in a negative mood state, rather than a disposition to ruminate generally, is predictive of future NSSI.

Nonetheless, results from the first study show that consideration of different aspects of ruminative thinking can illuminate the nuances in the rumination-NSSI relationship, hinting at the relevance of dwelling on the past and making comparisons with the present (i.e. counterfactual rumination) among adolescents with more severe NSSI. Although not predictive of NSSI onset and its escalation, counterfactual rumination may be characteristic of adolescents with more severe NSSI as they have experienced a greater number of adverse life events and therefore might be more prone to ponder about what could have been. Again, this speculation hints at a reverse direction in the association between rumination and NSSI, and might account for how results from the cross-sectional analysis were not replicated in the prospective studies reported in Chapter 6 and Chapter 7.

8.3 Research Implications

The current research highlights several areas for further investigation in regard to the contribution of emotion regulation processes in NSSI. Firstly, the impact of developments in cognitive-emotional processing during adolescence is of direct interest if effective interventions for adolescent NSSI are to be developed. Related to this, the current research focused on adolescents (12-18 year olds) and, as noted in Chapter 6, was able to examine NSSI onset predominantly from 14 years and above. However, this represents the upper range of the typical age of onset which has been estimated at 12 to 14 years. Extension of research to include younger children would be beneficial as it can assist in further elucidating developmental influences on NSSI, allowing for examination

of biological (e.g. puberty) and social (e.g. transitions from child to adolescent, primary to high school) changes.

Secondly, it ought to be noted that the effects of cognitive reappraisal in NSSI onset were weak. As discussed, the strength of the relationship between reappraisal and NSSI may be obscured by the indices of acute life stress and distress used in the current research which include more extreme incidents and psychological deterioration. Alternatively, effect sizes of reappraisal use may be dependent on other factors (e.g. self-efficacy, attributional styles) which were not examined in these studies. Cognitive reappraisal refers to a process by which emotions are regulated, and the measure indexes tendency to reappraise rather than the content of reappraisals. Future research on the influence of attributional styles (i.e. content of appraisals) may be useful as previous studies suggest negative attributional styles contribute to maintenance of NSSI (see Guerry & Prinstein, 2010), while optimism is negatively related to NSSI and attenuates the adverse contribution of high psychological distress (Tanner et al., *in press*). Work on *stress reappraisal* or, more specifically, *arousal reappraisal* (see Jamieson, Mendes, & Nock, 2013) where individuals interpret physiological stress responses in a positive light (e.g. assisting one to take action) suggests it may also be useful in extending understanding of reappraisal processes in NSSI. Finally, a recent study by Perez, Venta, Garnaat, and Sharp (2013) implicates beliefs about emotion regulation capability. The authors found that adolescents with high scores on the “limited access to emotion regulation strategies” subscale of the Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004), which reflect these beliefs, were more likely to have engaged in NSSI over and above other indices of emotion dysregulation (i.e. nonacceptance of emotional experience, difficulties with goal-directed behaviours and impulse control, lack of emotional awareness, and lack of emotional clarity). As

acknowledged by the authors, the study examined lifetime NSSI and is limited in its generalisability to current or future NSSI. However, it highlights another promising extension of findings reported in this thesis.

A third and further area of future research pertains to investigation of emotion regulation of negative mood states specifically rather than general use of these emotion regulation processes. As previously highlighted, the contribution of expressive suppression and rumination in NSSI may be predicated on engagement in these processes when in a negative mood. Thus, their contribution in NSSI may have been obscured in the current set of studies. Extending this argument, future research may benefit from utilising other designs such as experience sampling methods (for examples see Arney et al., 2011; Selby et al., 2013; Victor & Klonsky, 2014) which allow for more focused examination of how use of various emotion regulation processes impact on mood states (and vice versa), and how these dynamics are related to NSSI.

Fourth, as noted in Chapter 3, emotion regulation is a broad concept and includes a range of responses that serve to modulate emotional experience. The current research examined three of these processes. Future research would benefit from examination of other adaptive emotion regulation processes such as distraction and acceptance of emotion (Aldao et al., 2013; Webb et al., 2012) and their roles in NSSI. Additionally, examination of how these processes interact with personality factors such as alexithymia and emotional sensitivity/reactivity could deepen understanding of the emotional dynamics in NSSI. Future research may also benefit from extending the enquiry of emotion regulation in NSSI through an investigation of the influence of different profiles of emotion regulation (see Loughheed & Hollenstein, 2012 on the relationship of different emotion regulation profiles on internalising symptoms). The findings from the current research may guide this work and provides some clues as to

which emotion regulation processes (i.e. cognitive reappraisal) are most salient in predicting NSSI.

Finally, it has been observed that findings from cross-sectional studies do not always translate to longitudinal designs (Andrews et al., *in press*; Glenn & Klonsky, 2011). This was the case in the current research and emphasises the relevance of findings in regard to cognitive reappraisal which emerged as a significant factor across the three studies. Naturally more prospective studies are required to disentangle the contribution of various risk factors identified in cross-sectional studies in NSSI onset and severity. Findings from the current research that different processes may be implicated in first episode NSSI and escalation of the behaviour recommends future research into different domains of NSSI (e.g. onset, cessation, frequency, medical severity) to better elucidate which factors are pertinent in each of these domains to assist with the development of targeted interventions. As previous NSSI has been identified as a stronger predictor than putative risk factors of future NSSI, research designs that incorporate the notion of change (such as latent growth curve models) might assist with these investigations.

Related to the above, cross-sectional findings may not translate to prospective studies because of the bidirectional influences of NSSI on suggested risk factors. The various observations regarding acute life stress, expressive suppression and rumination noted above speculate how NSSI itself might influence these putative risk factors. As noted in Chapter 7, several data analytic techniques (e.g. autoregressive cross-lagged techniques, latent difference score approach) are available to examine piecemeal changes in emotion regulation processes and the concomitant influence on NSSI severity and vice versa. Unfortunately, due to lack of power, it was not possible in the current research to utilise these to test piecemeal and bidirectional influences. Certainly

future research with larger sample sizes to enable such investigations will be well regarded.

8.4 Clinical Implications

Findings from the three studies reported in this thesis have relevant implications for the design of prevention, early intervention and treatment programs for adolescent NSSI. While the tentative conclusion drawn from Study 1 was that contextual, social and behavioural factors may be more relevant than cognitive factors, findings from the subsequent studies highlight that addressing adolescents' appraisals of stressful situations and life events including the meanings they attribute to them can have a beneficial effect (albeit small) on their risk of engaging in NSSI in the first place, as well as the severity of the behaviour over time. Importantly, as adolescents who self-injure engage in reappraisal less than their non-self-injuring peers but are more prone to experience a greater number of acute life stressors, interventions should aim to, at least, increase their use of reappraisal to the same level as their peers. Additionally, given the nonsignificant associations between expressive suppression and rumination with NSSI, the current studies suggest improving adolescents' skill and capacity to reappraise and reduce the emotional salience of adverse life events is likely to have more utility than interventions aimed at reducing maladaptive emotion regulation use.

8.4.1 Prevention programs

In regard to NSSI prevention, results suggest building adolescents' resilience and capacity to cope with acute life stressors and managing distress is likely to be beneficial. Universal school-based programs addressing social and emotional learning and mental health have been implemented to address a range of issues including bullying, depression and anxiety, psychological health and well-being, and academic achievement. On the whole, these have been effective (for reviews see Calear &

Christensen, 2010; Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Weare & Nind, 2011). Such programs are likely to also have a beneficial impact in the prevention of adolescent NSSI as they build on general skills and competencies.

Hale, Fitzgerald-Yau, and Viner (2014) highlight the constraints under which school-based prevention efforts operate (e.g. limited funding and time constraints), and suggested programs aimed at reducing multiple health risk behaviours (MHRB) could be a solution to these challenges as these programs can target common risk factors. The authors reported there is some evidence for their effectiveness. Although, thus far, the evidence for MHRB intervention programs is limited to substance use, aggressive behaviours, and sexual risk-taking, the findings are promising and hint at a direction that prevention efforts for NSSI can take.

As NSSI typically first occurs among adolescents aged 12-14 years, findings from the current set of studies recommend targeted interventions for younger adolescents in early high school. Specifically, these programs should incorporate capacity building in the use of cognitive reappraisal to shore up adolescents' resilience against acute life stressors. Rather than an add-on, improving skills in reappraisal is likely to address common risk factors for other problems encountered in adolescence such as depression, anxiety, and school refusal (Betts et al., 2009; Hughes et al., 2010; Hughes et al., 2011) which would make these programs attractive given constraints noted above.

The perspectives and research discussed in Chapter 2 are relevant to prevention efforts. They highlight a range of factors such as exposure to peers who self-injure which may assist with early identification of adolescents at-risk. Findings from the current research add to this as they show that adolescents who self-injured experienced more stressful situations and life events which were predictive of NSSI onset. Experience of more stressors could, therefore, also be used as an indicator of NSSI risk.

In the current sample, self-injurers reported a mean of eight out of the twenty listed acute stressors in the Adolescent Life Events Survey (Hawton et al., 2006) at baseline, compared with non-self-injurers who reported a mean of five events¹⁸. There were significantly more self-injurers reporting each of the listed acute stressors compared with non-self-injurers. Greater differences were found on the more “benign” stressors such as problems with school work and family tensions (cf. abuse), suggesting it is the presence of more stressors rather than the nature of these stressors that increases risk. Tentatively, adolescents who have experienced more than five acute life stressors such as those listed in the Adolescent Life Events Survey may be considered to be at risk of engaging in NSSI.

As self-injurers also engaged in less cognitive reappraisal at baseline which increases risk of first episode NSSI, preventive interventions could, therefore, work with adolescents at-risk to increase reappraisal use as well as its effectiveness. How these adolescents interpret their circumstances to find more positive appraisals that facilitate their ability to cope with these stressors (e.g. grieving and accepting death of loved one as part of life versus catastrophising that they would never be loved again), is likely to be important. Moreover, given tentative observations regarding the impact of developmental influences on adolescents’ risky decision-making, preventive interventions for younger adolescents can also assist with strategies for reducing emotional arousal and identification of alternative and more productive ways to cope with these stressors (e.g. mindfulness; see Metz et al., 2013; Tan & Martin, *in press*) and reduce the perceived reward value of engaging in NSSI (e.g. weighing up costs and benefits of engaging in NSSI in the first place).

¹⁸ Self-injurers recorded standard deviation of 3.5 adverse life incidents at baseline (cf. non-self-injurers who recorded standard deviation of 3.0 incidents).

8.4.2 Early intervention and treatment programs

In regard to early intervention and treatment, access to adolescents who have begun or continue to engage in NSSI is a critical threshold issue. Adolescents who self-injure may be the most likely to require assistance but are the least likely to seek it (Evans et al., 2005). There have been several investigations into this issue (see Berger, Hasking, & Martin, 2013), including a promising evaluation of a school-based program which may increase the likelihood of help-seeking among the target population (Muehlenkamp, Walsh, & McDade, 2010).

For adolescents who self-injure, findings from the current research suggest increasing cognitive reappraisal use and proficiency is likely to have a beneficial impact. Such an approach can be incorporated into the range of promising interventions for adolescent NSSI identified in Chapter 2 (e.g. Cognitive-Behaviour Therapy, Dialectical Behaviour Therapy, Mentalization-Based Therapy).

Previous research highlights negative emotion states such as feeling sad, anxious or angry may serve as triggers for NSSI. Indeed, Arney et al. (2011) reported changes in levels of negative emotion are evident hours prior to self-injurious acts, and reach a peak during an NSSI episode. This suggests a temporal chain of escalating emotion which could be interrupted. Based on current research findings, assisting adolescents who have begun to engage in NSSI to identify cognitive and emotional triggers, and improving their skills in the use of reappraisal to de-escalate negative emotion states is indicated in the treatment of NSSI. This approach is featured in several of the interventions reviewed previously; however, use of *chain analysis* as featured in Dialectical Behaviour Therapy interventions extends the analysis further as it does not just focus on temporally proximate triggers (Koerner & Dimeff, 2007), and could therefore be more useful.

Chain analysis proceeds with identifying antecedent factors leading up to the focal behaviour (typically self-harming behaviours such as NSSI). These antecedent factors include situational, social, cognitive and emotional factors. The aim of chain analysis is to identify points at which individuals may interrupt the chain of events leading up to the behaviour. For example, an individual may identify feeling angry as a precursor to NSSI. The negative emotional state may be preceded by a comment from a family member or friend. Negative cognitions arising from the comment may also be identified, as well as general factors such as feeling physically unwell. Using chain analysis, the therapist will work with the client to recognise the vulnerabilities associated with feeling unwell and negative cognitions and to identify strategies to prevent future reoccurrence of the behavioural chain. Reappraisal may be one of the strategies suggested to address negative cognitions which in turn may prevent or reduce the angry feelings that trigger NSSI.

As the discussion in Chapter 2 shows, various perspectives on NSSI including the theoretical foundations in existing therapeutic approaches implicate a range of other factors that may be relevant in disrupting the behavioural chain described above. The Experiential Avoidance Model (Chapman et al., 2006), for example, identifies avoidance and lower capacity to tolerate distress as possible elements in this chain. Interventions such as Emotion Regulation Group Therapy (Gratz & Gunderson, 2006; Gratz & Tull, 2011) and Dialectical Behaviour Therapy include components such as acceptance of emotions, mindfulness and skills in distress tolerance; all of which are likely to have a beneficial impact. It is also likely that behavioural reinforcement principles will be pertinent. Previous research indicates NSSI may be reinforced through the alleviation of unwanted emotional states or achieving a desired emotional state, and may also be socially reinforced (Nock & Prinstein, 2004). These NSSI-specific vulnerabilities must

therefore be taken into account. Continuing from the previous example, alternative behaviours to soothe angry feelings may be suggested. Use of these alternative behaviours in future episodes is reinforced by the therapist, while reoccurrence of NSSI is not.

The relative strength of the various components described above (including cognitive strategies such as reappraisal) are unclear and could benefit from further investigation, particularly in the context of adolescent NSSI. Given differences in adolescents' capacities to engage in cognitive-emotional processing when under stress, finding the best "mix" is of direct importance.

8.5 Limitations

The above recommendations for future research, as well as prevention, early intervention and treatment efforts to address adolescent NSSI should be considered in light of several limitations. While some of these have been previously identified as topics for further research above, a number of others relating to the design of the current studies ought to be noted.

Firstly, the three studies drew from a single cohort of adolescents and therefore, consistent findings across these studies are unsurprising. Replication with different samples of adolescents is therefore required to establish their robustness. As the current cohort was predominantly female, and drawn from higher socioeconomic and urban areas, generalisability of findings to adolescents with different demographic backgrounds is also limited.

Additionally, less than 50% of the final sample participated across all three waves. To address this issue, the studies utilised accepted methodologies for handling missing data. Test of robustness by comparing results using MI and FIML, with data from

participants who completed the three waves showed findings were generally consistent, however efforts to increase retention rate in future work should be applauded.

Moreover, the current studies utilised self-report measures of the variables of interest which are subject to several biases including inaccuracies in reporting and interpretation. They also did not test specifically for how use of emotion regulation processes actually affect emotional states for which other designs such as experience sampling may be more suited. Related to this, the studies measured propensity to use these emotion regulation processes which may not translate to their effectiveness in modulating emotions.

Finally, recommendations regarding interventions are naturally tentative and require development and evaluation before firm conclusions can be made. Nonetheless, these recommendations highlight some interesting and worthwhile directions that interventions to address adolescent NSSI can take.

8.5 Conclusion

The current set of studies adds to the limited number of longitudinal examinations of adolescent NSSI and to investigations on proximal vulnerability factors which are amenable to change. Specifically, the role of specific emotion regulation processes in NSSI was examined and as such, provides new insights into the development and design of prevention, early intervention and treatment among this population.

Consistent with previous work in this area, results highlight differences in emotion regulation use among adolescents who engage in NSSI and those who do not. The longitudinal design allowed for an examination of the trajectories of these processes and showed that, despite the differences in initial levels, these trajectories are similar. However, adolescents who self-injure start off at a disadvantage and experience increased vulnerability over time as they are more likely to experience more acute life

stressors than their peers. While this group of adolescents have a propensity to engage in less helpful emotion regulation processes that tend to heighten negative emotion states, results suggest focusing on increasing use of more adaptive processes that reduce negative emotion (i.e. cognitive reappraisal) may have a more beneficial impact. The benefits of increased use and proficiency in cognitive reappraisal are likely to apply across the spectrum of prevention to treatment.

REFERENCES

Pursuant to the Monash University Faculty of Medicine, Nursing and Health Sciences guidelines on thesis by publication, only references appearing in Chapters 1 – 4 and Chapter 8 are included in this reference list. Also included are references appearing in the framing texts of Chapters 5 – 7.

- Acock, A. (2012). What to do about missing values. In H. Cooper (Ed.), *APA Handbook of Research Methods in Psychology*. Washington, DC: American Psychological Association.
- Aitken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park: Sage.
- Albert, A., & Steinberg, L. (2011). Judgement and decision making in adolescence. *Journal of Research on Adolescence*, 21, 211 – 224. doi: 10.1111/j.1532-7795.2010.00724.x
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30, 217 – 237.
- Allen, J. P., Manning, N., & Meyer, J. (2010). Tightly linked systems: Reciprocal relations between maternal depressive symptoms and maternal reports of adolescent externalizing behaviour. *Journal of Abnormal Psychology*, 119, 825 – 835. Doi: 10.1037/a0021081
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, VA: American Psychiatric Association.

- Andover, M. S., Morris, B. W., Wren, A., & Bruzzese, M. E. (2012). The co-occurrence of non-suicidal self-injury and attempted suicide among adolescents: Distinguishing risk factors and psychosocial correlates. *Child and Adolescent Psychiatry and Mental Health*, 6(11), 1-7.
- Andover, M. S., Pepper, C. M., & Gibb, B. E. (2007). Self-mutilation and coping strategies in a college sample. *Suicide & Life-Threatening Behaviour*, 37, 238 – 243.
- Andrews, T., Martin, G., Hasking, P., & Page, A. (2013). Predictors of continuation and cessation of non-suicidal self-injury. *Journal of Adolescent Health*, 53, 40-46. Doi: 10.1016/j.jadohealth.2013.01.009
- Andrews, T., Martin, G., Hasking, P., Page, A. (*in press*). Predictors of onset for non-suicidal self-injury within a community-based sample of adolescents. *Prevention Science*. doi: 10.1007/s11121-013-0412-8
- Armey, M. F., & Crowther, J. H. (2008). A comparison of linear versus non-linear models of aversive self-awareness, dissociation, and non-suicidal self-injury among young adults. *Journal of Consulting and Clinical Psychology*, 76, 9 – 14. Doi: 10.1037/0022-006X.76.1.9
- Armey, M. F., Fresco, D. M., Moore, M. T., Mennin, D. S., Turk, C. L., Heimberg, R. G., et al. (2009). Brooding and pondering: Isolating the active ingredients of depressive rumination with exploratory factor analysis and structural equation modelling. *Assessment*, 16, 315 – 327. Doi: 10.1177/1073191109340388
- Armey, M. F., Crowther, J. H., & Miller, I. W. (2011). Changes in Ecological Momentary Assessment reported affect associated with episodes of nonsuicidal self-injury. *Behaviour Therapy*, 42, 579 – 588.

- Australian Bureau of Statistics (2013a). *Census of Population and Housing: Socioeconomic Indexes for Areas (SEIFA), Australia 2011*. (ABS cat no. 2033.0.55.001). Canberra: ABS.
- Australian Bureau of Statistics (2013b). *Australian Social Trends, April 2013*. (ABS cat no. 4102.0). Canberra: ABS.
- Baetens, I., Claes, L., Willem, L., Muehlenkamp, J. J., & Bijttebier, P. (2011). The relationship between non-suicidal self-injury and temperament in male and female adolescents based on child- and parent-report. *Personality & Individual Differences, 50*, 527 – 530. Doi: 10.1016/j.paid.2010.11.015
- Baksheev, G. N., Robinson, J., Cosgrave, E. M., Baker, K., & Yung, A. R. (2011). Validity of the 12-item General Health Questionnaire (GHQ-12) in detecting depressive and anxiety disorders among high school students. *Psychiatry Research, 187*, 291 – 296. Doi: 10.1016/j.psychres.2010.10.010
- Bateman, A., & Fonagy, P. (2009). Randomized controlled trial of outpatient mentalization-based treatment versus structured clinical management for Borderline Personality Disorder. *American Journal of Psychiatry, 166*, 1355 – 1364.
- Berenbaum, H., Thompson, R. J., & Pomerantz, E. M. (2007). The relation between worrying and concerns: The importance of perceived probability and cost. *Behaviour Research and Therapy, 45*, 301 - 311.
- Berger, E., Hasking, P., & Martin, G. (2013). 'Listen to them': Adolescents' views on helping young people who self-injure. *Journal of Adolescence, 36*, 935 – 945. Doi: 10.1016/j.adolescence.2013.07.011
- Berking, M., & Wupperman, P. (2012). Emotion regulation and mental health: Recent findings, current challenges, and future directions. *Current Opinion in Psychiatry, 25*, 128 – 134. Doi: 10.1097/YCO.0B013E3283503669

- Betts, J., Gullone, E., & Allen, J. S. (2009). An examination of emotion regulation, temperament, and parenting style as potential predictors of adolescent depression risk status: A correlational study. *British Journal of Developmental Psychology*, 27, 473 – 485. Doi: 10.1348/026151008X314900
- Bilsky, S. A., Cole, D. A., Dukewich, T. L., Martin, N. C., Sinclair, K. R., Tran, C. V., Roeder, K. M., Felton, J. W., Tilghman-Osborne, C., Weitlauf, A. S., & Maxwell, M. A. (2013). Does supportive parenting mitigate the longitudinal effects of peer victimization on depressive thoughts and symptoms in children? *Journal of Abnormal Psychology*, 122, 406 – 419. Doi: 10.1037/a0032501
- Bjärehed, J., & Lundh, L. (2008). Deliberate self-harm in 14-year-old adolescents: How frequent is it, and how is it associated with psychopathology, relationship variables, and styles of emotional regulation? *Cognitive Behaviour Therapy*, 37, 26 – 37.
- Boergers, J., & Spirinto, A. (2003). Follow-up studies of child and adolescent suicide attempters. In R.A. King & A. Apter (Eds.), *Suicide in Children and Adolescents*. NY: Cambridge University Press.
- Borkovec, T. D. (1994). The nature, functions, and origins of worry. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on Theory, Assessment and Treatment* (pp. 5 - 33). West Sussex: John Wiley & Sons, Ltd.
- Borrill, J., Fox, P., Flynn, M., & Roger, D. (2009). Students who self-harm: Coping style, rumination and alexithymia. *Counselling Psychology Quarterly*, 22, 361 – 372.
- Brausch, A. M., & Girresch, S. K. (2012). A review of empirical treatment studies for adolescent nonsuicidal self-injury. *Journal of Cognitive Psychotherapy: An International Quarterly*, 26, 3 – 18. Doi: 10.1891/0889-8391.26.1.3

- Bresin, K. (2014). Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: A daily diary study. *Behaviour Therapy*, 45, 56 – 66.
- Bresin, K., & Gordon, K. H. (2013). Endogenous opioids and nonsuicidal self-injury: A mechanism of affect regulation. *Neuroscience and Biobehavioural Reviews*, 37, 374 – 383. Doi: 10.1016/j.neubiorev.2013.01.020
- Bridge, J. A., Goldstein, T. R., & Brent, D. A. (2006). Adolescent suicide and suicidal behaviour. *Journal of Child Psychology and Psychiatry*, 47, 372 – 394. doi: 10.1111/j.1469-7610.2006.01615.x
- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, 65, 1 – 19. Doi: 10.1002/jclp.20542
- Brown, S. A., Williams, K., & Collins, A. (2007). Past and recent deliberate self-harm: Emotion and coping strategy differences. *Journal of Clinical Psychology*, 63, 791 – 803. Doi: 10.1002/jclp.20380
- Bureau, J., Martin, J., Freynet, N., Poirier, A. A., Lafontaine, M., & Cloutier, P. (2010). Perceived dimensions of parenting and non-suicidal self-injury in young adults. *Journal of Youth and Adolescence*, 39, 484 – 494. doi: 10.1007/s10964-009-9470-4
- Burwell, R. A., & Shirk, S. R. (2007). Subtypes of rumination in adolescence: Associations between brooding, reflection, depressive symptoms and coping. *Journal of Clinical Child & Adolescent Psychology*, 36(1), 56 – 65. Doi: 10.1080/15374410709336568
- Calear, A. L., & Christensen, H. (2010). Systematic review of school-based prevention and early intervention programs for depression. *Journal of Adolescence*, 33, 429 – 438. Doi: 10.1016/j.adolescence.2009.07.004
- Calmes, C. A., & Roberts, J. E. (2007). Repetitive thought and emotional distress: Rumination and worry as prospective predictors of depressive and anxious

- symptomatology. *Cognitive Therapy and Research*, 30, 343 – 356. Doi: 10.1007/s10608-006-9026-9
- Caprara, G. V., Paciello, M., Gerbino, M., & Cugini, C. (2007). Individual differences conducive to aggression and violence: Trajectories and correlates of irritability and hostile rumination through adolescence. *Aggressive Behaviour*, 33, 359 – 374.
- Carter, G. L., Willcox, C. H., Lewin, T. J., Conrad, A. M., & Bendit, N. (2010). Hunter DBT project: Randomised controlled trial of dialectical behaviour therapy in women with borderline personality disorder. *Australian & New Zealand Journal of Psychiatry*, 44, 162 – 173.
- Chanen, A. M., & Kaess, M. (2012). Developmental pathways to Borderline Personality Disorder. *Current Psychiatry Reports*, 14, 45 – 53. Doi: 10.1007/s11920-011-0242-y
- Chapman, A. L., Gratz, K. L., & Brown, M. Z. (2006). Solving the puzzle of deliberate self-harm: The experiential avoidance model. *Behaviour Research and Therapy*, 44, 371 – 394. Doi: 10.1016/j.brat.2005.03.005
- Claes, L., Houben, A., Vandereycken, W., Bijttebier, P., & Muehlenkamp, J. (2010). Brief report: The association between non-suicidal self-injury, self-concept and acquaintance with self-injurious peers in a sample of adolescents. *Journal of Adolescence*, 33, 775 – 778.
- Conway, M., Csank, P. A. R., Holm, S. L., & Blake, C.K. (2000). On assessing individual differences in rumination on sadness. *Journal of Personality Assessment*, 75, 404 – 425.
- Costa, P. T., Jr., & McCrae, R. R. (1992). Revised NEO Personality Inventory (Neo-PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional manual. Odessa, FL: Psychological Assessment Resources.

- Crowell, S. E., Beauchaine, T. P., Hsiao, R. C., Vasilev, C. A., Yaptangco, M., Linehan, M. M., & McCauley, E. (2012). Differentiating adolescent self-injury from adolescent depression: Possible implications for borderline personality development. *Journal of Abnormal Child Psychology*, 40, 45 – 57. Doi: 10.1007/s10802-011-9578-3
- Dilberto, T. L., & Nock, M. K. (2008). An exploratory study of correlates, onset, and offset of non-suicidal self-injury. *Archives of Suicide Research*, 12, 219 – 231. Doi: 10.1080/13811110802101096
- Duggan, J. M., Toste, J. R., & Heath, N. L. (2013). An examination of the relationship between body image factors and non-suicidal self-injury in young adults: The mediating influence of emotion dysregulation. *Psychiatry Research*, 206, 256 – 264. doi: 10.1016/j.psychres.2012.11.016
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' Social and Emotional Learning: A meta-analysis of school-based universal interventions. *Child Development*, 82, 405 – 432. Doi: 10.1111/j.1467-8624.2010.01564.x
- Evans, E., Hawton, K., & Rodham, K. (2005). In what ways are adolescents who engage in self-harm or experience thoughts of self-harm different in terms of help-seeking, communication and coping strategies? *Journal of Adolescence*, 28, 573 – 587. Doi: 10.1016/j.adolescence.2004.11.001
- Evans, K., Tyrer, P., Catalan, J., Schmidt, U., Davidson, K., Dent, J., Tata, P., Thornton, S., Barber, J., & Thompson, S. (1999). Manual-assisted cognitive-behaviour therapy (MACT): A randomized controlled trial of a brief intervention with bibliotherapy in the treatment of recurrent deliberate self-harm. *Psychological Medicine*, 29, 19 – 25.

- Feigenbaum, J. (2010). Self-harm – The solution not the problem: The Dialectical Behaviour Therapy Model. *Psychoanalytic Psychotherapy*, 24, 115 – 134. doi: 10.1080/02668731003707873
- Felton, J. W., Cole, D. A., & Martin, N. C. (2013). Effects of rumination on child and adolescent depressive reactions to a natural disaster: The 2010 Nashville Flood. *Journal of Abnormal Psychology*, 122, 64 – 73. Doi: 10.1037/a0029303
- Fleischhaker, C., Bohme, R., Sixt, B., Bruck, C., Schneider, C., & Schulz, E. (2011). Dialectical Behavioral Therapy for Adolescents (DBT-A): A clinical trial for patients with suicidal and self-injurious behavior and borderline symptoms with a one-year follow-up. *Child and Adolescent Psychiatry and Mental Health*, 5:3. <http://www.capmh.com/content/5/1/3>
- Fliege, H., Lee, J., Grimm, A., & Klapp, B. F. (2009). Risk factors and correlates of deliberate self-harm behaviour: A systematic review. *Journal of Psychosomatic Research*, 66, 477 – 493. Doi: 10.1016/j.jpsychores.2008.10.013
- Giletta, M., Scholte, R. H. J., Engels, R., Ciairano, S., & Prinstein, M. J. (2012). Adolescent non-suicidal self-injury: A cross-national study of community samples from Italy, the Netherlands and the United States. *Psychiatry Research*, 197, 66 – 72. Doi: 10.1016/j.psychres.2012.02.009
- Glenn, C. R., & Klonsky, E. D. (2013). Nonsuicidal Self-Injury Disorder: An empirical investigation in adolescent psychiatric patients. *Journal of Clinical Child & Adolescent Psychology*, 42, 496 – 507. Doi: 10.1080/15374416.2013.794699
- Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson.
- Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I.

- Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality Psychology in Europe*, Vol. 7 (pp. 7–28). Tilburg, The Netherlands: Tilburg University Press.
- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549 – 576. Doi: 10.1146/annurev.psych.58.110405.085530
- Gratz, K. L. (2003). Risk factors for and functions of deliberate self-harm: An empirical and conceptual review. *Clinical Psychology: Science and Practice*, 10, 192 – 205. Doi: 10.1093/clipsy/bpg022
- Gratz, K. L. (2006). Risk factors for deliberate self-harm among female college students: The role and interaction of childhood maltreatment, emotional inexpressivity, and affect intensity/reactivity. *American Journal of Orthopsychiatry*, 76, 238 – 250. Doi: 10.1037/002-9432.76.2.238
- Gratz, K. L., & Chapman, A. L. (2007). The role of emotional responding and childhood maltreatment in the development and maintenance of deliberate self-harm among male undergraduates. *Psychology of Men & Masculinity*, 8, 1 – 14. Doi: 10.1037/1524-9220.8.1.1
- Gratz, K. L., & Gunderson, J. G. (2006). Preliminary data on an acceptance-based emotion regulation group intervention for deliberate self-harm among women with Borderline Personality Disorder. *Behavior Therapy*, 37, 25 – 35.
- Gratz, K.L., Levy, R., & Tull, M.T. (2012). Emotion regulation as a mechanism of change in Acceptance-based Emotion Regulation Group Therapy for deliberate self-harm among women with Borderline Personality pathology. *Journal of Cognitive Psychotherapy: An International Quarterly*, 26, 365 – 380. doi: 10.1891/0889-8391.26.4.365

- Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotional Regulation Scale. *Journal of Psychopathology and Behavioural Assessment*, 26, 41 – 54.
- Gratz, K. L., & Roemer, L. (2008). The relationship between emotion dysregulation and deliberate self-harm among female undergraduate students at an urban commuter university. *Cognitive Behaviour Therapy*, 37, 14 – 25. Doi: 10.1080/16506070701819524
- Gratz, K. L., & Tull, M. T. (2011). Brief report: Extending research on the utility of an adjunctive emotion regulation group therapy for deliberate self-harm among women with Borderline Personality pathology. *Personality Disorders: Theory, Research, and Treatment*, 2, 316 – 326. doi: 10.1037/a0022144
- Gresham, D., & Gullone, E. (2012). Emotion regulation strategy use in children and adolescents: The explanatory roles of personality and attachment. *Personality and Individual Differences*, 52, 616 – 621. Doi: 10.1016/j.paid.2011.12.016
- Gross, J. J. (1998a). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, 74, 224 – 237.
- Gross, J. J. (1998b). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2, 271 – 299.
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348 – 362. Doi: 10.1037/0022-3514.85.2.348

- Gross, J. J. (2013). Emotion regulation: Taking stock and moving forward. *Emotion*. Advanced Publication. doi: 10.1037/a0032135
- Gross, J. J., & Barrett, L. F. (2011) Emotion generation and emotion regulation: One or two depends on your point of view. *Emotion Review*, 3, 8 – 16. Doi: 10.1177/1754073910380974
- Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behaviour. *Journal of Personality and Social Psychology*, 64, 970 – 986.
- Gross, J. J., & Levenson, R. W. (1997). Hiding feelings: The acute effects of inhibiting negative and positive emotion. *Journal of Abnormal Psychology*, 106, 95 – 103.
- Guan, K., Fox, K. R., & Prinstein, M. J. (2012). Nonsuicidal self-injury as a time-invariant predictor of adolescent suicide ideation and attempts in a diverse community sample. *Journal of Consulting and Clinical Psychology*, 80, 842 – 849. Doi: 10.1037/a0029429
- Guerry, J. D., & Prinstein, M. J. (2010). Longitudinal prediction of adolescent nonsuicidal self-injury: Examination of a cognitive vulnerability-stress model. *Journal of Clinical Child & Adolescent Psychology*, 39, 77 – 89. Doi: 10.1080/15374410903401195
- Gullone, E. & Taffe, J. (2012). The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA): A psychometric evaluation. *Psychological Assessment*, 24, 409 – 417. Doi : 10.1037/a0025777
- Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: A 2-year follow-up study. *Journal of Child Psychology and Psychiatry*, 51, 567 – 574. Doi: 10.1111/j.1469-7610.2009.02183.x

- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. (2001). Development and initial validation of the Self-Harm Behavior Questionnaire. *Journal of Personality Assessment*, 77(3), 475 – 490. Doi: 10.1207/S15327752JPA7703_08
- Haines, J., & Williams, C. L. (1997). Coping and problem solving of self-mutilators. *Journal of Clinical Psychology*, 53, 177 – 186.
- Hales, D. R., Fitzgerald-Yau, N., & Viner, R. M. (2014). A systematic review of effective interventions for reducing multiple health risk behaviours in adolescence. *American Journal of Public Health*, 104, e19 – e41. Doi: 10.2105/AJPH.2014.301874
- Hampel, P. & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, 34, 73 – 83. Doi: 10.1007/s10964-005-3207-9
- Hamza, C. A., Stewart, S. L., & Willoughby, T. (2012). Examining the link between nonsuicidal self-injury and suicidal behaviour: A review of the literature and an integrated model. *Clinical Psychology Review*, 32, 482 – 495. Doi: 10.1016/j.cpr.2012.05.003
- Hankin, B. L., & Abela, J. R. Z. (2011). Nonsuicidal self-injury in adolescence: Prospective rates and risk factors in a 2½ year longitudinal study. *Psychiatry Research*, 186, 65 – 70. Doi: 10.1016/j.psychres.2010.07.056
- Harrington, J. A., & Blankenship, V. (2002). Ruminative thoughts and their relation to depression and anxiety. *Journal of Applied Social Psychology*, 32, 465 – 485.
- Hasking, P. A., Coric, S. J., Swannell, S., Martin, G., Thompson, H. K., & Frost, A. D. J. (2010). Emotion regulation and coping as moderators in the relationship between personality and self-injury. *Journal of Adolescence*, 33, 767 – 773. Doi: 10.1016/j.adolescence.2009.12.006

- Hasking, P., Andrews, T., & Martin, G. (2013). The role of exposure to self-injury among peers in predicting later self-injury. *Journal of Youth and Adolescence*, 42, 1543 – 1556. Doi: 10.1007/s10964-013-9931-7
- Hasking, P., Momeni, R., Swannell, S., & Chia, S. (2008). The nature and extent of non-suicidal self-injury in a non-clinical sample of young adults. *Archives of Suicide Research*, 12, 208 – 218. Doi: 10.1080/13811110802100957
- Hawton, K., Rodham, K., & Evans, E. (2006). *By Their Own Young Hand. Deliberate Self-Harm and Suicidal Ideas in Adolescents*. London: Jessica Kingsley.
- Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, 64, 1152 – 1168.
- Heath, N. L., Ross, S., Toste, J. R., Charlebois, A., & Nedecheva, T. (2009). Retrospective analysis of social factors and nonsuicidal self-injury among young adults. *Canadian Journal of Behavioural Science*, 41, 180 – 186.
- Hilt, L. M., Cha, C. B., & Nolen-Hoeksema, S. (2008). Nonsuicidal self-injury in young adolescent girls: Moderators of the Distress-Function relationship. *Journal of Consulting and Clinical Psychology*, 76, 63 – 71. Doi: 10.1037/0022-006X.76.1.63
- Hilt, L. M., Nock, M. K., Lloyd-Richardson, E. E., & Prinstein, M. J. (2008). Longitudinal study of nonsuicidal self-injury among young adolescents: Rates, correlates, and preliminary test of an interpersonal model. *Journal of Early Adolescence*, 28, 455 – 469. Doi: 10.1177/0272431608316604
- Hoff, E. R., & Muehlenkamp, J. J. (2009). Nonsuicidal self-injury in college students: The role of perfectionism and rumination. *Suicide & Life-Threatening Behaviour*, 39, 576 – 587.

- Hong, R. Y. (2007). Worry and rumination: Differential associations with anxious and depressive symptoms and coping behavior. *Behaviour Research and Therapy*, 45, 227 – 290. Doi: 10.1016/j.brat.2006.03.006
- Horne, O., & Csipke, E. (2009). From feeling too little and too much, to feeling more and less? A nonparadoxical theory of the functions of self-harm. *Qualitative Health Research*, 19(5), 655 – 667. Doi: 10.1177/1049732309334249
- Howe-Martin, L. S., Murrell, A. R., & Guarnaccia, C. A. (2012). Repetitive nonsuicidal self-injury as experiential avoidance among a community sample of adolescents. *Journal of Clinical Psychology*, 68(7), 809 – 828. Doi: 10.1002/jclp.21868
- Hughes, E. K., Gullone, E., & Watson, S. D. (2011). Emotional functioning in children and adolescents with elevated depressive symptoms. *Journal of Psychopathology and Behavioural Assessment*, 33, 335 – 345. Doi: 10.1007/s10862-011-9220-2
- Hughes, E.K., Gullone, E., Dudley, A., & Tonge, B. (2010). A case-control study of emotion regulation and school refusal in children and adolescents. *Journal of Early Adolescence*, 30, 691 – 706. Doi: 10.1177/0272431609341049
- Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behaviour among adolescents: A critical review of the literature. *Archives of Suicide Research*, 11, 129 – 147. Doi: 10.1080/13811110701247602
- James, A. C., Taylor, A., Winmill, L., & Alfoadari, K. (2008). A preliminary community study of dialectical behaviour therapy with adolescent females demonstrating persistent, deliberate self-harm. *Child and Adolescent Mental Health*, 13, 148 – 152.
- Jamieson, J. P., Mendes, W. B., & Nock, M. K. (2013). Improving acute stress responses: The power of reappraisal. *Current Directions in Psychological Science*, 22, 51 – 56. Doi: 10.1177/0963721412461500

- Jelicic, H., Phelps, E., & Lerner, R. M. (2010). Why missing data matter in the longitudinal study of adolescent development: Using the 4-H Study to understand the uses of different missing data methods. *Journal of Youth and Adolescence*, 39, 816 – 835. Doi: 10.1007/s10964-010-9542-5
- John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, 72, 1301 – 1334.
- Joormann, J., Dkane, M., & Gotlib, I. H. (2006). Adaptive and maladaptive components of rumination? Diagnostic specificity and relation to depressive biases. *Behavior Therapy*, 37, 269 – 280.
- Jose, P. E., & Brown, I. (2008). When does gender difference in rumination begin? Gender and age differences in the use of rumination by adolescents. *Journal of Youth and Adolescence*, 37, 180 – 192. Doi: 10.1007/s10964-006-9166-y
- Kakhnovets, R., Young, H. L., Purnell, A. L., Huebner, E., & Bishop, C. (2010). Self-reported experience of self-injurious behaviour in college students. *Journal of Mental Health Counseling*, 32, 309 – 323.
- Katz, L. Y., Cox, B. J., Gunasekara, S., & Miller, A. L. (2004). Feasibility of dialectical behavior therapy for suicidal adolescent inpatients. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 276 – 282.
- Kelly, O., Matheson, K., Ravindran, A., Merali, Z., & Anisman, H. (2007). Ruminative coping among patients with dysthymia before and after pharmacotherapy. *Depression and Anxiety*, 24, 233 – 243. Doi: 10.1002/da.20236
- Kerr, P. L., Muehlenkamp, J. J., & Turner, J. M. (2010). Nonsuicidal self-injury: A review of current research for family medicine and primary care physicians. *Journal of the American Board of Family Medicine*, 23, 240 – 259.

- King, L. A., & Pennebaker, J. W. (1996). Thinking about goals, glue and meaning of life. In R. S. Wyer (Ed.), *Ruminative Thoughts* (pp. 97 – 106). New Jersey: Lawrence Erlbaum Associates.
- Kirchner, T., Forns, M., & Mohino, S. (2008). Identifying the risk of deliberate self-harm among young prisoners by means of coping typologies. *Suicide & Life-Threatening Behaviour*, 38, 442 – 448.
- Kline, T. J. B., & Dunne, B. (2000). Analysis of interaction terms in structural equation models: A non-technical demonstration using the deviation score approach. *Canadian Journal of Behavioural Science*, 32, 127 - 132.
- Klonsky, E.D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, 27, 226 – 239. doi: 10.1016/j.cpr.2006.08.002
- Klonsky, E. D. (2009). The functions of self-injury in young adults who cut themselves: Clarifying the evidence for affect-regulation. *Psychiatry Research*, 166, 260 – 268. Doi: 10.1016/j.psychres.2008.02.008
- Klonsky, E. D., May, A. M., & Glenn, C. R. (2013). The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. *Journal of Abnormal Psychology*, 122, 231 – 237. Doi: 10.1037/a0030278
- Klonsky, E.D., Oltmanns, T.F., & Turkheimer, E. (2003). Deliberate self-harm in a nonclinical population: Prevalence and psychological correlates. *American Journal of Psychiatry*, 160, 1501 – 1508.
- Koerner, K., & Dimeff, L. A. (2007). Overview of Dialectical Behaviour Therapy. In Dimeff, L. A. & Koerner, K. (eds.), *Dialectical Behaviour Therapy in Clinical Practice: Applications across disorders and settings* (pp. 1 – 18). New York: The Guilford Press.

- Koole, S. L. (2009). The psychology of emotion regulation: An integrative review. *Cognition & Emotion*, 23, 4 – 41. Doi: 10.1080/02699930802619031
- LaGrange, B., Cole, D. A., Jacquez, F., Ciesla, J., Dallaire, D., Pineda, A., Truss, A., Weitlauf, A., Tilghman-Osborne, C., & Felton, J. (2011). Disentangling the prospective relations between maladaptive cognitions and depressive symptoms. *Journal of Abnormal Psychology*, 120, 511 – 527. Doi: 10.1037/a0024685
- Lang, C. M., & Sharma-Patel, K. (2011). The relation between childhood maltreatment and self-injury: A review of the literature on conceptualisation and intervention. *Trauma, violence, and abuse*, 12(1), 23 – 37. Doi: 10.1177/1524838010386975
- Lewis, A. R., Zinbarg, R. E., & Durbin, C. E. (2010). Advances, problems, and challenges in the study of emotion regulation: A commentary. *Journal of Psychopathology and Behavioural Assessment*, 32, 83 – 91. Doi: 10.1007/s10862-009-9170-0
- Lewis, S. P., & Baker, T. G. (2011). The possible risks of self-injury web sites: A content analysis. *Archives of Suicide Research*, 15, 390 – 396. doi: 10.1080/13811118.2011.616154
- Lewis, S. P., Heath, N. L., St Denis, J. M., & Noble, R. (2011). The scope of non-suicidal self-injury on YouTube. *Pediatrics*, 127, e552 – e557. doi: 10.1542/peds.2010-2317
- Lewis, S. P., Heath, N. L., Sornberger, M. J., & Arbuthnott, A. E. (2012). Helpful or harmful? An examination of viewers' responses to nonsuicidal self-injury videos on YouTube. *Journal of Adolescent Health*, 51, 380 – 385. doi: 10.1016/j.adolhealth.2012.01.013
- Lewis, S. P., Rosenrot, S. A., & Messner, M. A. (2012). Seeking validation in unlikely places: The nature of online questions about non-suicidal self-injury. *Archives of Suicide Research*, 16, 263 – 272. doi: 10.1080/13811118.2012.695274

- Linehan, M. (1993). *Skills Training Manual for Treating Borderline Personality Disorder*. (New York: Guilford Publication).
- Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine*, 37, 1183 – 1192. Doi: 10.1017/S003329170700027X
- Lougheed, J. P., & Hollenstein, T. (2012). A limited repertoire of emotion regulation strategies is associated with internalizing problems in adolescence. *Social Development*, 21, 704 – 721. Doi: 10.1111/j.1467-9507.2012.00663.x
- Lynch, T. R., & Cozza, C. (2009). Behaviour therapy for nonsuicidal self-injury. In *Understanding Nonsuicidal Self-Injury: Origins, Assessment, and Treatment*. Nock, M.K. (ed.). pp. 221 – 250. Washington: American Psychological Association.
- Lyubomirsky, S., Kasri, F., & Zehm, K. (2003). Dysphoric ruminations impairs concentration on academic tasks. *Cognitive Therapy and Research*, 27, 309 – 330.
- Mahoney, A. E. J., McEvoy, P. M., & Moulds, M. L. (2012). Psychometric properties of the Repetitive Thinking Questionnaire in a clinical sample. *Journal of Anxiety Disorders*, 26, 359 – 367. doi: 10.1016/j.janxdis.2011.12.003
- Marroquin, B. M., Fontes, M., Scilletta, A., & Miranda, R. (2010). Ruminative subtypes and coping responses: Active and passive pathways to depressive symptoms. *Cognition & Emotion*, 24, 1446 – 1455. Doi: 10.1080/02699930903510212
- Martin, G., Swannell, S., Harrison, J., Hazell, P., & Taylor, A. (2010). *The Australian National Epidemiological Study of Self-Injury (ANESSI)*. Brisbane, Australia: Centre for Suicide Prevention Studies.
- Martin, L. L., Tesser, A., & McIntosh, D. (1993). Wanting but not having: The effects of unattained goals on thoughts and feelings. In D.M. Wegner & J.W. Pennebaker

- (Eds.), *Handbook of Mental Control* (pp. 552 – 572). Englewood Cliffs, NJ: Prentice Hall.
- McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology*, 60, 577 – 605. doi: 10.1146/annurev.psych.60.110707.163612
- McEvoy, P. M., Watson, H., Watkins, E. R., & Nathan, P. (2013). The relationship between worry, rumination, and comorbidity: Evidence for repetitive negative thinking as a transdiagnostic construct. *Journal of Affective Disorders*, 151, 313 – 320. doi: 10.1016/j.jad.2013.06.014
- McNamara, P. M. (2013). Adolescent suicide in Australia: Rates, risk and resilience. *Clinical and Child Psychology and Psychiatry*, 18, 351 – 369. doi: 10.1177/1359104512455812
- McRae, K., Gross, J. J., Weber, J., Roberston, E. R., Sokol-Hessner, P., Ray, R. D., Gabrieli, J. D. E., & Ochsner, K. N. (2012). The development of emotion regulation: An Fmri study of cognitive reappraisal in children, adolescents and young adults. *SCAN*, 7, 11 – 22. Doi: 10.1093/scan/nsr093
- Metz, S. M., Frank, J. L., Reibel, D., Cantrell, T., Sanders, R., & Broderick, P. C. (2013). The effectiveness of the learning to BREATHE program on adolescent emotion regulation. *Research in Human Development*, 10, 252 – 272. doi: 10.1080/15427609.2013.818488
- Mikolajczak, M., Petrides, K. V., & Hurry, J. (2009). Adolescents choosing self-harm as an emotion regulation strategy: The protective role of trait emotional intelligence. *British Journal of Clinical Psychology*, 48, 181 – 193. Doi: 10.1348/014466508X386027

- Mor, N., & Winkvist, J. (2002). Self-focused attention and negative affect: A meta-analysis. *Psychological Bulletin*, 128, 638 – 662. Doi: 10.1037//0033-2909.128.4.638
- Moran, P., Coffey, C., Romaniuk, H., Olsson, C., Borschmann, R., Carlin, J. B., & Patton, G. C. (2012). The natural history of self-harm from adolescence to young adulthood: A population-based cohort study. *Lancet*, 379, 236 – 43. Doi: 10.1016/S0140-6736(11)61141-0
- Muehlenkamp, J. J., & Brausch, A. M. (2012). Body image as a mediator of non-suicidal self-injury in adolescents. *Journal of Adolescence*, 35, 1 – 9. doi: 10.1016/j.adolescence.2011.06.010
- Muehlenkamp, J. J., Claes, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child and Adolescent Psychiatry and Mental Health*, 6(10), 1 – 9.
- Muehlenkamp, J. J., Cowles, M. L., & Gutierrez, P. M. (2009). Validity of the Self-Harm Behaviour Questionnaire with diverse adolescents. *Journal of Psychopathology and Behavioural Assessment*, 32, 263 – 243. Doi: 10.1007/s10862-009-9131-7
- Muehlenkamp, J. J., Kerr, P. L., Bradley, A. R., & Larsen, M. A. (2010). Abuse subtypes and nonsuicidal self-injury: Preliminary evidence of complex emotion regulation patterns. *Journal of Nervous and Mental Disease*, 198, 258 – 263. Doi: 10.1097/NMD.0b013e3181d612ab
- Muehlenkamp, J. J., Walsh, B. W., & McDade, M. (2010). Preventing non-suicidal self-injury in adolescents: The Signs of Self-Injury Program. *Journal of Youth and Adolescence*, 39, 306 – 314. Doi: 10.1007/s10964-009-9450-8
- Muris, P., Roelofs, J., Meesters, C., & Boomsma, P. (2004). Rumination and worry in nonclinical adolescents. *Cognitive Therapy and Research*, 28, 539 – 554.

- Nixon, M. K., Cloutier, P., & Jansson, S. M. (2008). Nonsuicidal self-harm in youth: A population-based survey. *Canadian Medical Association Journal*, 178, 306–312.
- Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, 18(2), 78 – 83.
- Nock, M. K. (2012). Future directions for the study of suicide and self-injury. *Journal of Clinical Child & Adolescent Psychology*, 41, 255 – 259. doi: 10.1080/15374416.2012.652001
- Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioural functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, 114, 140 -146. Doi: 10.1037/0021-843X.114.1.140
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behaviour. *Journal of Consulting and Clinical Psychology*, 72, 885 – 890. Doi: 10.1037/0022-006X.72.5.885
- Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviours: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118, 816 – 827. Doi: 10.1037/a0016948
- Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology*, 109, 504 – 511. Doi: 10.1037//0021-843X.109.3.504
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Lorna Prieta earthquake. *Journal of Personality and Social Psychology*, 61, 115 – 121.
- Nolen-Hoeksema, S., Stice, E., Wade, E., & Bohon, C. (2007). Reciprocal relations between rumination and bulimic, substance abuse, and depressive symptoms in female

- adolescents. *Journal of Abnormal Psychology*, 116, 198 – 207. Doi: 10.1037/0021-843X.116.1.198
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3, 400 – 424. Doi: 10.1111/j.1745-6924.2008.00088.x
- O'Connor, R. C., & Noyce, R. (2008). Personality and cognitive processes: Self-criticism and different types of rumination as predictors of suicidal ideation. *Behaviour Research and Therapy*, 46, 392 – 401.
- O'Connor, R. C., O'Connor, D. B., & Marshall, R. (2007). Perfectionism and psychological distress: Evidence of the mediating effects of rumination. *European Journal of Personality*, 21, 429 – 452. Doi: 10.1002/per.616
- O'Connor, R. C., Rasmussen, S., & Hawton, K. (2009). Predicting deliberate self-harm in adolescents: A six month prospective study. *Suicide & Life-Threatening Behaviour*, 39, 364 – 375.
- Ougrin, D., Tranah, T., Leigh, E., Taylor, L., & Asarnow, J. R. (2012). Practitioner review: Self-harm in adolescents. *Journal of Child Psychology and Psychiatry*, 53, 337 – 350. doi: 10.1111/j.1469-7610.2012.02525.x
- Peled, M., & Moretti, M. M. (2007). Rumination on anger and sadness in adolescence: Fueling of fury and deepening of despair. *Journal of Clinical Child & Adolescent Psychology*, 36, 66- 75.
- Perez, J., Venta, A., Garnatt, S., & Sharp, C. (2012). The Difficulties in Emotion Regulation Scale: Factor Structure and associatioin with nonsuicidal self-injury in adolescent inpatients. *Journal of Psychopathology and Behavioural Assessment*, 34, 393 – 404. Doi: 10.1007/s10862-012-9292-7

- Prinstein, M. J., Heilbron, N., Guerry, J. D., Franklin, J. C., Rancourt, D., Simon, V., & Spirito, A. (2010). Peer influence and nonsuicidal self-injury: Longitudinal results in community and clinically-referred adolescent samples. *Journal of Abnormal Child Psychology*, 38, 669 – 682. Doi: 10.1007/s10802-010-9423-0
- Radovic, S., & Hasking, P. (2013). The relationship between portrayals of nonsuicidal self-injury, attitudes, knowledge, and behaviour. *Crisis*, 34, 324 – 334. Doi: 10.1027/0227-5910/a000199
- Rathus, J. H., & Miller, A. L. (2002). Dialectical behaviour therapy adapted for suicidal adolescents. *Suicide & Life-Threatening Behaviour*, 32, 146 – 157.
- Rayner, K. E., Schniering, C. A., Hutchinson, D. M., Rapee, R. M., & Taylor, A. (2013). Adolescent girls' friendship networks, body dissatisfaction, and disordered eating: Examining selection and socialization processes. *Journal of Abnormal Psychology*, 122, 93 – 104. Doi: 10.1037/a0029304
- Robinson, M. S., & Alloy, L. B. (2003). Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. *Cognitive Therapy and Research*, 27, 275 – 292.
- Rossouw, T. I., & Fonagy, P. (2012). Mentalization-based treatment for self-harm in adolescents: A randomized controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51, 1304 – 1313.
- Schoofs, H., Hermans, D., & Raes, F. (2010). Brooding and reflection as subtypes of rumination: Evidence from confirmatory factor analysis in nonclinical samples using the Dutch Ruminative Response Scale. *Journal of Psychopathology and Behavioural Assessment*, 32, 609 – 617. Doi: 10.1007/s10862-010-9182-9
- Scoliers, G., Portzky, G., Madge, N., Hewitt, A., Hawton, K., de Wilde, E. J., Ystgaard, M., Arensman, E., de Leo, D., Fekete, S., & van Heeringen, K. (2009). Reasons for

- adolescent deliberate self-harm: A cry of pain and/or a cry for help? Findings from the Child and Adolescent Self-Harm in Europe (CASE) Study. *Social Psychiatry and Psychiatric Epidemiology*, 44, 601 – 607. Doi: 10.1007/s00127-008-0469-z
- Segerstrom, S. C., Stanton, A. L., Alden, L. E., & Shortridge, B. E. (2003). A multidimensional structure for repetitive thought: What's on your mind, and how, and how much? *Journal of Personality and Social Psychology*, 85, 909 – 921. Doi: 10.1037/0022-3514.85.5.909
- Segerstrom, S. C., Tsao, J. C. I., Alden, L. E., & Craske, M. G. (2000). Worry and rumination: Repetitive thought as a concomitant and predictor of negative mood. *Cognitive Therapy and Research*, 24, 671 – 688.
- Selby, E. A., & Joiner, T. E. (2009). Cascades of emotion: The emergence of Borderline Personality Disorder from emotional and behavioural dysregulation. *Review of General Psychology*, 13, 219 – 229. Doi: 10.1037/a0015687
- Selby, E. A., Anestis, M. D., & Joiner, T. E. (2008). Understanding the relationship between emotional and behavioural dysregulation: Emotional cascades. *Behaviour Research and Therapy*, 46, 593 – 611. Doi: 10.1016/j.brat.2008.02.002
- Selby, E. A., Bender, T. W., Gordon, K. H., Nock, M. K., & Joiner, T. E. (2012). Non-suicidal self-injury (NSSI) disorder: A preliminary study. *Personality Disorders: Theory, Research, and Treatment*, 3, 167 – 175. doi: 10.1037/a0024405
- Selby, E. A., Connell, L. D., & Joiner, T. E. (2010). The pernicious blend of rumination and fearlessness in non-suicidal self-injury. *Cognitive Therapy and Research*, 34, 421 – 428. Doi: 10.1007/s10608-009-9260-z
- Selby, E. A., Franklin, J., Carson-Wong, A., & Rizvi, S. L. (2013). Emotional cascades and self-injury: Investigating instability of rumination and negative emotion. *Journal of Clinical Psychology*, 69, 1213 – 1227. Doi: 10.1002/jclp.21966

- Siegle, G. J., Moore, P. M., & Thase, M. E. (2004). Rumination: One construct, many features in healthy individuals, depressed individuals, and individuals with lupus. *Cognitive Therapy and Research*, 28, 645 – 668.
- Silvers, J. A., McRae, K., Gabrieli, J. D. E., Gross, J. J., Remy, K. A., & Ochsner, K. N. (2012). Age-related differences in emotional reactivity, regulation and rejection sensitivity in adolescence. *Emotion*, 12, 1235 – 1247. Doi: 10.1037/a0028297
- Sim, L., Adrian, M., Zeman, J., Cassano, M., & Friedrich, W. N. (2009). Adolescent deliberate self-harm: Linkages to emotion regulation and family emotional climate. *Journal of Research on Adolescence*, 19, 75 – 91.
- Skitch, S. A., & Abela, J. R. Z. (2008). Rumination in response to stress as a common vulnerability factor to depression and substance misuse in adolescence. *Journal of Abnormal Child Psychology*, 36, 1029 – 1045. Doi: DOI 10.1007/s10802-008-9233-9
- Slee, N., Garnefski, N., van der Leeden, R., Arensman, E., & Spinhoven, P. (2008). Cognitive-behavioural intervention for self-harm: randomised controlled trial. *British Journal of Psychiatry*, 192, 202 – 211. doi: 10.1192/bjp.bp.107.037564
- Slee, N., Spinhoven, P., Garnefski, N., & Arensman, E. (2008). Emotion regulation as mediator of treatment outcome in therapy for deliberate self-harm. *Clinical Psychology and Psychotherapy*, 15, 205 – 216. Doi: 10.1002/cpp.577
- Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical Psychology Review*, 29, 116 – 128.
- Stanley, B., Sher, L., Wilson, S., Ekman, R., Huang, Y., & Mann, J. J. (2010). Non-suicidal self-injurious behaviour, endogenous opioids and monoamine neurotransmitters. *Journal of Affective Disorders*, 124, 134 – 140. Doi: 10.1016/j.jad.2009.10.028

- Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*, 9, 69 – 74. Doi: 10.1016/j.tics.2004.12.005
- Stoffers, J. M, Völlm, B. A., Rücker, G., Timmer. A., Huband, N., & Lieb, K. (2012). Psychological therapies for people with borderline personality disorder. *Cochrane Database of Systematic Reviews* 2012, Issue 8. Art.No.:CD005652. doi:: 10.1002/14651858.CD005652.pub2.
- Swannell, S., Martin, G., Page, A., Hasking, P., & St John, N. (2014). Prevalence of non-suicidal self-injury (NSSI) in non-clinical samples; Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior*, 44, 273 – 303.
- Swannell, S., Martin, G., Page, A., Hasking, P., Hazell, P., Taylor, A., & Protani, M. (2012). Child maltreatment, subsequent non-suicidal self-injury and the mediating roles of dissociation, alexithymia and self-blame. *Child Abuse & Neglect*, 36, 572 – 584. Doi: 10.1016/j.chiabu.2012.05.005
- Szabo, M., & Lovibond, P. F. (2002). The cognitive content of naturally occurring worry episodes. *Cognitive Therapy and Research*, 26(2), 167 - 177.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (Fifth Edition ed.). New York: Harper Collins.
- Tait, R. J., French, D. J., & Hulse, G. K. (2003). Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. *Australian and New Zealand Journal of Psychiatry*, 37, 374 – 381.
- Tait, R., & Silver, R.C. (1989). Coming to terms with major negative life events. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended Thought* (pp. 351 – 382). New York: Guilford Press.

- Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2009). Intrusive versus deliberate rumination in posttraumatic growth across US and Japanese samples. *Anxiety, Stress and Coping*, 22, 129 – 136. Doi: 10.1080/10615800802317841
- Tallis, F., Davey, G. C. L., & Capuzzo, N. (1994). The phenomenology of non-pathological worry: A preliminary investigation. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on Theory, Assessment and Treatment* (pp. 61 - 89). West Sussex: John Wiley & Sons, Ltd.
- Tan, L., & Martin, G. (*in press*). Taming the adolescent mind: A randomised controlled trial examining clinical efficacy of an adolescent mindfulness-based group programme. *Child and Adolescent Mental Health*. doi: 10.1111/camh.12057
- Tanner, A., Hasking, P., & Martin, G. (*in press*). Effects of rumination and optimism on the relationship between psychological distress and non-suicidal self-injury. *Prevention Science*.
- Tanner, A., Voon, D., Hasking, P., & Martin, G. (2013). Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire. *Cognitive Therapy and Research*, 37, 633 – 646. Doi: 10.1007/s10608-012-9492-1
- Tatnell, R., Kelada, L., Hasking, P., & Martin, G. (2014). Longitudinal analysis of adolescent NSSI: The role of intrapersonal and interpersonal factors. *Journal of Abnormal Child Psychology*, 42, 885 – 896. doi: 10.1007/s10802-013-9837-6
- Taylor, L. M. W., Oldershaw, A., Richards, C., Davidson K., Schmidt, U., Simic, M. (2011). Development and pilot evaluation of a manualized cognitive-behavioural treatment package for adolescent self-harm. *Behavioural and Cognitive Psychotherapy*, 39, 619 – 625. doi: 10.1017/S1352465811000075
- Thomsen, D. K. (2006). The association between rumination and negative affect: A review. *Cognition & Emotion*, 20, 1216 – 1235. Doi: 10.1080/02699930500473533

- Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, 27, 247 – 259.
- Tyrer, P., Thompson, S., Schmidt, U., Jones, V., Knapp, M., Davidson, K., Catalan, J., Airlie, J., Baxter, S., Byford S., et al. (2003). Randomized controlled trial of brief cognitive behaviour therapy versus treatment as usual in recurrent deliberate self-harm: the POPMACT study. *Psychological Medicine*, 33, 969 – 976.
- Vasey, M. W., & Borkovec, T. D. (1992). A catastrophic assessment of worrisome thoughts. *Cognitive Therapy and Research*, 16, 505 - 520.
- Verstraeten, K., Vasey, M. W., Raes, F., & Bijttebier, P. (2010). Brooding and reflection as components of rumination in late childhood. *Personality and Individual Differences*, 48, 367 – 372. Doi: 10.1016/j.paid.2009.11.001
- Victor, S. E., & Klonsky, E. D. (2014). Daily emotion in non-suicidal self-injury. *Journal of Clinical Psychology*, 70, 364 – 375. doi: 10.1002/jclp.22037
- Walsh, B. W. (2005). *Treating self-injury: A practical guide*. New York, NY: Guilford Press.
- Ward, A., Lyubomirsky, S., Sousa, L., & Nolen-Hoeksema, S. (2003). Can't quite commit: Rumination and uncertainty. *Personality and Social Psychology Bulletin*, 29, 96 – 107. Doi: 10.1177/0146167202238375
- Washburn, J. J., Richardt, S. L., Styer, D. M., Gebhardt, M., Juzwin, K. R., Yourek, A., & Aldridge, D. (2012). Psychotherapeutic approaches to non-suicidal self-injury in adolescents. *Child and Adolescent Psychiatry and Mental Health*, 6:14, 1 – 8.
- Watkins, E. (2004). Adaptive and maladaptive ruminative self-focus during emotional processing. *Behaviour Research and Therapy*, 42, 1037 – 1052. Doi: 10.1016/j.brat.2004.01.009
- Watkins, E. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin*, 134, 163 - 206. doi: 10.1037/0033-2909.134.2.163

- Weare, K., & Nind, M. (2011). Mental health promotion and problem prevention in schools: What does the evidence say? *Health Promotion International*, 26, i29 – i69. Doi: 10.1093/heapro/dar075
- Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, 138, 775 – 808. Doi: 10.1037/a0027600
- Weinberg, I., Gunderson, J. G., Hennen, J., & Cutter, C. J. (2006). Manual assisted cognitive treatment for deliberate self-harm in Borderline Personality Disorder patients. *Journal of Personality Disorders*, 20, 482 – 492.
- Weismore, J. T., & Esposito-Smythers, C. (2010). The role of cognitive distortion in the relationship between abuse, assault, and non-suicidal self-injury. *Journal of Youth and Adolescence*, 39, 281 – 190. doi: 10.1007/s10964-009-9452-6
- Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Abrams, G. B., Barrier, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health*, 52, 486-192.
- Whitlock, J., Purington, A., & Gershkovich, M. (2009). Media, the internet, and nonsuicidal self-injury. In M.K. Nock (Ed), *Understanding nonsuicidal self-injury: Origins, assessment, and treatment* (pp. 139 – 155). Washington DC, US: American Psychological Association.
- Williams, F., & Hasking, P. (2010). Emotion regulation, coping and alcohol use as moderators in the relationship between non-suicidal self-injury and psychological distress. *Prevention Science*, 11, 33 – 41. Doi: 10.1007/s11121-009-0147-8
- Yates, T. M., Tracy, A. J., & Luthar, S. S. (2008). Nonsuicidal self-injury among “privileged” youths: Longitudinal and cross-sectional approaches to

developmental process. *Journal of Consulting and Clinical Psychology*, 76, 52 – 62.

doi: 10.1037/0022-006X.76.1.52

You, J., Leung, F., Fu, K., & Lai, C.M. (2011). The prevalence of nonsuicidal self-injury and different subgroups of self-injurers in Chinese adolescents. *Archives of Suicide Research*, 15, 75 – 86. Doi: 10.1080/13811118.2011.540211

Zelazo, P. D., & Carlson, S. M. (2012). Hot and cool executive function in childhood and adolescence: Development and Plasticity. *Child Development Perspectives*, 6, 354 – 360. Doi: 10.1111/j.1750-8606.2012.00246.x

Zeman, J., Cassano, M., Perry-Parrish, C., & Stegall, S. (2006). Emotion regulation in children and adolescents. *Developmental and Behavioral Pediatrics*, 27, 155 – 168.

APPENDIX A

PRELIMINARY STUDY

UNDERLYING STRUCTURE OF RUMINATIVE THINKING: FACTOR ANALYSIS OF THE RUMINATIVE THOUGHT STYLE QUESTIONNAIRE

The following study was undertaken during the Doctor of Psychology candidacy. It examined the structure of the Ruminative Thought Style Questionnaire (Brinker & Dozois, 2009) which was used to measure general ruminative thinking style in the three main studies reported in this thesis. This preliminary investigation allowed for the inclusion of a more nuanced examination of the role of rumination in NSSI.

The published article below is reproduced in this appendix.

Article:

Tanner, A., **Voon**, D., Hasking, P., & Martin, G. (2013). Underlying structure of ruminative thinking: Factor analysis of the Ruminative Thought Style Questionnaire. *Cognitive Therapy and Research*, 37, 633-646. Five-year impact factor = 1.99.

Underlying Structure of Ruminative Thinking: Factor Analysis of the Ruminative Thought Style Questionnaire

Alicia Tanner · David Voon · Penelope Hasking ·
 Graham Martin

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Abstract The Ruminative Thought Style Questionnaire (RTSQ) is a 20-item measure assessing a single dimension of rumination over and above valence, temporal orientation of thought content, and the cognitive-affective context in which it occurs. The current study examined the factor structure of rumination as measured by the RTSQ, and whether findings of its initial validation study could be replicated within an adolescent sample ($N = 2,362$). An exploratory factor analysis and a subsequent confirmatory factor analysis were undertaken on two subsamples ($n = 1,181$) which did not significantly differ in gender and age. Five items with factor loadings of $<.50$ or cross loadings of $>.30$ on a second factor were removed. As hypothesised, an exploratory factor analysis on the final 15 items demonstrated the RTSQ was comprised of four rumination subcomponents, labelled “Problem-Focused Thoughts”, “Counterfactual Thinking”, “Repetitive Thoughts”, and “Anticipatory Thoughts”. A confirmatory factor analysis supported this, contrary to the initial validation study. Each of these subscales had differential contributions to psychological distress and coping styles in separate multiple regressions. Our findings support the increasing body of evidence suggesting a multidimensional structure for rumination, and clinical implications are noted.

Keywords Rumination · Factor analysis · Adolescents · Psychological distress

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Introduction

Mental health problems and disorders are the leading cause of non-fatal burden of disease and injury among young people in Australia, accounting for almost 50 % of the burden of disease among 16–24 year-olds (Australian Institute of Health and Welfare, AIHW 2011). Leading causes of mental disease among young people in 2007 were anxiety and depression, which together accounted for almost one-quarter (24 %) of the burden of disease in this age group (AIHW 2011). It is well-established that adolescence is a developmental period characterized by increases in uncontrollable life stressors and vulnerability to the development of mental health problems (Hankin et al. 1998) and, as such, improving our understanding of the psychological factors that predispose, precipitate, and perpetuate mental health problems during this time is of critical importance.

Rumination, broadly defined as the tendency to think repetitively, recurrently, uncontrollably, and intrusively (Brinker and Dozois 2009) is a psychological construct implicated in a range of mental health problems and observed to increase from late childhood through to adolescence (Hampel and Petermann 2005). Rumination is associated with the development and maintenance of depression (Mor and Winquist 2002; Smith and Alloy 2009; Thomsen 2006) and predicts chronicity of depressive episodes (Nolen-Hoeksema 2000). Marks et al. (2010) found rumination moderates the relationship between life hassles and depressive symptoms. Also reported are associations between rumination and anxiety (Calmes and Roberts 2007; Harrington and Blankenship 2002; Muris et al. 2004; Nolen-Hoeksema 2000), violent and aggressive behaviour (Caprara et al. 2007; Peled and Moretti 2007), and a range of dysregulated behaviours such as substance

use and eating disorders (Nolen-Hoeksema et al. 2007; Selby et al. 2008; Skitch and Abela 2008). Additional research has linked rumination with non-suicidal self-injury (Borrill et al. 2009; Hilt et al. 2008; Hoff and Muehlenkamp 2009), and suicidal ideation and suicidality (for review see Morrison and O'Connor 2008).

Despite its association with a number of negative consequences, it is unclear why many individuals engage and persist in rumination. Davis and Nolen-Hoeksema (2000) suggested rumination may be characterised and maintained by an inflexible cognitive style. Watkins and Baracaia (2001) posited rumination may be maintained by meta-cognitive beliefs about the self-perceived helpfulness of rumination. In their research exploring reasons for rumination among a sample of self-identified ruminators, 80 % of participants reported at least one perceived benefit for rumination (such as increasing understanding and insight, preventing future mistakes, and increasing empathy), despite almost all acknowledging serious disadvantages (including increases in depressed and negative feelings, reductions in constructive and pleasurable activities, and increases in negative and unrealistic thinking). The majority of respondents also identified that the automatic and compulsive nature of rumination, rather than its perceived helpfulness, prevented them from ceasing. Taken together, these findings suggest rumination may initially represent a strategic response intentionally selected to manage difficult situations, which then becomes automatic and inflexible over time. Thus, while ostensibly instrumental to emotion regulation (Hilt et al. 2008) and coping with problems (Mikolajczak et al. 2009), as a rigid and inflexible response style rumination paradoxically exerts the opposite effect. It decreases the use of emotion-focused strategies and cognitive disengagement from problems (Kelly et al. 2007), is associated with greater disengagement from problems (Hong 2007) and reduced problem-solving behaviours (Lyubomirsky et al. 2003; Ward et al. 2003).

As noted, adolescence is a developmental period characterized by increases in life stressors and vulnerability to the development of mental health problems (Hankin et al. 1998; Larson and Ham 1993). It is also a period when rumination and other maladaptive coping strategies increase (Hampel and Petermann 2005). Considering that rumination is associated with concurrent depression in older children and adolescents (Abela et al. 2002), it appears that adolescence may be the stage in which rumination is first rehearsed as a coping strategy (albeit a maladaptive one). Thus, a greater understanding of the nature of rumination during this period may enable intervention designed to reduce its negative influence prior to becoming an embedded automated response.

Understanding, however, is constrained by a number of challenges. First, there is little consensus on the definition

of rumination (see Smith and Alloy 2009). Rumination has been broadly defined as “attempts to find alternate means to reach important unattained goals or reconciling oneself to not reaching those goals” (Martin and Tesser 1989; p. 311), and as “a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms” (Nolen-Hoeksema et al. 2008, p. 400). Second, a number of instruments purporting to measure rumination have been developed across research domains and from different theoretical standpoints which appear to measure multiple, correlated, rumination-like constructs such as rumination on depressive symptoms, intrusiveness of thoughts about distressing events, searching for meaning of negative experiences, and recurrently thinking about discrepancies in attaining goals (Siegle et al. 2004). This proliferation of instruments obscures understanding of how rumination may be related to psychological outcomes as some are focused on specific thought content and context, primarily depressive or negative thoughts, and may therefore inflate the relationship between rumination and the outcomes under investigation (Brinker and Dozois 2009). Finally, there is an increasing understanding that rumination is multifaceted and multidimensional (Smith and Alloy 2009). Indeed, a number of components have been identified in factor analytic studies of measures of rumination. However, there is a lack of consensus regarding whether these facets and dimensions contribute differentially to various psychological outcomes.

For instance, Segerstrom et al. (2003) propose that repetitive thinking styles such as worry and rumination exist along two dimensions: positive versus negative content valence, and searching versus solving purpose. The extent to which repetitive thinking styles contribute to maladjustment is posited to depend on the amount and proportion by which individuals engage in different types of thinking, i.e. whether they attend to positive or negative aspects of their lives and, whether they are searching for new perspectives, attempting to solve problems, or preparing for eventualities. Similarly, Watkins (2008) suggested that a number of factors differentially impact the influence of rumination on psychological outcomes, including valence of thought content, its temporal orientation, controllability and purpose, the cognitive-affective context in which it occurs, and level of construal adopted.

Fresco et al. (2002) examined the factor structure of the Response Style Questionnaire (RSQ; Nolen-Hoeksema and Morrow 1991), identifying two factors. “Active Cognitive Appraisal” comprised items elucidating motivations for rumination (e.g. “Isolate yourself and think about the reasons you feel sad” and “Analyse recent events to try to understand why you are depressed”). “Dwelling on the Negative” comprised items tapping into thought content

(e.g. “Think about how passive and unmotivated you feel” and “Think about how alone you feel”). Only the second factor was found to be associated with symptoms of depression and anxiety.

Similarly, Treynor et al. (2003) isolated two factors for the RSQ following removal of items overlapping the Beck Depression Inventory. “Brooding” described a passive comparison of one’s current state with an unachieved standard (e.g. “Think of a recent situation, wishing it had gone better” and “Think, why can’t I handle things better?”). “Reflection” suggested purposeful and introspective attempts at problem-solving to alleviate depressive symptoms (e.g. “Analyse recent events to try to understand why you are depressed” and “Go away by yourself and think about why you feel this way”). The reflection factor was associated with less depression over time, although related to more depression concurrently. In contrast, brooding was associated with more depression both concurrently and over time. These findings were replicated in a Dutch sample of undergraduate students using confirmatory factor analysis (Schoofs et al. 2010). Segerstrom et al. (2003) identified a three-factor solution for the full RSQ. The first factor contained items focused on depressive symptoms, the second related to self-analysis, and the third related to self-reproach. While there was some convergence with Treynor et al. (2003), some items mapped onto different factors across the two studies. For example, the item “Think about all my shortcomings, failures, faults, mistakes” was excluded by Treynor et al. due to its overlap with depression content, whereas Segerstrom et al. found that it mapped onto the self-reproach factor.

Research examining the factor structure of rumination has not been limited to the RSQ. Segerstrom et al. (2003) found that the Rumination Scale (Martin et al. 1993), a measure of more global ruminative thinking style, comprised two distinct factors. The first reflected uncontrollability and distractibility of thoughts, and the second related to cognitive rehearsal and processing. Siegle et al. (2004) performed factor analyses on a number of instruments measuring rumination and noted differential factor loadings for scales measuring valence-neutral reflection and alternative responses to emotional information, and scales measuring rumination on negative information.

In contrast to research supporting multidimensionality of rumination, Brinker and Dozois (2009) developed the Ruminative Thought Style Questionnaire (RTSQ) to assess a unitary construct of general ruminative thinking, with the 20 items of the RTSQ loading onto a single factor accounting for 28.93 % of variance. However these findings may be due to the authors’ reliance on Cattell’s (1966) scree test, and opting for a more parsimonious single-factor solution. Fabrigar et al. (1999) noted that

reliance on a scree plot to determine the number of factors may be somewhat arbitrary and subjective, and suggested other criteria may be warranted such as alternative factor identification procedures, factor loadings, and interpretability of the final rotated solution. They indicated that substantial error may occur when too few factors are included in a model, as variables loading onto another factor not included in the model may falsely load onto included factors.

In initial validation studies with 118 undergraduate students, the RTSQ demonstrated good convergent validity with the RSQ, the Global Rumination Scale, and the BDI-II. The RTSQ appeared to assess a more general thinking style than the RSQ, with partial correlations showing that the RTSQ accounted for variance in depressed mood even after controlling for RSQ scores (Brinker and Dozois 2009). It appears to elicit a broader range of ruminative thoughts of varying valence and temporal orientation and is not predicated on being in a depressed mood such as the RSQ and the Rumination on Sadness Scale (Conway et al. 2000), or stressful events (Robinson and Alloy 2003).

No other studies to date have examined the factor structure of the RTSQ, yet there are several reasons for doing so. First, a measure of a dispositional ruminative thinking style not specifically linked to an individual’s mood state or life circumstances is useful for both research and clinical purposes as it allows for broader investigation of how a repetitive, recurrent, uncontrollable and intrusive thinking style may influence a range of psychological outcomes. Second, identifying the underlying structure of the RTSQ may allow for further investigation of how different facets and dimensions of a ruminative thinking style may differentially impact on psychological outcomes. Finally, an understanding of the underlying structure of rumination may lead to better targeted interventions aimed at mitigating adverse impacts of rumination.

The current study explored the underlying structure of rumination among adolescents. The RTSQ is an appropriate measure to use for this purpose given the objectives of its developers, and we specifically sought to replicate the findings of the RTSQ initial validation study. However, we hypothesised the RTSQ would comprise more than one factor. Consistent with the findings of Siegle et al. (2004) factor analysis of the RTSQ was expected to yield at least three factors, and these would be hierarchically organised under a higher-order construct of ruminative thinking.

Given research with the RSQ suggest facets of rumination may differentially relate to different psychological outcomes (Armey et al. 2009; Taku et al. 2009) and coping styles (Burwell and Shirk 2007; Marroquin et al. 2010), we also explored the contribution of any derived factors to psychological distress and coping styles.

Method

Participants

The sample comprised 2,638 participants recruited as part of a larger study on how adolescents cope with emotional problems. Participants were recruited from 41 schools (23 Catholic and 18 independent), across five Australian states. Of the initial sample, 276 participants did not complete all 20-items of the RTSQ, and were removed. The final sample included 2,362 participants (1,611 females and 751 males) aged between 10 and 18 years ($M = 13.95$, $SD = .99$).

Participants were randomly assigned to two groups (see Gerbing and Hamilton 1996). An exploratory factor analysis (EFA) was performed on data from the first group of 1,181 participants (817 females, 364 males) aged 10–18 years ($M = 13.92$, $SD = 1.01$). A confirmatory factor analysis (CFA) was performed on data from the second group of 1,181 participants (794 females, 387 males) aged 12–18 years ($M = 13.97$, $SD = .97$). There were no significant differences in gender or age between the groups.

Materials

The Ruminative Thought Style Questionnaire (RTSQ), (Brinker and Dozois 2009) is a 20-item measure describing positive, negative and neutral facets of global rumination (e.g., “I can’t stop thinking about some things” or “I have never been able to distract myself from unwanted thoughts”). Respondents rated each statement on a 7-point Likert scale (1 = *not at all descriptive of me*, 7 = *describes me very well*). The RTSQ has demonstrated good convergent validity with the Response Style Questionnaire, the Global Rumination Scale and the Beck Depression Inventory, adequate test–retest reliability and high internal consistency (Brinker and Dozois 2009). Alpha for the present sample was $\alpha = .94$.

The General Health Questionnaire (GHQ-12) (Goldberg and Williams 1988) is a 12-item measure of current psychological distress. Questions are positively phrased (e.g. “Been feeling reasonably happy all things considered”) and negatively (e.g. “Been feeling unhappy and depressed”), with an equal distribution. Respondents rated on a 4-point Likert scale (1 = *better than usual*, 4 = *much worse than usual*). The GHQ-12 has been extensively evaluated and has solid validity and reliability (see for example Hardy et al. 1999; Tait et al. 2002). Alpha for the present sample was $\alpha = .89$.

The Adolescent Coping Scale—Short Form (ACS-SF) (Frydenberg and Lewis 1993) is an 18-item measure describing different ways in which adolescents cope with problems (e.g. “Work at solving the problem to the best of my ability” or “Shut myself off from the problem so that I

can avoid it”). Respondents rate a 5-point scale (1 = *didn’t do it*, 5 = *used a great deal*). Items load onto three subscales—Productive Coping, Non-productive Coping, and Reference to Others, each with moderate internal consistency ($\alpha = .50$ –.66, Frydenberg and Lewis 1996). Alphas for the present sample were $\alpha = .68$, .76 and .38, respectively.

Procedure

With ethical clearance (Monash University, University of Queensland, Education sectors), schools distributed explanatory statements and consent forms to parents/guardians of students in years 7–10; children with consent completed the questionnaire on school grounds. Participants were notified they could withdraw from the study at any time. A unique code was derived to facilitate confidentiality, yet enable identification in the event responses raised concern about immediate risk. Researchers were present to clarify questions. The questionnaire took approximately 1 h, and, on completion, participants received a pack with information about depression, as well as relevant mental health resources.

Results

Data Screening

Datasets for the EFA and CFA were screened for univariate and multivariate outliers, and for distribution normality. For each dataset, there were no univariate outliers (scales scores ± 3.3 SD). Multivariate outliers were identified by examining Mahalanobis distances using a Chi-square cut-off of $p < .001$; yielding 66 cases in the EFA dataset, and an additional 62 cases in the CFA dataset with scores exceeding the critical value of 45.32. These cases were removed from the analysis. Neither dataset satisfied the omnibus test of multivariate normality developed by DeCarlo (1997), suggesting the assumption of multivariate normality was not met. Although Curran et al. (1996) suggest the impact of multivariate non-normality is attenuated by a reasonable model and, importantly, a large sample size (as in the present study) care should be taken in interpreting our results.

Exploratory Factor Analysis

Factorability of the 20 RTSQ items was assessed, and all but one item (R16) had $r > .3$ with at least one other item. Kaiser’s (1970) measure of sampling adequacy (the Kaiser–Meyer–Olkin MSA) was .95, and Bartlett’s test of sphericity was significant ($\chi^2(190) = 14,038.54$, $p < .01$), indicating

suitability of the correlation matrix for factor analysis. The determinant of the R-matrix was less than .0001, suggesting no multicollinearity. Communalities for all 20 items were above .4. Taken together the results indicated that all 20 RTSQ items were suitable for inclusion in factor analysis.

There were a number of considerations in determining the number of factors to extract. Following suggestions by Fabrigar et al. (1999) alternative factor identification procedures were utilised, as well as consideration of factor loadings and the interpretability of the final rotated solution. An initial unconstrained PCA of the RTSQ items was undertaken which indicated four eigenvalues over 1 (see Table 1; Kaiser 1970), suggesting a 4-factor solution. However, Kaiser's eigenvalues-greater-than-one rule may be more pertinent to determining the upper limit of factors for extraction, and may be less useful in recommending the actual number of factors that ought to be extracted. Examination of the scree plot (Cattell 1966) was inconclusive, showing a sharp drop in eigenvalues from one to two factors with a gradual decline from two to seven factors. Three to six factor solutions were indicated using this method. Velicer's minimum average partial (MAP) test (Velicer 1976) and Horn's parallel analysis (Horn 1965) were also undertaken using syntax proposed by O'Connor (2000). The MAP test suggested a 3-factor solution while the parallel analysis indicated a 4-factor solution.

Based on these results, PCAs¹ were undertaken for an initial 3-factor and subsequent 4-factor solution using oblique rotations with Promax, as previous research suggests correlations among different rumination constructs (Siegle et al. 2004), and different types of repetitive thoughts (Segerstrom et al. 2003). Both solutions were comparable in regard to factor loadings. The 3-factor solution had four items with factor loadings of $<.50$ or cross loadings of $>.30$ on a second factor, while the 4-factor solution had five items (see Table 1). However, the 3-factor solution was less interpretable. Examination of the items loading onto the first factor suggested that they could be logically separated into two factors—observable when the 4-factor extraction with oblique rotation was performed. Ultimately, the 4-factor solution was preferred as (1) no other factors had eigenvalues greater than 1, (2) it accounted for a further 5 % of the total variance explained, and (3) it was more interpretable.²

¹ PCAs were conducted to enable comparisons with Brinker and Dozois' (2009) initial validation study which utilised the same method.

² Following feedback from anonymous reviewers, a comparison data method for factor extraction (see Ruscio and Roche 2012) was undertaken which suggested a 5-factor solution. Results of an oblique rotation showed that item loadings on three factors were retained, and that four of the five deleted items had factor loadings on two factors

The five items with factor loadings of $<.50$ or cross loadings of $>.30$ on a second factor were removed based on recommendations by Floyd and Widaman (1995) and opting for a conservative approach. These were "If there is an important event coming up I think about it so much that I work myself up", "When I am trying to work out a problem, it is like I have a long debate in my mind where I keep going over different points", "I like to sit and think about pleasant events from the past", "Sometimes even during a conversation, I find unrelated thoughts popping into my head", and "When I have an important conversation coming up, I tend to go over it in my mind again and again". A second PCA was undertaken on the remaining 15 items and the final 4-factor solution (see Table 2) accounted for 73.49 % of total variance. The first factor, accounting for 50.94 % of the total variance, was largely focused on problems ('Problem-focused Thoughts'). The second factor, accounting for 8.84 % of total variance, pertained to generating alternative scenarios ("Counterfactual Thinking"), while the third factor described the repetitive nature of thoughts ("Repetitive Thoughts") and accounted for 7.64 % of total variance. The final factor appeared to be in anticipation of upcoming events ("Anticipatory Thoughts"), accounted for 6.08 % of total variance. As indicated in Table 2, these four factors were moderately inter-correlated ($r = .47-.60$), with high internal consistency for the first three subscales and moderate for the fourth (see Table 2). The size of these intercorrelations were all $<.85$, suggesting they are distinct separate factors (see Kline 2005).

Confirmatory Factor Analysis

A CFA was performed with AMOS using a maximum likelihood method of estimation (see Fig. 1). As with the EFA, factors were allowed to correlate. Given that only two items loaded onto the Anticipatory Thoughts factor, a model with these two items removed and comprised of Problem-focused Thoughts, Counterfactual Thinking, and Repetitive Thoughts was tested. Brinker and Dozois' (2009) unitary model and a "higher-order model", where an underlying rumination factor accounted for each of the subscales, were also tested.

As illustrated in Table 3, Chi-square goodness-of-fit statistics were significant for all four models. Compared to the 3-factor model, the 4-factor model had a better fit,

Footnote 2 continued

that ranged from .3–.4. Four items loaded onto a 5th factor (R15, R16, R17, R18); R16 had no cross-loadings (factor loading = .87), R17 had a factor loading of .31 and a cross-loading on the 4th factor of .81, and R15 and R18 had cross-loadings in the .3–.4 range. Applying Floyd and Widaman's (1995) recommendation as with the initial analyses, the 5th factor would consist of only one item. Therefore, analysis of a 5-factor solution was not pursued further.

Table 1 Communalities and factor loadings for unrotated principal components analysis and at initial oblique rotation

	h^2	1	2	3	4	1	2	3	4
Eigenvalues		9.82	1.46	1.21	1.00	<i>Initial rotation</i>			
I find that my mind goes over things again and again (R1)	.79	.67		-.55				.97	
When I have a problem, it will gnaw on my mind for a long time (R2)	.78	.73		-.50				.87	
I find that some thoughts come to my mind over and over throughout the day (R3)	.79	.75		-.47				.86	
I can't stop thinking about some things (R4)	.70	.74		-.67				.72	
When I am expecting to meet someone, I will imagine every possible scenario and conversation (R5)	.64	.68			-.34		.83		
I tend to replay past events as I would have liked them to happen (R6)	.76	.74			-.37		.90		
I find myself daydreaming about things I wish I had done (R7)	.70	.74				.81			
When I feel I have had a bad interaction with someone, I tend to imagine various scenarios where I would have acted differently (R8)	.71	.72			-.32	.84			
When trying to solve a complicated problem, I find that I just keep coming back to the beginning without ever finding a solution (R9)	.66	.72		-.36		.77			
If there is an important event coming up, I think about it so much that I work myself up (R10)	.57	.73				.46			.33
I have never been able to distract myself from unwanted thoughts (R11)	.66	.67		-.46		.88			
Even if I think about a problem for hours, I still have a hard time coming to a clear understanding (R12)	.81	.74		-.50		.98			
It is very difficult for me to come to a clear conclusion about some problems, no matter how much I think about it (R13)	.76	.74		-.46		.91			
Sometimes I realise I have been sitting and thinking about something for hours (R14)	.59	.72				.62			
When I am trying to work out a problem, it is like I have a long debate in my mind where I keep going over different points (R15)	.56	.74				.38			
I like to sit and think about pleasant events from the past (R16)	.44	.45		.45			.34		.56
When I am looking forward to an exciting event, thoughts of it interfere with what I am working on (R17)	.72	.61			.48	-.36			.94
Sometimes even during a conversation, I find unrelated thoughts popping into my head (R18)	.55	.59						.50	
When I have an important conversation coming up, I tend to go over it in my mind again and again (R19)	.63	.74					.32		.47
If I have an important event coming up, I can't stop thinking about it (R20)	.67	.63			.46				.87

Factor loadings <.30 have been suppressed

Table 2 Factor loadings and factor correlations for final 4-factor solution using principal components analysis

	Problem-focused thoughts	Counterfactual thinking	Repetitive thoughts	Anticipatory thoughts
When trying to solve a complicated problem, I find that I just keep coming back to the beginning without ever finding a solution (R9)	.74			
I have never been able to distract myself from unwanted thoughts (R11)	.84			
Even if I think about a problem for hours, I still have a hard time coming to a clear understanding (R12)	.96			
It is very difficult for me to come to a clear conclusion about some problems, no matter how much I think about it (R13)	.90			
Sometimes I realise I have been sitting and thinking about something for hours (R14)	.63			
When I am expecting to meet someone, I will imagine every possible scenario and conversation (R5)		.82		
I tend to replay past events as I would have liked them to happen (R6)		.89		
I find myself daydreaming about things I wish I had done (R7)		.81		
When I feel I have had a bad interaction with someone, I tend to imagine various scenarios where I would have acted differently (R8)		.83		
I find that my mind goes over things again and again (R1)			.97	
When I have a problem, it will gnaw on my mind for a long time (R2)			.86	
I find that some thoughts come to my mind over and over throughout the day (R3)			.85	
I can't stop thinking about some things (R4)			.70	
When I am looking forward to an exciting event, thoughts of it interfere with what I am working on (R17)				.89
If I have an important event coming up, I can't stop thinking about it (R18)				.86
Factor Correlations (and Cronbach's alpha)				
Problem-focused thoughts ($\alpha = .89$)	1.00			
Counterfactual thinking ($\alpha = .87$)	.60	1.00		
Repetitive thoughts ($\alpha = .89$)	.58	.60	1.00	
Anticipatory thoughts ($\alpha = .71$)	.47	.52	.50	1.00

Factor loadings <.30 have been suppressed

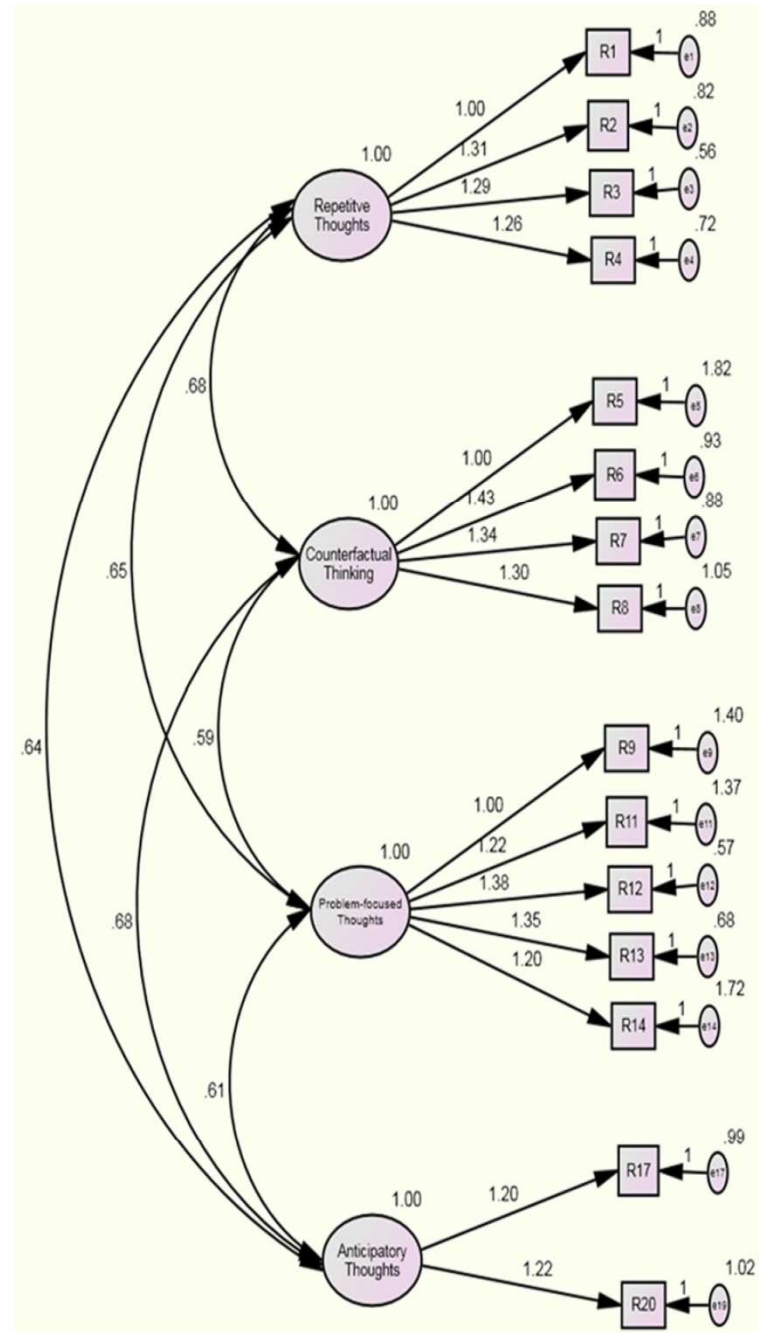
$\Delta\chi^2(1) = 43.78, p < .01$. It also had a better fit than the higher-order model, $\Delta\chi^2(1) = 100.92, p < .01$. However, Chi-square goodness-of-fit indices can be unreliable with large sample sizes (Tabachnick and Fidell 2007). Additional indices of model fit were therefore assessed. On the Bentler–Bonnett normed fit index (NFI) the 4-factor and 3-factor models were comparable and slightly better than the higher-order model (NFIs > .95 are indicative of good model fit; Hu and Bentler 1999). On the comparative fit index (CFI) the 4-factor and 3-factor models were comparable and slightly better than the higher-order model (CFIs > .95 are indicative of good model fit; Hu and Bentler 1999). Both 4-factor and 3-factor models had higher than recommended levels of error based on standardised root-mean-square residual (SRMR) and root-mean-square error approximation (RMSEA) whereas the higher-order model met recommended cut-offs for the SRMR and was comparable to the other two models on the RMSEA (SRMRs <.08, and RMSEAs <.06 are

recommended; Hu and Bentler 1999). The unitary model fell short of recommended levels on all indices.

To confirm the discriminant validity of the four factors, analyses were undertaken following the procedure described by Anderson and Gerbing (1988). Correlations for each pair of factors were constrained to 1. Results compared with the unconstrained 4-factor model in the confirmatory factor analysis. The Chi-square goodness-of-fit index was significantly lower than that for the constrained models, thereby establishing factor discriminant validity.³

³ Following feedback from anonymous reviewers and in accordance with the observations of Simmons, Nelson, and Simonsohn (2011), analyses were undertaken which included (1) the multivariate outliers that were initially excluded, and (2) imputed data using Expectation Maximisation (Tabachnick and Fidell 2007) for the 220 participants who completed at least one item on the RTSQ. For both EFAs and CFAs performed with these datasets, the 4-factor structure of the RTSQ identified in the initial analyses reported was stable and performed better compared with the alternative models tested.

Fig. 1 Confirmatory factor analysis on a 4-factor solution for the RTSQ



Comparing Total Score on the RTSQ with Brinker and Dozois (2009)

Within the current sample, mean total score on the RTSQ was 87.34 (SD = 24.50). Independent sample t-tests

conducted to compare mean scores obtained in the current study with those obtained in Brinker and Dozois' (2009) validation samples (Study 1: M = 88.94, SD = 17.78; Study 2: M = 88.00, SD = 16.17) showed no statistically significant difference.

Table 3 Comparison of fit indices for 3-factor and 4-factor models from the confirmatory factor analysis

	χ^2	df	p	NFI	CFI	RMSEA	SRMR
3 Factor	524.18	65	<.01	.95	.96	.08	.10
4 Factor	567.61	87	<.01	.95	.96	.07	.09
Unitary model ^a	3,619.35	170	<.01	.78	.78	.14	–
Higher order model	666.49	89	<.01	.94	.95	.08	.07

Paths between factors were set to 1. Following feedback from anonymous reviewers, the paths were set to the intercorrelations between the four factors as reported for the EFA. This model and the model we tested were largely comparable ($\chi^2(92) = 637.74$, $p < .01$; NFI = .95; CFI = .95; RMSEA = .07; SRMR = .12)

Following feedback from anonymous reviewers, we cross-validated the findings of the EFA by performing an exploratory data analysis on the CFA dataset. The 4-factor structure was preserved although only two items (R18 and R19) cross-loaded onto a second factor with a loading of at least .30. Results of a CFA of this model showed that it performed slightly worse than the conservative model we initially tested ($\chi^2(132) = 1073.29$, $p < .01$; NFI = .92; CFI = .93; RMSEA = .08; SRMR = .09)

^a AMOS was unable to fit the model. The option to fit an unidentified model was selected to obtain goodness of fit indices but no SRMR value was calculated

Table 4 Means (standard deviation) of factor scores, and results of linear regressions (beta weights and *t* scores) showing contribution to various psychological factors

	Problem-focused thoughts	Counterfactual thinking	Repetitive thoughts	Anticipatory thoughts
Mean (SD)	17.80 (7.35)	18.92 (6.27)	19.19 (5.70)	9.71 (2.99)
Contribution to psychological distress ($R^2 = .27^{***}$)				
$\beta(t)$	.42*** (17.01)	.00 (.17)	.19*** (7.67)	-.08*** (-3.74)
Contribution to productive coping ($R^2 = .09^{***}$)				
$\beta(t)$	-.32*** (-11.48)	.02 (.63)	-.07* (-2.33)	.23*** (9.15)
Contribution to non-productive coping ($R^2 = .38^{***}$)				
$\beta(t)$	.45*** (19.68)	.09*** (3.98)	.16*** (6.79)	-.02*** (-.92)
Contribution to reference to others ($R^2 = .02^{***}$)				
$\beta(t)$	.02 (.62)	-.02 (-.61)	-.02 (-.75)	.15*** (5.65)

For each multiple linear regression, factors were entered simultaneously in the same block

* $p < .05$, *** $p < .001$

Associations with Psychological Distress and Coping Styles

Means and standard deviations for the four RTSQ subscales for the full dataset are reported in Table 4. Factor

intercorrelations were $<.90$ (see Tabachnick and Fidell 2007) and the variance inflation factor less than 10 (for discussion see O'Brien 2007) which suggests that, although highly correlated in some cases, that there is no multicollinearity. A number of multiple linear regressions were undertaken with psychological distress and different coping styles as criterion variables. All but the Counterfactual Thinking subscale predicted psychological distress; with Anticipatory Rumination emerging as a protective factor (see Table 4). In regard to coping styles, all but Anticipatory Thoughts significantly contributed to Non-Productive Coping. Problem-focused Thoughts was predictive of lower Productive Coping; higher scores on Anticipatory Thoughts significantly predicted relying on others as a coping style.

Discussion

The main purpose of the current study was to examine the factor structure of the RTSQ and determine whether the initial one-factor structure suggested by Brinker and Dozois (2009) was replicable within a community sample of adolescents. An exploratory factor analysis provided evidence for four rumination subcomponents, labelled “Problem-Focused Thoughts”, “Counterfactual Thinking”, “Repetitive Thoughts”, and “Anticipatory Thoughts”. Confirmatory factor analysis indicated the RTSQ did not measure a unitary construct of ruminative thinking. We conclude the measure is better conceptualised as subscales measuring different facets of ruminative thinking, hierarchically organised under a single higher-order rumination factor. This conclusion and the results of the confirmatory factor analysis on a unitary model are inconsistent with Brinker and Dozois’ (2009) findings, but support contemporary conceptualisations of rumination as multidimensional and multifaceted (e.g. Smith and Alloy 2009). Our findings are consistent with those reported by Siegle et al. (2004), which suggest that although different facets of ruminative thought can be elucidated across multiple measures of rumination, they aggregate reliably to a single overarching construct. Although the four subscales were correlated with each other, the size of the correlations was moderate and was not sufficiently high to indicate multicollinearity.

The current study is the first to use the RTSQ with a community sample of adolescents. Comparing global RTSQ scores between the current sample and the initial adult validation sample suggests overall levels of rumination among adults and adolescents are almost identical. This observation provides preliminary support for the notion that adolescence may be the developmental stage in which rumination reaches its peak and becomes an automated maladaptive coping strategy persisting into adulthood.

However, longitudinal research utilising the RTSQ from primary school age into adolescence is required to determine whether adolescence represents the time when rumination is first rehearsed as a coping strategy.

Components of Rumination

The first component of rumination emerging from the current study, *problem-focused thoughts*, is perhaps the most consistent with traditional conceptualisations of rumination, reflected in the proportion of variance accounted for by this factor. Reflecting a lack of problem-solving ability and stunted information processing, this factor appears congruent with Nolen-Hoeksema's (1991) conceptualisation of rumination as repetitive thinking about causes, consequences, and symptoms of negative affect. It is also congruent with stress reactive rumination defined by Conway et al. (2000). Consistent with these conceptualisations of rumination, and with previous research, *problem-focused thoughts* was found to increase risk of psychological distress and reliance on non-productive coping strategies, and to decrease the likelihood of relying on productive coping strategies. In multiple regression analyses for psychological distress and non-productive coping, it had the highest coefficient among the four identified components. An additional feature of this factor appears to be the lengthy time spent ruminating (e.g. "Even if I think about a problem for hours..." and "Sometimes I realise I have been sitting and thinking about something for hours"). While most measures of rumination acknowledge *frequency* of ruminative thoughts and others the voluntariness, suddenness, dismissability, and intrusiveness of these thoughts, few acknowledge or directly access the *duration* of individual episodes of rumination. This tendency to ruminate for significantly long periods of time may be differentially linked to various psychological outcomes compared with the tendency to ruminate in general. Future research could clarify this possibility by determining whether the duration of ruminative thoughts contributes significantly to various psychological outcomes.

The second factor emerging from our factor analysis comprised items reflecting "wishful thinking" or a "what if..." thinking style, and is conceptually similar to the term *counterfactual thinking*, often used to refer to thinking about alternative outcomes and seen as the key psychological process underlying emotions like regret, relief, disappointment (Kahneman and Miller 1986), shame and guilt (Niedenthal et al. 1994). *Upward counterfactuals* are said to refer to imagined alternatives preferable to reality, and thus appear most relevant to the second factor identified in the current study (e.g. "I tend to replay past events as I would have liked them to happen" and "...I tend to imagine various scenarios where I would have acted

differently"). Consistent with research on counterfactual thinking, there was a significant and positive contribution of the second factor to non-productive coping; although it did not contribute to psychological distress. Future research on the differential role of this specific aspect of rumination on various mental health outcomes is warranted, as upward counterfactual thoughts have been associated with both positive and negative psychological outcomes (Prokopčáková and Ruiselová 2008; Roesse 1994).

The third component of rumination identified in the current study, *repetitive thoughts*, also appears reflective of traditional conceptions of rumination. Indeed, most definitions of rumination refer to frequency, and their repetitive nature (e.g. Conway et al. 2000; Martin et al. 1993; Nolen-Hoeksema 1991). Initially, this factor appeared similar to problem-focused rumination in regard to traditional conceptualisations of rumination and an item reflecting both the existence of a problem and the duration of rumination (i.e., "When I have a problem it will gnaw on my mind for a long time"). The salient features of this factor, however, appear to be intrusiveness, persistence, and automaticity of ruminative thoughts. This factor was observed to be the most well-defined and internally consistent, and was an independent predictor of psychological distress and non-productive coping over and above the other components. Interestingly, it may be this aspect of rumination specifically that contributes to the link observed between rumination and obsessive-compulsive symptoms among non-clinical samples (e.g., Wahl et al. 2012). Future research is required to examine the unique contribution of repetitive thoughts to various psychological outcomes and to further differentiate this factor from problem-focused rumination.

The fourth factor, *anticipatory thoughts*, appears to assess future-oriented rumination in addition to capturing the persistent nature of these thoughts. Brinker and Dozois (2009) attempted to create items for the RTSQ that were valence-neutral; however, it appears the items comprising this factor may be "valence ambiguous", such that both could be interpreted as either positive or negative depending on the emotional state of the individual at the time of rumination, and the content of the rumination itself. However, multiple regressions suggest that it is more likely linked to a positive process. Unlike the other factors, *anticipatory thoughts* was the only factor that was protective of psychological distress, and had a positive contribution to productive coping and reference to others. The future-orientation of this factor suggests it might be linked to worry associated with anticipation of threat or danger (Borkovec 1994; Szabo and Lovibond 2002; Tallis et al. 1994). The intrusive and uncontrollable thoughts described by this factor are not dissimilar to the catastrophizing process in worry where individuals develop, elaborate and

expand on worry themes about the future (Borkovec et al. 1998; Dugas and Ladouceur 2000; Gladstone and Parker 2003; Tallis et al. 1994). However, excessive and uncontrollable worry can exacerbate poor health, and lead to demoralisation, exhaustion, depression and other anxiety disorders (Behar et al. 2009; Riskind 2005); whereas anticipatory rumination in this study appears to be protective of psychological health and well-being. Future research investigating associations between anticipatory thoughts and worry, and various psychological outcomes may be warranted to understand the differential contribution of these related constructs.

Taken together, results from the multiple regressions suggest the process of repetitively thinking about a problem without resolution may be a stronger mechanism for psychological distress than engaging in a reflective “what if ...” thinking style and anticipating future eventualities. Engaging in counterfactual rumination, while not productive in the face of stressful situations and life events, appears to be neutral in regard to its contribution to psychological distress in these circumstances. Ruminating on future eventualities may be adaptive and lends itself to identifying resources to decrease isolation and to better cope with these eventualities thereby exerting a protective influence on psychological distress.

Implications

Results of the current study have several relevant applied implications, particularly concerning theoretical conceptualisations of rumination in research and subsequent clinical practice and intervention. Rumination may be conceptualised as a non-productive coping style associated with psychological distress. Results support the predominant definition of rumination as a focus on symptoms of distress and their causes and consequences (Nolen-Hoeksema 1991). However, the findings in regard to *anticipatory thoughts* suggest that in some instances, rumination may be useful in identifying strategies and resources to cope with future eventualities. Previous research suggests that rumination is largely comprised of a dimension that describes the overall level of repetitive thinking that individuals engage in and that subsequent dimensions tend to describe qualitative differences arising from content (Segerstrom et al. 2003, 2010). Our findings are consistent with this perspective given the high communalities reported for the items of the RTSQ in the unrotated PCA. However, results also suggest that qualitative differences in ruminative thinking may nonetheless be salient features for consideration in future research on rumination and its effects. Of all models tested, the one representing rumination as a unitary construct performed the worst; and the various methods utilised for determining the number of factors to extract

consistently recommended more than one. Finally, results of the multiple regressions showed that aspects of ruminative thinking make different contributions to psychological distress and coping styles. Our findings support the observation by Segerstrom et al. (2003) that the extent that individuals attend to positive or negative content, and are searching for new perspectives, attempting to solve problems, or preparing for eventualities when engaged in rumination can affect psychological health and well-being in different ways. Future research on the effects of the qualitative differences in rumination as assessed by the RTSQ may benefit from utilising the 15-item scale that was analysed in this study.

Findings supporting a multidimensional structure of rumination are also relevant for clinical practice and may inform selection of available interventions as well as development of new interventions. Skilling individuals in problem-solving, mindfulness-based interventions, distraction and thought stopping may be useful in treating the repetitive and recurrent nature of ruminating on negative content. Future research could benefit intervention from investigating these possibilities.

Limitations

Despite the novel findings provided by the current study, we stress the current sample was drawn from the general community. The structure of rumination may differ in populations where the overall level of rumination can be expected to be greater (e.g., clinical populations; Nolen-Hoeksema 2000). Indeed, identification of a similar factor structure within clinical populations is required before many of our suggestions regarding clinical practice and intervention can be implemented. Similarly, while recent research has observed lower levels of rumination in later life (i.e., in individuals 63 years and older; Suttelin et al. 2012) the exact nature of rumination across the lifespan has not been extensively studied and further research is required to determine whether the current findings can be generalized to adults.

Given there are a number of measures purporting to measure ruminative thinking, replication of our findings among these other measures—specifically the RSQ—would be beneficial. Moreover, while Brinker and Dozois (2009) showed that both the RTSQ and RSQ were independent predictors of depressed mood, the discriminant validity of the scale with other psychological constructs such as positive affectivity and coping style, was not assessed. Further investigation into the construct validity of the RTSQ is therefore warranted.

Finally, while most identified factors were found to contribute to psychological distress and non-productive coping, the cross-sectional nature of the analysis precludes

any conclusions regarding the differential contribution of these factors to the causal mechanisms for a range of negative psychological outcomes. Future work would be beneficial to guide the implementation of preventative interventions among adolescents.

Conclusion

This study established a four-factor structure of rumination assessed by the RTSQ that differs significantly from the original structure observed in its validation study. This provides support for the notion of rumination as a multifaceted and multidimensional construct. Future research identifying sources of convergent and discriminant validity would provide further refinement of these factors in addition to examining whether they are differentially associated with psychopathology.

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References

- Abela, J. R. Z., Brozina, K., & Haigh, E. P. (2002). An examination of the response style theory of depression in third- and seventh-grade children: A short-term longitudinal study. *Journal of Abnormal Child Psychology*, 30, 515–527.
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modelling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103, 411–423.
- Arney, M. F., Fresco, D. M., Moore, M. T., Mennin, D. S., Turk, C. L., Heimberg, R. G., et al. (2009). Brooding and pondering: Isolating the active ingredients of depressive rumination with exploratory factor analysis and structural equation modelling. *Assessment*, 16, 315–327. doi:10.1177/1073191109340388.
- Australian Institute of Health and Welfare. (2011). *Young Australians: their health and wellbeing 2011*. Cat. No. PHE 140. Canberra: Australian Institute of Health and Welfare.
- Behar, E., DiMarco, I. D., Hekler, E. B., Mohlman, J., & Staples, A. M. (2009). Current theoretical models of generalised anxiety disorder (GAD): Conceptual review and treatment implications. *Journal of Anxiety Disorders*, 23, 1011–1023.
- Borkovec, T. D. (1994). The nature, functions and origins of worry. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 5–33). West Sussex: Wiley.
- Borkovec, T. D., Ray, W. J., & Stober, J. (1998). Worry: A cognitive phenomenon intimately linked to affective, physiological, and interpersonal behavioural processes. *Cognitive Therapy and Research*, 22(6), 561–576.
- Borrill, J., Fox, P., Flynn, M., & Roger, D. (2009). Students who self-harm: Coping style, rumination and alexithymia. *Counselling Psychology Quarterly*, 22, 361–372.
- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, 65, 1–19. doi:10.1002/jclp.20542.
- Burwell, R. A., & Shirk, S. R. (2007). Subtypes of rumination in adolescence: Associations between brooding, reflection, depressive symptoms and coping. *Journal of Clinical Child & Adolescent Psychology*, 36(1), 56–65. doi:10.1080/15374410709336568.
- Calmes, C. A., & Roberts, J. E. (2007). Repetitive thought and emotional distress: Rumination and worry as prospective predictors of depressive and anxious symptomatology. *Cognitive Therapy and Research*, 30, 343–356. doi:10.1007/s10608-006-9026-9.
- Caprara, G. V., Paciello, M., Gerbino, M., & Cugini, C. (2007). Individual differences conducive to aggression and violence: Trajectories and correlates of irritability and hostile rumination through adolescence. *Aggressive Behaviour*, 33, 359–374.
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioural Research*, 1(2), 245–276.
- Conway, M., Csank, P. A. R., Holm, S. L., & Blake, C. K. (2000). On assessing individual differences in rumination on sadness. *Journal of Personality Assessment*, 75, 404–425.
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1, 16–29.
- Davis, R. N., & Nolen-Hoeksema, S. (2000). Cognitive inflexibility among ruminators and nonruminators. *Cognitive Therapy and Research*, 24(6), 699–711.
- DeCarlo, L. T. (1997). On the meaning and use of kurtosis. *Psychological Methods*, 2, 292–307.
- Dugas, M. J., & Ladouceur, R. (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. *Behaviour Modification*, 24, 635–657.
- Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4, 272–299.
- Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7, 286–299.
- Fresco, D. M., Frankel, A. N., Mennin, D. S., Turk, C. L., & Heimberg, R. G. (2002). Distinct and overlapping features of rumination and worry: The relationship of cognitive production to negative affective states. *Cognitive Therapy and Research*, 26, 179–188.
- Frydenberg, E., & Lewis, R. (1993). *The adolescent coping scale: Administrator's manual*. Melbourne: Australian Council for Educational Research.
- Frydenberg, E., & Lewis, R. (1996). A replication study of the structure of the adolescent coping scale: Multiple forms and applications of a self-report inventory in a counselling and research context. *European Journal of Psychological Assessment*, 12, 224–235.
- Gerbing, D. W., & Hamilton, J. G. (1996). Viability of exploratory factor analysis as a precursor to confirmatory factor analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, 3(1), 62–72.
- Gladstone, G., & Parker, G. (2003). What's the use of worrying? Its function and its dysfunction. *Australian and New Zealand Journal of Psychiatry*, 37, 347–354.
- Goldberg, D., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor: NFER-Nelson.
- Hampel, P., & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, 34(2), 73–83.
- Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*, 107(1), 128–140.

- Hardy, G. E., Shapiro, D. A., Haynes, C. E., & Rick, J. E. (1999). Validation of the General Health Questionnaire-12: Using a sample of employees from England's health care services. *Psychological Assessment*, 11(2), 159–165. doi:10.1037/1040-3590.11.2.159.
- Harrington, J. A., & Blankenship, V. (2002). Ruminative thoughts and their relation to depression and anxiety. *Journal of Applied Social Psychology*, 32, 465–485.
- Hilt, L. M., Cha, C. B., & Nolen-Hoeksema, S. (2008). Nonsuicidal self-injury in young adolescent girls: Moderators of the distress-function relationship. *Journal of Consulting and Clinical Psychology*, 76, 63–71. doi:10.1037/0022-006X.76.1.63.
- Hoff, E. R., & Muehlenkamp, J. J. (2009). Nonsuicidal self-injury in college students: The role of perfectionism and rumination. *Suicide & Life-Threatening Behaviour*, 39, 576–587.
- Hong, R. Y. (2007). Worry and rumination: Differential associations with anxious and depressive symptoms and coping behavior. *Behaviour Research and Therapy*, 45, 227–290. doi:10.1016/j.brat.2006.03.006.
- Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30, 179–185.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55.
- Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, 93, 136–153.
- Kaiser, H. F. (1970). A second generation Little Jiffy. *Psychometrika*, 35, 401–415.
- Kelly, O., Matheson, K., Ravindran, A., Merali, Z., & Anisman, H. (2007). Ruminative coping among patients with dysthymia before and after pharmacotherapy. *Depression and Anxiety*, 24, 233–243. doi:10.1002/da.20236.
- Kline, R. B. (2005). *Principals and practice of structural equation modeling* (2nd ed.). New York: Guilford Press.
- Larson, R., & Ham, M. (1993). Stress and “storm and stress” in early adolescence: The relationship of negative events with dysphoric affect. *Developmental Psychology*, 29, 130–140.
- Lyubomirsky, S., Kasri, F., & Zehm, K. (2003). Dysphoric ruminations impair concentration on academic tasks. *Cognitive Therapy and Research*, 27, 309–330.
- Marks, A. D. G., Sobanski, D. J., & Hine, D. W. (2010). Do dispositional rumination and/or mindfulness moderate the relationship between life hassles and psychological dysfunction in adolescents? *Australian and New Zealand Journal of Psychiatry*, 44, 831–838.
- Marroquin, B. M., Fontes, M., Scilletta, A., & Miranda, R. (2010). Ruminative subtypes and coping responses: Active and passive pathways to depressive symptoms. *Cognition and Emotion*, 24, 1446–1455. doi:10.1080/02699930903510212.
- Martin, L. L., & Tesser, A. (1989). Toward a motivational and structural theory of ruminative thought. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 306–326). New York: Guilford Press.
- Martin, L. L., Tesser, A., & McIntosh, D. (1993). Wanting but not having: The effects of unattained goals on thoughts and feelings. In D. M. Wegner & J. W. Pennebaker (Eds.), *Handbook of mental control* (pp. 552–572). Englewood Cliffs, NJ: Prentice Hall.
- Mikolajczak, M., Petrides, K. V., & Hurry, J. (2009). Adolescents choosing to self-harm as an emotion regulation strategy: The protective role of trait emotional intelligence. *British Journal of Clinical Psychology*, 48, 181–193.
- Mor, N., & Winquist, J. (2002). Self-focused attention and negative affect: A meta-analysis. *Psychological Bulletin*, 128, 638–662. doi:10.1037/0033-2909.128.4.638.
- Morrison, R., & O'Connor, R. C. (2008). A systematic review of the relationship between rumination and suicidality. *Suicide & Life-Threatening Behaviour*, 38, 523–538.
- Muris, P., Roelofs, J., Meesters, C., & Boomsma, P. (2004). Rumination and worry in nonclinical adolescents. *Cognitive Therapy and Research*, 28, 539–554.
- Niedenthal, P. M., Tagney, J. P., & Gavanski, I. (1994). “If only I weren't” versus “If only I hadn't”: Distinguishing shame and guilt in counterfactual thinking. *Journal of Personality and Social Psychology*, 67, 585–595.
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, 100, 569–582.
- Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology*, 109, 504–511. doi:10.1037/0021-843X.109.3.504.
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology*, 61, 115–121.
- Nolen-Hoeksema, S., Stice, E., Wade, E., & Bohon, C. (2007). Reciprocal relations between rumination and bulimic, substance abuse, and depressive symptoms in female adolescents. *Journal of Abnormal Psychology*, 116, 198–207. doi:10.1037/0021-843X.116.1.198.
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3, 400–424. doi:10.1111/j.1745-6924.2008.00088.x.
- O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41, 673–690. doi:10.1007/s11335-006-9018-6.
- O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behaviour Research Methods and Instrumentation*, 32, 396–402.
- Peled, M., & Moretti, M. M. (2007). Rumination on anger and sadness in adolescence: Fueling of fury and deepening of despair. *Journal of Clinical Child & Adolescent Psychology*, 36, 66–75.
- Prokopčáková, A., & Ruiselová, Z. (2008). Counterfactual thinking as related to anxiety and self-esteem. *Studia Psychologica*, 50, 429–437.
- Riskind, J. H. (2005). Cognitive mechanisms in generalised anxiety disorders: A second generation of theoretical perspectives. *Cognitive Therapy and Research*, 29, 1–5.
- Robinson, M. S., & Alloy, L. B. (2003). Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. *Cognitive Therapy and Research*, 27, 275–292.
- Roese, N. J. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology*, 66, 805–818.
- Ruscio, J., & Roche, B. (2012). Determining the number of factors to retain in an Exploratory Factor Analysis using comparison data of known factorial structure. *Psychological Assessment*, 24, 282–292. doi:10.1037/a0025697.
- Schoofs, H., Hermans, D., & Raes, F. (2010). Brooding and reflection as subtypes of rumination: Evidence from confirmatory factor analysis in nonclinical samples using the Dutch Ruminative Response Scale. *Journal of Psychopathology and Behavioural Assessment*, 32, 609–617. doi:10.1007/s10862-010-9182-9.
- Segerstrom, S. C., Roach, A. R., Evans, D. R., Schipper, L. J., & Darville, A. K. (2010). The structure and health correlates of trait repetitive thoughts in older adults. *Psychology and Aging*, 25, 505–515. doi:10.1037/a0019456.

- Segerstrom, S. C., Stanton, A. L., Alden, L. E., & Shortridge, B. E. (2003). A multidimensional structure for repetitive thought: What's on your mind, and how, and how much? *Journal of Personality and Social Psychology*, 85, 909–921. doi:10.1037/0022-3514.85.5.909.
- Selby, E. A., Anestis, M. D., & Joiner, T. E. (2008). Understanding the relationship between emotional and behavioural dysregulation: Emotional cascades. *Behaviour Research and Therapy*, 46, 593–611. doi:10.1016/j.brat.2008.02.002.
- Siegle, G. J., Moore, P. M., & Thase, M. E. (2004). Rumination: One construct, many features in healthy individuals, depressed individuals, and individuals with lupus. *Cognitive Therapy and Research*, 28, 645–668.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, 22, 1359–1366.
- Skitch, S. A., & Abela, J. R. Z. (2008). Rumination in response to stress as a common vulnerability factor to depression and substance misuse in adolescence. *Journal of Abnormal Child Psychology*, 36, 1029–1045. doi:10.1007/s10802-008-9233-9.
- Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical Psychology Review*, 29, 116–128.
- Suttelin, S., Paap, M. C. S., Babic, S., Kubler, A., & Vogeel, C. (2012). Rumination and age: Some things get better. *Journal of Aging Research*, 1–10. doi: 10.1155/2012/267327.
- Szabo, M., & Lovibond, P. F. (2002). The cognitive content of naturally occurring worry episodes. *Cognitive Therapy and Research*, 26(2), 167–177.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). New York: Harper Collins.
- Tait, R. J., French, D. J., & Hulse, G. K. (2002). Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. *Australian and New Zealand Journal of Psychiatry*, 37(3), 374–381. doi:10.1046/j.1440-1614.2003.01133.x.
- Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2009). Intrusive versus deliberate rumination in posttraumatic growth across US and Japanese samples. *Anxiety, Stress and Coping*, 22, 129–136. doi:10.1080/10615800802317841.
- Tallis, F., Davey, G. C. L., & Capuzzo, N. (1994). The phenomenology of non-pathological worry: A preliminary investigation. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 61–89). West Sussex: Wiley.
- Thomsen, D. K. (2006). The association between rumination and negative affect: A review. *Cognition and Emotion*, 20, 1216–1235. doi:10.1080/02699930500473533.
- Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, 27, 247–259.
- Velicer, W. F. (1976). Determining the number of components from the matrix of partial correlations. *Psychometrika*, 41, 321–327.
- Wahl, K., Ertle, A., Böhne, A., Zurowski, B., & Kordon, A. (2012). Relations between a ruminative thinking style and obsessive-compulsive symptoms in non-clinical samples. *Anxiety, Stress & Coping: An International Journal*, 24(2), 217–225.
- Ward, A., Lyubomirsky, S., Sousa, L., & Nolen-Hoeksema, S. (2003). Can't quite commit: Rumination and uncertainty. *Personality and Social Psychology Bulletin*, 29, 96–107. doi:10.1177/0146167202238375.
- Watkins, E. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin*, 134, 163–206. doi:10.1037/0033-2909.134.2.163.
- Watkins, E., & Baracaia, S. (2001). Why do people ruminate in dysphoric moods? *Personality and Individual Differences*, 30, 723–734.