FROM ATTACHMENT INSECURITY TO NON-SUICIDAL SELF-INJURY: THE

MEDIATING ROLE OF EMOTION REGULATION

BY

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Abstract

Non-suicidal self-injury (NSSI) is a relatively common behaviour in adolescents. This is concerning as NSSI is a transdiagnostic risk factor for a range of mental disorders and is associated with increased risk of later suicide attempts. In this thesis, I used a longitudinal sample of New Zealand secondary school students to investigate the possible developmental pathway of parental attachment to NSSI via the mediating effect of emotion regulation. First, I examined the suitability of the Emotion Regulation Index for Children and Adolescents (ERICA; MacDermott et al., 2010) as a measure of emotion regulation in a New Zealand sample using confirmatory factor analysis, followed by a comparison with a more popularly used measure (the Difficulties in Emotion Regulation Scale; Gratz & Roemer, 2004). Finding the ERICA to be suitable for use with my sample, I conducted a cross-lagged panel analysis with a longitudinal mediation to investigate how attachment, emotion regulation, and NSSI relate to each other over time. I found that emotion regulation was a significant mediator of the relationship between attachment and NSSI, supporting my hypothesis. The theoretical and practical implications of this are discussed in terms of the development of NSSI and intervention and treatment possibilities.

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Preface

This thesis draws on the work of the Youth Wellbeing Study (YWS), a research group that I am involved in based at Victoria University of Wellington.[1] Among other things, the YWS conduct an ongoing longitudinal survey amongst secondary school students in the Wellington region. This survey covers a range of topics relevant to understanding the needs of New Zealand youth, including (but not limited to) non-suicidal self-injury, suicidality, bullying, identity, perfectionism, and social support.

When given the opportunity to examine the data available from the YWS survey, I was drawn to attachment, which combines my interests in social, clinical, developmental and evolutionary psychology. Thankfully, they had a wealth of existing data suitable for answering my research question, which allowed me to conduct my study despite the COVID-19 situation. With lockdown measures in place on and off throughout the past year, I am incredibly grateful for the hard work of the YWS team which has allowed me to conduct the research that I had planned.

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[1] https://youthwellbeingstudy.wordpress.com/

From attachment insecurity to non-suicidal self-injury: The mediating role of emotion

regulation

Adolescence is a challenging period during which young people face new and

unprecedented demands in school, relationships, and their identity (Hollenstein & Lanteigne,

2018; Schäfer et al., 2017; Seiffge-Krenke et al., 2009). Simultaneously, developmental

changes within the brain cause adolescents to experience more intense and more frequent

emotional highs and lows than in childhood or adulthood, with a particular increase in the

frequency of negative emotions such as irritability, anger, and sadness (Bailen et al., 2019;

Larson et al., 2002; Riediger & Klipker, 2014). Compounding these difficulties, adolescents

must also become increasingly self-reliant when it comes to managing these situations and

the accompanying emotions as they gain autonomy from their parents (Mónaco et al., 2019;

Riediger & Klipker, 2014). This combination of unique stressors, social environment, and

brain development makes adolescence a period of particular risk for engaging in risky or

maladaptive behaviours, as well as for the development of psychopathology (Betts et al.,

2009; Cicchetti & Rogosch, 2002). One adolescent behaviour that has risen to the forefront of

scientific, clinical, and wider societal concern in recent years is that of non-suicidal self-

injury (NSSI) (Nock, 2010).

Non-Suicidal Self-Injury

NSSI is the direct, deliberate injury of one's own body tissue without suicidal intent

and without cultural sanction (Nock & Favazza, 2009). For example, common behaviours

classified as NSSI include cutting, punching, or burning oneself. In comparison, a behaviour

like binge-drinking is not considered NSSI as it may not injure bodily tissue directly

(although people may engage in it in a deliberately harmful way); tattooing and piercing,

while direct and deliberate, are typically considered to be culturally acceptable and are

primarily an aesthetic choice.

While NSSI is not intended to cause death, this does not mean that the behaviour is harmless. Once primarily thought to be a symptom of borderline personality disorder (BPD), further research has indicated that NSSI is associated with a wide range of psychiatric disorders and is thus more appropriately considered transdiagnostic (Bentley et al., 2016; Nock et al., 2006). Additionally, NSSI is consistently associated with an increased risk of suicide, both in high-risk and clinical samples (e.g., Chesin et al., 2017; Horwitz et al., 2015), as well as in community samples (e.g., Scott et al., 2015). Indeed, NSSI is a stronger predictor of suicide attempts than depressive symptoms, anxiety, and impulsivity, second only to suicidal ideation (Burke et al., 2018; Klonsky et al., 2013). This risk is increased by longer history of NSSI, greater variety of methods (e.g., cutting, burning, and scratching, not cutting alone), and absence of physical pain during NSSI (Nock et al., 2006). Joiner (2005) theorised that those who engage in NSSI are at increased risk of suicide attempts as they become habituated to pain and gain an "acquired capability" for suicide – that is, NSSI functions as a practice trial of sorts. Thus, although NSSI itself is an explicitly non-suicidal act, it serves as an indicator and predictor of psychological distress. Additionally, NSSI can also result in harm to the individual in terms of injuring themselves more seriously (e.g., infection, nerve damage); social repercussions (e.g. damaging relationship with peers or parents); and inhibiting themselves from developing more effective coping strategies (Burke et al., 2019; Wilkinson & Goodyer, 2011).

NSSI disproportionately affects young people and is often considered an "adolescent-limited" behaviour – that is, both its onset and its cessation typically occur during the adolescent period (Klonsky, 2011; Robinson et al., 2019). Indeed, NSSI is relatively common in adolescence, with recent estimates indicating that between 38% and 49% of New Zealand (NZ) teens report engaging in NSSI at least once (Fitzgerald & Curtis, 2017; Garisch & Wilson, 2015). This falls towards the higher end of global estimates: a meta-analysis by

Cipriano and colleagues (2017) reviewed papers published in English between 1998 and 2016 and found prevalence rates ranging from 8% to 47% of adolescents.[2] In Fitzgerald and Curtis' sample, 13% had engaged in NSSI in the past year, while Robinson and colleagues (2019) reported one in five. In comparison, global estimates of past year NSSI range from 7 to 37% (Muehlenkamp et al., 2012). NZ appears to have elevated rates of NSSI; this is particularly interesting as NZ also has relatively high suicide rates, especially among youth. In fact, NZ's youth suicide rate is among the highest in high-income countries.[3] Given the consequences of NSSI (particularly its link to suicidality), furthering our understanding of its risk factors, functions, and trajectory is of vital importance in supporting young people in NZ.

The Emotion Regulatory Function of Non-Suicidal Self-Injury

What is it that distinguishes NSSI from other acts that involve injury to the self? Many NSSI researchers argue that NSSI is based on function rather than form – that is, it is *why* people engage in NSSI that makes it an issue of concern, rather than there being a specific act (e.g., cutting) that makes something "count" as NSSI. Why, then, would someone choose to inflict pain on themselves, a behaviour which seems totally at odds with any sense of self-preservation (Nock, 2010)? It is widely accepted among NSSI researchers that it is the function of *emotion regulation* that distinguishes NSSI from other behaviours that cause injury to the self (Cipriano et al., 2017; Gratz & Roemer, 2004; Linehan, 1993; McKenzie & Gross, 2014). Emotion regulation refers to the ways in which one shapes, maintains, or otherwise controls one's emotional response (Gross, 2014; see detailed discussion starting p. 6). While emotion regulation refers to what we do to alter *any* emotion, it is typically negative or distressing emotions that require an active regulatory response – although the

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[2] The wide range of rates can be partially explained by differences in measurement – the field is relatively young and NSSI has been measured and defined in a variety of ways. This meta-analysis also looked at clinical and community samples.

[3] New Zealand had the highest number of youth deaths by suicide per capita in 2017, with 15.6 deaths per 100 000 in 2012–13 (aged 15–19; UNICEF Innocenti, 2017), falling slightly to second place (after Lithuania) with 14.9 deaths per 100 000 in 2013–15 (UNICEF Innocenti, 2020).

regulation of both positive and negative emotions plays an important role in psychological wellbeing (Joormann & Siemer, 2014).

Self-report surveys of people who self-injure support the conceptualisation of NSSI as a form of emotion regulation. The most common measure of NSSI function is the Inventory of Statements About Self-Injury (ISAS; Klonsky & Glen, 2009), which assesses a variety of potential intra- and interpersonal functions. While developing the scale, they found that affect regulation was the most commonly endorsed function, followed by self-punishment. A meta-analysis by Taylor and colleagues (2018) replicated this, indicating that emotion regulation is the most prevalent function of NSSI, followed by communicating distress and self-punishment. The accounts of NZ secondary school adolescents also align with these findings, with participants endorsing affect regulation and self-punishment as their prime reasons for self-injuring (Robinson et al., 2019).

How does hurting oneself regulate one's emotions? As stated by Chapman and colleagues (2006), NSSI can be "exceptionally effective at terminating unwanted emotional states" (p. 374); thus, the use of NSSI as an emotion regulation tool is not as puzzling as it may appear at a glance, particularly if the self-injuring individual has not had the opportunities to learn more adaptive coping skills. Various influential theories of deliberate self-harm[4] and NSSI elaborate on how exactly NSSI might operate to regulate one's emotions. For example, the Experiential Avoidance Model of Deliberate Self-Harm explicitly incorporates emotion regulation as an important facet of the NSSI process (see Figure 1; Chapman et al., 2006). According to the Experiential Avoidance Model, NSSI is primarily a strategy that allows one to avoid experiencing distressing emotions, by providing either escape or relief. An individual first learns that self-injury may result in relief from personal experience, or from peers or media via social learning. When negative emotions are elicited

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[4] Includes both suicidal and non-suicidal self-injurious behaviours.

by a stimulus (e.g., arguing with a parent, peer rejection), the self-injuring individual is motivated to avoid them. Engaging in self-injury relieves these emotions by creating a physical sensation of pain. This sensation may provide relief through cognitive distraction from emotional distress; through the release of endogenous opioids in response to physical injury; and/or by confirming negative self-concepts, which provides a sense of control (i.e., gaining satisfaction from giving oneself their "deserved" punishment; Chapman et al., 2006). Thus, according to the Experiential Avoidance Model, NSSI functions as an emotion regulation strategy as it effectively reduces negative emotions. Additionally, variations in one's individual emotion regulation abilities may increase one's risk of NSSI, such as having limited availability of strategies or difficulty regulating emotions when experiencing high emotional arousal.

Figure 1

The Experiential Avoidance Model of Deliberate Self-Harm (Chapman et al., 2006)
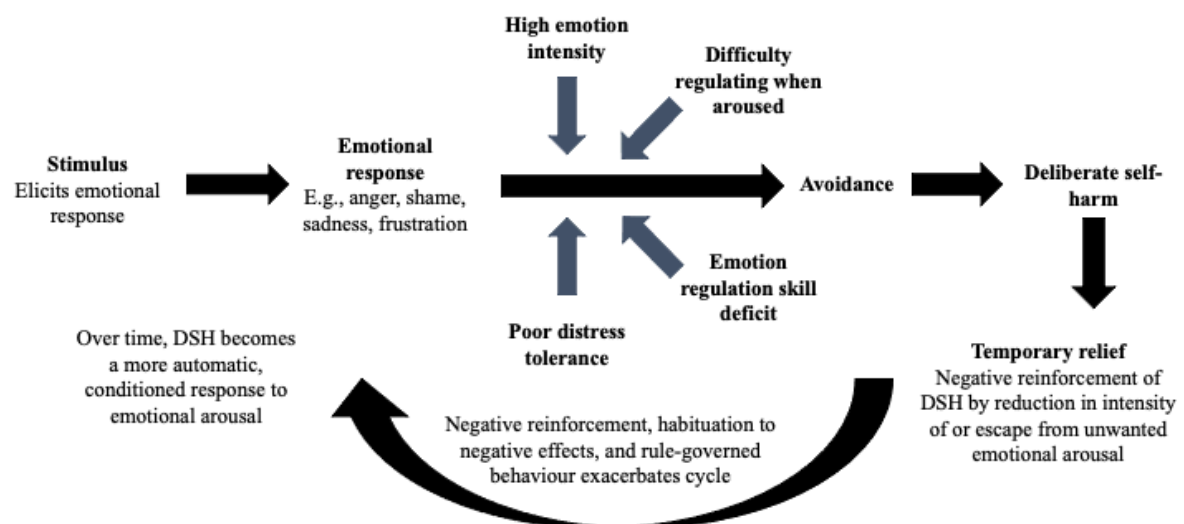
Note. Reproduction of figure from Chapman and colleagues (2006).

Similarly, in Nock and Prinstein's Four-Function Model of NSSI (2004), which delineates the ways in which NSSI may be reinforced, *all* of the functions listed relate to the

regulation of emotion (see Table 1). NSSI may be automatically reinforced by providing an escape from aversive affective or cognitive states (e.g., by providing distraction from distressing emotions), or by increasing desired affective or cognitive states (e.g., through release of endorphins). These functions are explicitly regulatory, decreasing negative emotion or increasing positive emotion respectively. NSSI may also provide escape from aversive social events (e.g., by being kept home from school), or by increasing desired social events (e.g., receiving attention or support). These can also be conceptualised as forms of emotion regulation – for example, to escape an aversive situation which is causing one distress is an attempt to decrease one's negative emotions. Finally, it is the automatic functions which are most commonly endorsed by self-injurers, again supporting the idea that NSSI is primarily used for emotion regulatory purposes.

Table 1

The Four-Function Model of Non-Suicidal Self-Injury (Nock & Prinstein, 2004)

Reinforcement type	Automatic	Social
Negative	Decrease or eliminate aversive affective or cognitive state/s	Decrease or eliminate aversive social event/s (escape)
Positive	Increase or generate desired affective or cognitive state/s	Increase or generate desired social event/s (attention)

Emotion Regulation

Emotions are a vital guide to interpreting the constant sensory input that we receive from our environment, allowing us to use our cognitive resources efficiently and priming us to respond to the situation at hand (Gross, 2014, 2015). They function as a shortcut that tells us what we want – what is attractive, what is aversive, what is safe and unsafe. While they tend to work well as a general guide, there are often times when the alteration of one's emotions is necessary in order to achieve a particular goal. For example, one may wish to reduce feelings of sadness if it is preventing them from performing an important task, or one

may elicit feelings of sadness in order to empathise with another person. Fortunately, humans are also able to regulate our emotions. *Emotion regulation* refers to the range of things one might do to alter, maintain, or suppress one's emotional response (Gross, 2014). This may involve altering the *intensity* (i.e., down-regulating or up-regulating an emotion) or the *valence* (e.g., from finding a situation embarrassing to finding it humorous) of the emotion in question (Gross, 2015).

Many of the behaviours people engage in involve emotion regulation of some form, simply because of how fundamental emotions are in daily functioning. Perhaps as a result of this, emotion regulation can be difficult to define and measure. Many researchers have focussed on examining the use of particular emotion regulation *strategies,* which are the actions that one takes in order to regulate their emotions. Alternatively, the measurement of emotion regulation *ability* focusses on one's general dispositional approach and understanding of emotions (Naragon-Gainey et al., 2017). These may inter-relate: for example, one's emotion regulation ability may affect which strategies one tends to use (Zhou et al., 2020). When referring to emotion regulation in this thesis, I mean one's general self-reported *ability* to regulate their emotions effectively.

Emotion Regulation and Psychological Wellbeing

While emotions are typically a useful guide to one's environment, difficulties can arise when one's emotions are of the wrong type, duration, or intensity for the given situation (Gross, 2014). If one is regularly unable to regulate these emotions effectively, emotions may become a hindrance rather than being helpful. Indeed, emotion regulatory abilities are regularly found to be associated with better outcomes across various facets of psychological wellbeing (Nyklíček et al., 2011). Emotion *dysregulation*, on the other hand, is transdiagnostic and a key feature of many psychological disorders (American Psychiatric Association, 2013; Gratz & Roemer, 2004). Many studies have also identified emotion

regulation as a mediator of the relationships between various risk factors and NSSI (e.g.,

Fraser et al., 2018; Kiekens et al., 2017; Tatnell et al., 2014). Thus, understanding why some

people develop better emotion regulation ability than others may elucidate who is more likely

to engage in NSSI and why.

The Development of Emotion Regulation

Emotion regulation abilities develop over time. Infants and young children rely

heavily on extrinsic emotion regulation, whereby others (typically the parent) manage their

emotions for them. Arguably, one of the parent's most important roles is regulating their

child's emotions while teaching them how to process and manage emotions themselves (e.g.,

Fonagy et al. 1991). As they grow older, children progressively begin to rely more on

intrinsic emotion regulation – that is, they are expected to regulate their own emotions rather

than having them managed by an outside source such as a parent or teacher.[5] Throughout this

process, children learn how to think about emotion and develop a general pattern of

responding (Zeman et al., 2006).

Why is it, then, that some people develop ways of experiencing and coping with their

emotions that seem to be more adaptive than others? One key psychological theory that has

been used to explain differences in emotion regulation is that of *attachment*. Attachment

theory posits that the foundations of emotion regulation lie in the personal understandings of

emotion and support-seeking learned through the our relationship with our primary caregiver

(Bowlby, 1969/1982; Cassidy, 2016).

Attachment

The human infant is an extremely vulnerable creature. Totally reliant upon the adults

around them, it has been theorised that infant behaviour evolved in order to keep them close

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[5] While we may still experience extrinsic regulation throughout the lifespan, it is not to the extent of that in infancy and early childhood.

to those adults (Simpson & Belsky, 2016). These behaviours are part of the attachment

system which motivates the infant to seek proximity to attachment figures, particularly when

in distress (see Figure 2; Bowlby, 1969/1982; 1973; 1980). This serves a variety of adaptive

functions, including enhanced feeding, learning about the environment, regulation of

emotions, and social interaction, as well as protection from predators (Bowlby, 1969/1982;

see also Simpson & Belsky, 2016). Through their interactions, the infant and their caregiver

form an attachment bond that provides the infant with a fundamental sense of *security*, or the

belief that the attachment figure will be available and responsive when they are needed

(Bowlby, 1969/1982).

Figure 2

Functioning of the Attachment System
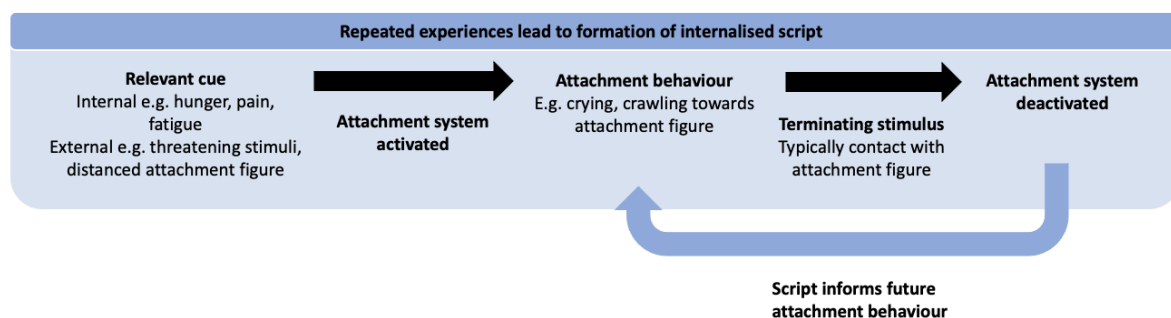
Note. Informed by Cassidy (2016).

The nature of the attachment bond is shaped by the caregiver's responsiveness to the

infant, particularly when they are in danger or distress (whether real, potential, or perceived;

see Figure 2). The infant's repeated experiences of how their caregiver responds to their

attachment behaviour results in the formation of a script or *internal working model* for how to

best act in future attachment-relevant situations – that is, situations in which they find

themselves in danger or distress. If the caregiver is sensitive to the infant's emotional needs

(i.e., is not under- or overreactive), and responsive (i.e., provides support when the infant

needs it), the infant is more likely to become securely attached[6] (Cassidy, 2016). Thus, the

quality of the attachment bond is especially related to the infant's emotional development,

and affects how they approach support-seeking in future (Cassidy, 2016).

One's attachment to their parents typically remains relatively stable across time (e.g.,

Fraley, 2002; Scharfe, 2003). Shifts that do occur during infancy to adolescence can typically

be linked to attachment-related changes to the caregiving environment, such as loss of a

parent (Fearon & Roisman, 2017). One's attachment style generally persists throughout the

lifespan and continues to shape the way in which one behaves in future close relationships,

and so attachment has lasting implications for social and emotional wellbeing (see Fraley,

2002; Hazan & Shaver, 1987; Zeifman, 2019).

How Attachment Shapes Emotion Regulation

One of the key things that the infant learns about through the attachment bond is their

own emotions: how to perceive them, label them, interpret them, and regulate them (Bowlby,

1969/1982; Thompson, 2014). Through this relationship, the infant also learns about

themselves, the people around them, and what to expect from others. If their caregiver is

responsive, the infant forms a secure attachment, learning that their emotions can be

effectively regulated and that they can expect to receive support from others when they need

it. Moreover, they learn a certain way of responding to their emotions: if emotions are

expressed, then they will receive support and guidance that effectively alleviates their distress

(Mikulincer & Shaver, 2016). More securely attached infants are more comfortable

exploring, which is also associated with greater flexibility in emotion regulation strategy use

(Jaffe et al., 2010).

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[6] While attachment may be referred to as "secure" or "insecure" throughout this thesis for brevity, please note that attachment is dimensional rather than categorical – one is "more secure" or "less secure."

Those who are less securely attached tend to display different patterns of emotion regulation depending on whether they have an avoidant or anxious attachment style. An insecure-avoidant attachment style typically relies on emotion suppression as a result of cool or rejecting treatment by the attachment figure (Girme et al., 2021; Mikulincer & Shaver, 2016). Avoidant individuals learn to suppress their emotions and try to downregulate negative feelings by minimising interdependence and intimacy, as they have learned that support-seeking behaviour will not be met with validation or support (Mikulincer & Shaver, 2016; Stevens, 2014). Thus, avoidant attachment is characterised by attempts to prevent situations (e.g., intimacy) that might lead to negative events (e.g., conflict or rejection), and when that fails, attempts to hide evidence of vulnerability (Mikulincer & Shaver, 2016).

If the attachment figure is inconsistently responsive, however, the infant develops an insecure-anxious attachment style. This style is distinct from secure and avoidant attachment in that negative emotions are not perceived as counter to one's goals. While secure and avoidant types generally try to downregulate their negative emotions, either by reappraisal and support-seeking or by suppression (respectively), the anxiously attached individual interprets negative emotions as a means of eliciting care from their attachment figure (Mikulincer & Shaver, 2016). They use these emotions as an indirect method of requesting support, rather than risk directly asking for it and being rejected. Where the avoidant individual tends to suppress the expression of their emotions, the anxious individual intensifies them (Mikulincer & Shaver, 2016).

Thus, the attachment bond fundamentally shapes how we experience and interpret our world, ourselves, and others, with secure attachment providing a qualitatively different emotional experience to an insecure attachment. It should come as no surprise, then, that attachment security is related to one's psychological wellbeing.

Attachment and Psychological Wellbeing

Attachment provides a solid foundation on which various other facets of social and emotional development are able to build upon (see Greenberg, 1999). The effects of attachment can be observed in many areas of psychological wellbeing, with secure attachment generally associated with better (and insecure with poorer) outcomes. Various studies have found that those who are more securely attached report higher self-esteem (e.g., Armsden & Greenberg, 1987; Marrero-Quevedo et al., 2019; Tatnell et al., 2014), self-worth, and self-efficacy (e.g., Kenny & Sirin, 2006; Tatnell et al., 2014), while insecure individuals show increased sensitivity to rejection, criticism, and disapproval (e.g., Natarajan et al., 2011). Secure attachment is also related to lesser self-criticism and maladaptive perfectionism (e.g., Falgares et al., 2017; Thompson & Zuroff, 1999; Ulu & Tezer, 2010). Secure individuals report greater life satisfaction (e.g., Armsden & Greenberg, 1987; He et al., 2018; Mónaco et al., 2019), and greater positive (and lesser negative) affect (e.g., Mónaco et al., 2019), as well as lower hopelessness (e.g., He et al., 2018). They also tend to be more socially competent (e.g., DiTomasso et al., 2003; Groh et al., 2014). Early attachment insecurity is linked to later internalising and externalising symptoms (Fearon et al., 2010; Groh et al., 2012), with securely attached individuals typically reporting fewer depressive and anxious symptoms than those who are insecurely attached (e.g., He et al., 2018, Kenny & Sirin, 2006). Insecurely attached individuals report greater levels of general psychological distress (He et al., 2018; Oldfield et al., 2015).

Overall, there is an ever-growing body of research to suggest that insecure attachment is a risk factor for (and secure attachment a buffer against) all manner of emotional and behavioural problems across the lifespan (Claes et al., 2016). Additionally, it seems likely that this occurs through the enhanced emotion regulation abilities that develop via secure attachment (e.g., Karreman & Vingerhoets, 2012).

Attachment and NSSI.

NSSI is closely linked to family-related factors (Schade, 2013). Indeed, a maladaptive family environment is one of the strongest predictors of NSSI (see Kelada et al., 2018), while supportive family relationships is one of the most important protective factors (Tatnell et al., 2014). Taking into consideration the link between secure attachment and better psychological outcomes, the theoretical pathway from secure attachment to better emotion regulation, and the emotion regulatory role of NSSI, it is theoretically consistent that NSSI should be associated with insecure attachment.

Indeed, many researchers have found that those who engage in self-injury report less secure parental attachment. This relationship has been found in self-injuring young adults (e.g., Braga & Gonçalves, 2014; Bureau et al., 2010; Claes et al., 2016; Gratz et al., 2002), as well as self-injuring adolescents (e.g., Gandhi et al., 2016; Hilt et al., 2008; Jiang et al., 2017; Tatnell et al., 2014). However, these studies vary greatly in the measures used to examine parental attachment. It is common to find that a study examining the relationship between attachment and NSSI reports only individual subscales of an attachment measure, or finds differential associations of NSSI with each subscale (e.g., Claes et al., 2016, Tatnell et al., 2018). Additionally, although many NSSI studies have included attachment among their measures, there has not been a systematic review of the link between attachment and NSSI at the time of writing. Nevertheless, there is a general trend in that insecure attachment is typically related to greater NSSI.

The Unique Context of Adolescence

Finally, it is important to consider what it may be about adolescence that puts individuals at particular risk for engaging in NSSI (Klonsky, 2011; Robinson et al., 2019). In terms of attachment, adolescence is a fascinating period as individuals are increasingly shifting their attachment from their parents, to their peers, to their romantic partners (Allen &

Tan, 2016). Not only is the key figure of attachment shifting, but older children and adolescents are also increasingly able to rely on the mental representation of their attachment figure to comfort them (as opposed to the attachment system of infants and young children, which functions through the direct physical – and emotional – presence of their parent; Selcuk et al., 2012). Finally, adolescents have to balance their need for autonomy with their continued need for an attachment figure (Allen & Tan, 2016). Despite these changes, parents continue to play a key role as attachment figures, particularly in more extreme cases of distress – indeed, this is observable into adulthood (Allan & Tan, 2016; Rosenthal & Kobak, 2010).

Alongside these changes in attachment, adolescents face unique emotional challenges. The emotions which adolescents are dealing with are more intense, more frequent, and more labile – it is not simply that they are less effective at managing them (e.g., Ahmed et al., 2015; Spear, 2011; Stroud et al., 2009). Additionally, impulsivity and risk-taking behaviour peaks during adolescence, placing them in a unique position of risk (Steinberg, 2008). It is theorised that differential development across the brain predisposes adolescents to their particular difficulties with emotion regulation – that is, the subcortical areas which are involved in the experience of emotion typically develop before the areas of the brain responsible for higher cognitive functions, such as decision-making (Ahmed et al., 2015; Riediger & Klipker, 2014). Thus, with experience and maturation, adolescents naturally move towards healthier emotion regulation (John & Gross, 2004).

Thus, emotion regulation in adolescence is a complex interaction between changes in the brain, adolescent emotionality, and the social environment (including parenting). While this period of life is, in many ways, defined by an increased separation from parental figures, the relationship an adolescent has with their parents continues to play a vital role in their socioemotional wellbeing (Allen & Tan, 2016). Attachment both sets the foundation for

learning about adaptive emotion regulation, as well as augmenting the adolescent's ability to seek and receive help from parental figures.

Attachment, Emotion Regulation, and Non-Suicidal Self-Injury – the Present Study

Altogether, the theoretical and empirical evidence suggests that attachment drives the development of emotion regulation, while also being associated with NSSI, which is thought to have a strong emotion regulatory component. As previously described, many studies have linked attachment to emotion regulation, emotion regulation to NSSI, and NSSI to attachment. Finally, NSSI was once considered to simply be a symptom of BPD, with the only mention of NSSI in previous Diagnostic and Statistical Manuals being a diagnostic criterion for BPD (American Psychiatric Association, 2000). It has been previously noted by researchers that BPD shares remarkable similarities with insecure attachment, particularly an anxious or disorganised attachment style (e.g., Fonagy et al., 2000). People with BPD have marked difficulties with regulating their emotions, which might explain why NSSI, particularly more severe (and therefore more visible) NSSI, co-occurs with BPD (Turner et al., 2015).

Taking all of this into consideration, it is plausible there may be a developmental pathway from attachment to NSSI via emotion regulation. While many NSSI studies have worked within the assumption that attachment theory is a possible explanatory framework for NSSI (see Levesque et al., 2010), no study to date has examined how attachment, emotion regulation, and NSSI relate over time. Tatnell and colleagues (2014) conducted a cross-sectional mediation investigating whether emotion regulation mediated the attachment-NSSI relationship. They found that the relationship between attachment (as measured by the Adolescent Attachment Questionnaire; West et al., 1998) and NSSI (as measured by the Self-Harm Behaviour Questionnaire; Gutierrez et al., 2001) was significantly mediated by use of

cognitive reappraisal (as measured by the Emotion Regulation Questionnaire; Gross & John, 2003), providing preliminary evidence for a potential mediating effect over time.

In this thesis, I aim to examine how adolescents' attachment to their parents relates to NSSI engagement. In particular, I will investigate whether emotion regulation mediates the relationship between attachment and NSSI across time. If this is the case, it will provide evidence for a causal link from attachment, to emotion regulation, to NSSI. The majority of studies to date that link parenting factors to NSSI are correlational and use cross-sectional samples (Arbuthnott & Lewis, 2015). Additionally, there are no published studies addressing attachment and NSSI in NZ adolescents. Thus, the present study will both demonstrate whether attachment and NSSI are related in a NZ sample, as well as investigate whether there is a developmental pathway from attachment to emotion regulation to NSSI.

Study 1: Evaluating Measures of Adolescent Emotion Regulation

Emotion regulation is typically measured using self-report. When measuring emotion regulation in adolescents, items need to be as cognitively simple as possible as the capacity for abstract thought and complex meta-cognition is still developing (Zeman et al., 2007). While a variety of emotion regulation measures exist, those that have been developed for use with adolescents are more limited. In the present study, emotion regulation was measured using the *Emotion Regulation Index for Children and Adolescents* (ERICA; MacDermott et al., 2010). The ERICA was developed as a simplified version of the unpublished Emotion Regulation Checklist for Adolescents (ERCA; Biesecker & Easterbrooks, 2001), which in turn was based on the other-report Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997). While the ERC originally contained two subscales, *Lability/Negativity* (dysregulated negative affect, lack of flexibility, mood lability) and *Emotion Regulation* (emotional self-awareness, empathy, situationally-appropriate displays of affect), the ERICA found that items

broke down into three factors, which were labelled *Emotional Control*, *Emotional Self-Awareness,* and *Situational Responsiveness* (see Table 2).

Table 2

Emotion Regulation Index for Children and Adolescents (MacDermott et al., 2010)

Factor	Item
Factor 1: Emotional Control	*5. When things don't go my way I get upset easily*
	7. I have angry outbursts
	9. I can be disruptive at the wrong times
	10. I get angry when adults tell me what I can and can't do
	12. I have trouble waiting for something I want
	14. I do things without thinking about them first
	16. I annoy others by not minding my own business
Factor 2: Emotional Self-Awareness	1. I am a happy person
	3. I can handle it well when things change or I have to try something new
	4. When I get upset, I can get over it quickly
	11. I am a sad person
	13. I am quiet and shy, and I don't show my feelings
Factor 3: Situational Responsiveness	2. When adults are friendly to me, I am friendly to them
	6. When other kids are friendly to me, I am friendly to them
	8. I enjoy seeing others hurt or upset
	15. When others are upset, I become sad or concerned for them

Note. Italicised items are reversed when calculating total score.

The ERICA was selected for use in the YWS survey as it was specifically developed for use with children and adolescents. However, the ERICA has not been as extensively validated as other measures of emotion regulation, such as the DERS (Gratz & Roemer, 2004). Thus, a confirmatory factor analysis was conducted in order to assess whether the

factor structure proposed by MacDermott and colleagues (2010) was replicated in our sample of NZ adolescents.

1A: Examining the Factor Structure of the ERICA in a New Zealand Sample

Method

      Participants.

      Data for Study 1A were collected in 2016 during the fourth wave of a longitudinal survey conducted by the YWS, which focussed on various aspects of adolescent wellbeing using Wellington-based secondary-school participants. A total of 670 participants completed this wave. Participants' age ranged from 15 to 18 years ($M = 16.4$, $SD = 0.58$). Six participants elected not to enter their age. The majority of participants reported their main ethnic group identification as Pākehā/NZ European (74.8%, $N = 495$), followed by Māori[7] (5%, $N = 33$). 16.4% ($N = 108$) identified with another ethnic group.[8] 3.9% ($N = 26$) of the sample reported that they could not choose only one ethnic group, and 8 participants did not report their ethnicity. 56.3% of participants identified their gender as female ($N = 377$), 40.5% as male ($N = 271$), and 2.1% identified their gender as something else ($N = 14$). Eight participants did not report their gender.

      Measures.

      Emotion Regulation. The ERICA was used to examine emotion regulation (MacDermott et al., 2010). This measure consists of 16 items across three subscales (see Table 2). The *Emotional Control* subscale measures inappropriate displays of emotion; the *Emotional Self-Awareness* subscale measures awareness and modulation of one's emotions; and *Situational Responsiveness* measures empathy and displays of emotion which are

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[7] Indigenous New Zealanders.
[8] 3.5% Samoan, 1.7% Chinese, 1.2% Indian, 0.6% Cook Island, 0.2% Tongan; 9.2% other. Pākehā were overrepresented and Māori and Asians underrepresented compared to the general NZ population (Stats NZ, 2019).

appropriate to the situation. Participants rate their agreement with each item on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Contrait items were reverse-coded prior to analysis. Item scores were then totalled to provide scores for each subscale and overall emotion regulation. Higher scores indicate higher competency in emotion regulation.

Previous work with the ERICA has indicated that it is a reliable and psychometrically sound measure. During initial development, the ERICA demonstrated adequate internal reliability (Cronbach's α = .75), as well as good test-retest reliability over a period of four weeks (.77); the ERICA also showed convergent and discriminant validity with related measures (e.g. positively correlated with empathy, negatively correlated with depression; MacDermott et al., 2010). To date, 11 English-language studies have been published which use the ERICA as a measure, have a unique sample, and report reliability. Among these, the Cronbach's alpha for the entire scale ranged from .74 to .83. The Emotional Control subscale ranged from .70 to .86, Emotional Self-Awareness from .57 to .74, and Situational Responsiveness from .21 to .76 (see Appendix A).

Procedure.

Ethical approval for this study was granted by the New Zealand National Health and Disability Ethics Committee (12/NTB/35). School and parent/caregiver consent were obtained prior to administering the survey to students (students over the age of 16 did not require parental consent). Students over the age of 16 gave consent to participate and those under 16 gave assent (parental consent did not mean that the student was required to participate).

Members of the YWS team visited schools to conduct the survey in person. As this was the fourth wave of the study, the majority of students had already been through this process. A YWS member briefed students on the purpose of the survey and explained

confidentiality and the voluntary nature of the survey to ensure students understood. This

same information was provided in a hard copy. Students were informed that if they

represented an imminent risk of harm, the school counsellor would be advised to contact

them within the next 48 hours.[9] They also had the option to request a counsellor or other

specified person contact them later as part of the survey. A clinical psychologist associated

with the YWS was present on-site in case of questions or emergency.

Students completed the survey during a regular school period (typically about 50

minutes). The full time was allocated for them to complete the survey, although most

completed it within 30 minutes. They were instructed to complete the survey in silence to

ensure confidentiality and were encouraged to engage in a silent activity if they finished early

(e.g. reading, coursework). Students completed the survey via Qualtrics on their personal

devices, although paper copies were available if a personal device was unavailable. Upon

completion of the survey, participants were debriefed and given an information sheet which

included contact details for support services, as well as a chocolate bar for their participation.

Participants were again encouraged to speak to one of the YWS clinical psychologists if they

had any immediate concerns following the survey.[10]

Data screening and analysis plan.

To maximise the sample size, missing values were imputed where possible. Little's

Missing Completely At Random (MCAR) test indicated that ERICA values were not missing

completely at random ($\chi^2 = 1552.86$, DF = 1014, $p < .001$), so values were imputed in IBM

SPSS Statistics 27.0 (IBM Corp., 2020) using expectation-maximisation[11] (Little & Rubin,

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[9] Calculated based on responses to the Suicidal Behaviours Questionnaire-Revised (Osman et al., 2001); specifically, those who scored higher than 7 overall, who answered "yes" to having, in the last year, "…made a plan about how you would kill yourself (attempt suicide?)" or "… tried to kill yourself (attempt suicide)?" or answered "yes" to "In the last two weeks, have you seriously thought about killing yourself (attempting suicide)?"

[10] To date, no participant has reached out to one of the clinicians after completing the survey.

[11] Expectation-maximisation uses the means, variances, and covariances of the values from the rest of the dataset in order to estimate the most likely missing value (Howell, 2007).

2019; see Appendix B for descriptive statistics before and after imputation). For the DSHI, missing values were substituted with zeros, as they were assumed to indicate an absence of that behaviour based on the initial screening question (see Lundh et al., 2007). The imputed values dataset was used in all analyses unless stated otherwise.

Results

Descriptive statistics.

13.5% of participants reported a lifetime history of NSSI; an additional 8.1% reported having thought about it (but not done it). Overall, participants tended to report higher emotion regulation ability (*M* = 3.73, *SD* = .46). The ERICA demonstrated acceptable internal consistency,[12] with an overall Cronbach's α of .78 (subscale α's: Emotional Control – .76; Emotional Self-Awareness – .75; Situational Responsiveness – .62).[13]

Confirmatory factor analysis.

A confirmatory factor analysis was conducted in IBM SPSS Amos 27.0.0 (Arbuckle, 2020). A variety of goodness-of-fit indices were considered as recommended by Kline (2016) and Brown (2015). These indices and their recommended cut-off values are as follows.

Chi-square (χ^2). Chi-square is a measure of absolute fit and a significant result indicates poor fit. However, the χ^2 statistic is very sensitive to sample size and model complexity, and therefore is typically divided by the degrees of freedom in order to obtain a more useful statistic (Brown, 2015). Wheaton and colleagues (1977) suggested that a χ^2/DF of less than 5 indicates acceptable fit. Others have recommended that a χ^2/DF maximum threshold of 3 indicates acceptable fit (Carmines & McIver, 1983), others proposing a threshold of 2 (Byrne, 1989).

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[12] Calculated post-imputation of missing values.
[13] Peter (2002) states that an alpha coefficient over .60 is acceptable for a factor measured by six or fewer items.

Standardised root mean square residual (SRMR). Another measure of absolute fit, the SRMR measures the discrepancy between the correlations observed in the input matrix and those predicted by the model. SRMR ranges from 0.0 (perfect fit) to 1.0, thus the smaller the SRMR, the better the fit. An SRMR of < .05 generally indicates good fit.

Root mean square error of approximation (RMSEA). The RMSEA is a parsimony correction index, relatively sensitive to number of model parameters and insensitive to sample size. It measures how well the model "reasonably" fits the population (i.e., not whether the data fits the model exactly). A RMSEA of <.06 indicates good fit, while ≤ .05 indicates excellent fit (Browne & Cudeck, 1993; Hu & Bentler, 1999).

Comparative fit indices. The *comparative fit index, Tucker-Lewis index,* and *incremental fit index* are measures of comparative fit and range from 0.0 to 1.0 (perfect fit); thus, the larger they are, the better. A value of > .90 is considered acceptable, while > .95 is excellent (Bentler 1990; Hoyle & Panter, 1995; Hu & Bentler, 1995; Tucker & Lewis, 1973).

These model fit indices were used to assess how well the model fit the data and make any changes necessary (see Table 3 for fit indices for each model). A three-factor model was initially proposed based on the findings of the original authors (see Figure 3; MacDermott et al., 2010). While the χ^2 was significant, the χ^2/DF was 4.79, indicating adequate fit. However, the majority of indices (SRMR, RMSEA, CFI, TLI, and IFI) failed to meet their relative thresholds indicative of good fit. Overall, the original model did not fit the data well. Examination of the factor loadings indicated that Item 15, "When others are upset, I become sad or concerned for them," had a relatively low factor loading (.32). This item was removed for Model 2 (see Figure 4), resulting in minor improvements on all indices; however, they remained subpar overall.

The modification indices for Model 2 revealed a high correlation between the error terms associated with items 3 and 4 on the Emotional Self-Awareness factor, "I handle it well when things change or I have to try something new," and "When I get upset, I can get over it quickly." The same was found between the error terms associated with items 5 and 14 on the Emotional Control factor ("When things don't go my way I get upset easily" and "I do things without thinking about them first"). As the item pairs in each correlation existed within the same factor, it was theoretically consistent to include this covariance within my model (Brown, 2015), and so this covariance was accounted for in Model 3 (see Figure 5). This resulted in some improvement on all indices, notably the CFI and IFI, which reached an acceptable threshold. The RMSEA also showed an acceptable level of fit.

Next, the standardised residual covariances were examined, and item 25, "When others are upset, I become sad or concerned for them," was removed for Model 4 (see Figure 6). This resulted in some improvement, with the SRMR indicating good fit and the TLI surpassing the threshold. Further alterations to the model after this point made negligible changes or did not make theoretical sense and thus Model 4 is the final model reported here.

Table 3

Goodness-of-Fit Indicators for Models in Confirmatory Factor Analysis

Model	χ^2	df	χ^2/df	SRMR	RMSEA	RMSEA 90% CI (upper)	CFI	TLI	IFI
Model 1: Three-factor, 16-item	483.85	101	4.79*	.07	.08	.08	.85	.82	.85
Model 2: 15-item	381.07	87	4.38*	.06	.07	.08	.88	.85	.88
Model 3: 15-item, additional covariance among error terms	297.23	85	3.50*	.06	.06*	.07	.91*	.89	.91*
Model 4: 14-item, covariance among error terms	228.26	72	3.17*	.05**	.06*	.07	.93*	.91*	.93*

* indicates satisfactory fit ** indicates good fit. Note. All chi-squares were significant at the *p* <.05 level

Note. All models significantly differed from each other, *p* < .001

Figure 3

Confirmatory Factor Analysis Model 1: Three-Factor, 16-Item
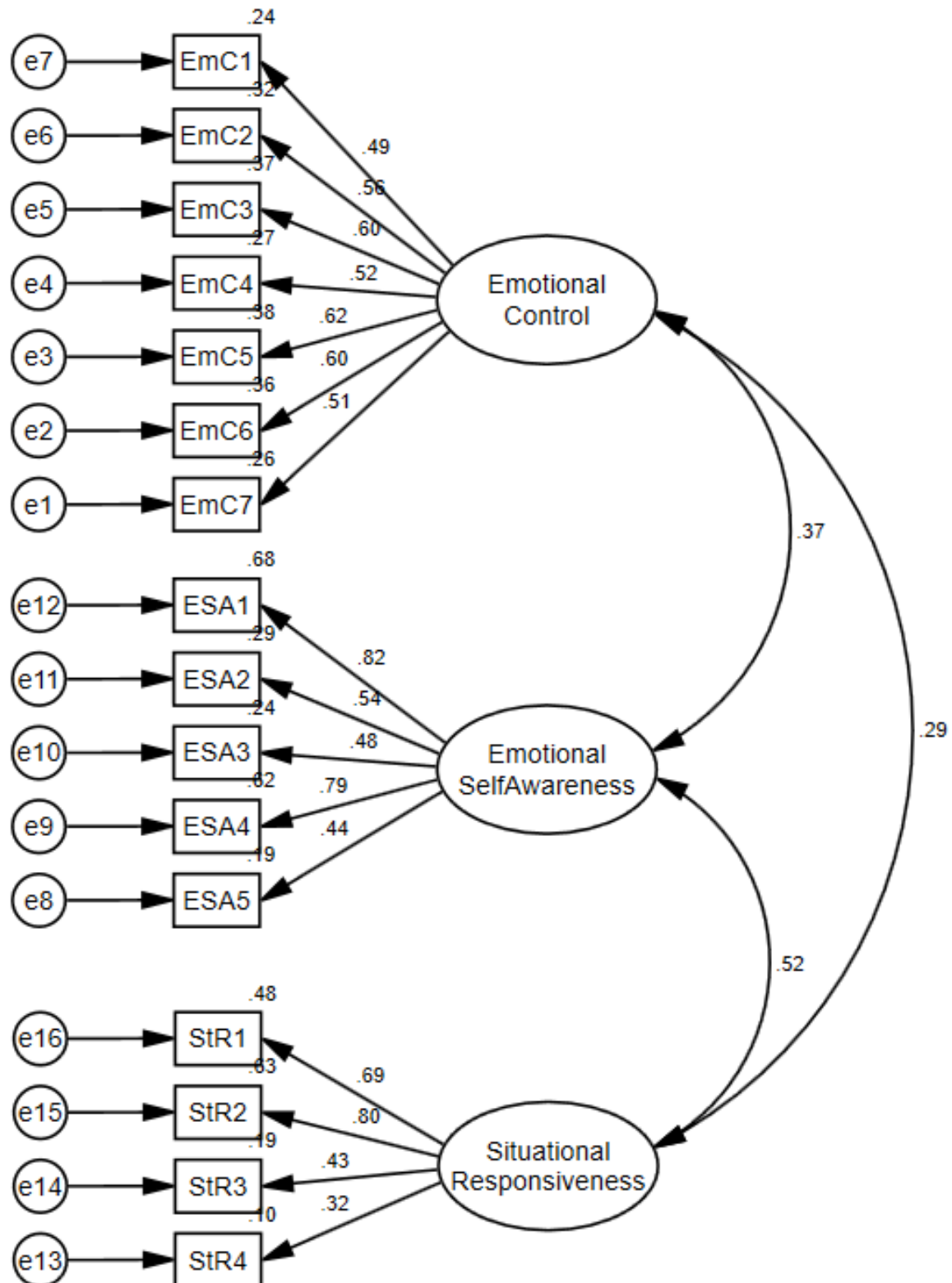
Figure 4

Confirmatory Factor Analysis Model 2: 15-Item
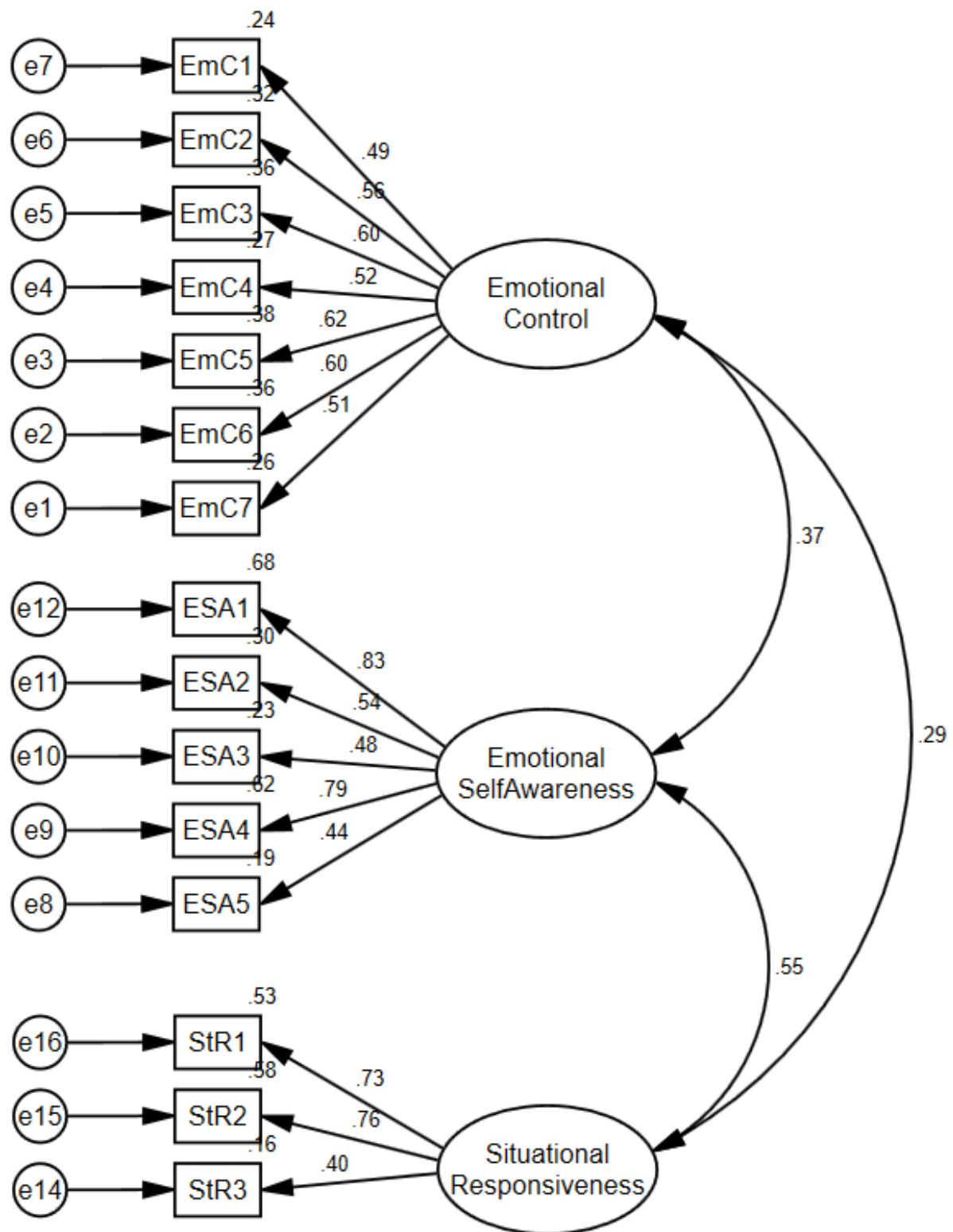
Figure 5

Confirmatory Factor Analysis Model 3: 15-Item with Additional Covariance Among Error
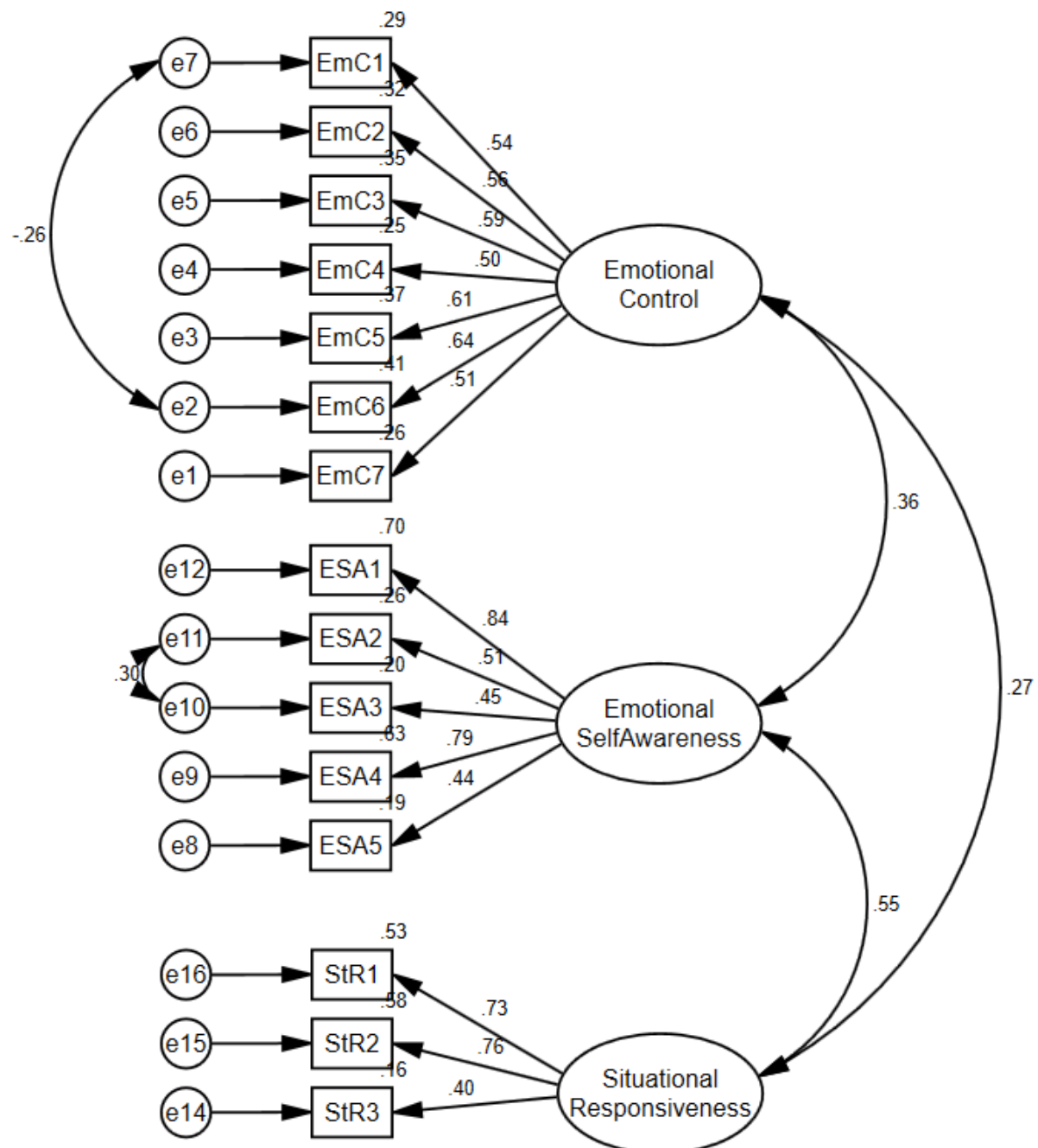
Terms

Figure 6

Confirmatory Factor Analysis Model 4: 14-Item, Covariance Among Error Terms
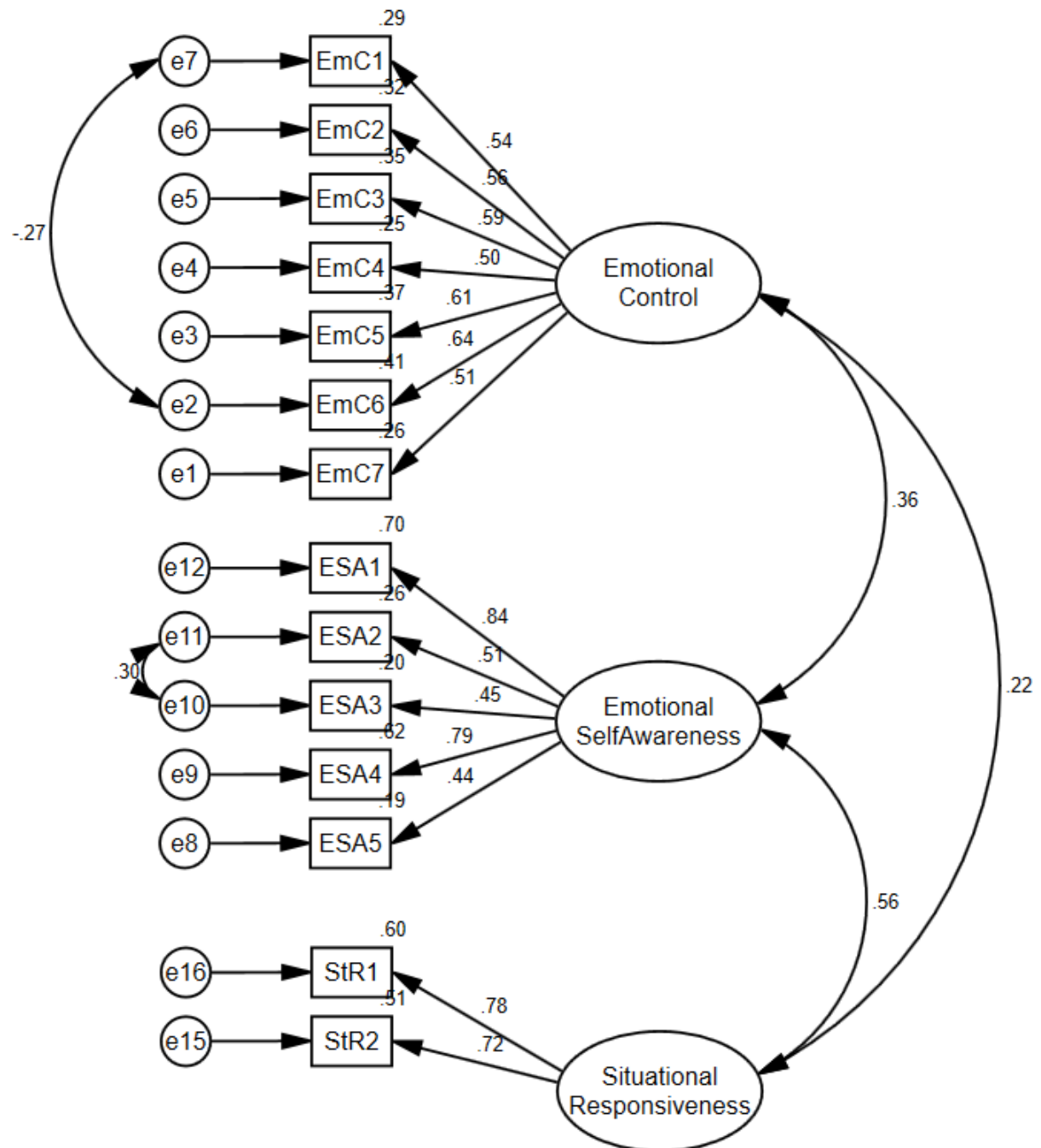
Discussion

The confirmatory factor analysis showed that the original model did not fit the data well, although many of the key fit indices were close to the recommended thresholds. With some adjustments, it became acceptable. Two items were removed, both from the Situational Responsiveness subscale. This suggests that this third subscale is relatively weak compared to the Emotional Control and Emotional Self-Awareness subscales. Taking the large number of items in the ERICA into consideration, as this increased model complexity can affect fit indices (Brown, 2015), I judged the final model to be acceptable. Although two items were removed from the final model, I decided not to remove them in further analyses as that reduced the third factor to only two items, which is not recommended (Little et al., 1999). Additionally, keeping these items allows for comparison across studies using the same measure (Tatnell et al., 2018). Blind adherence to goodness-of-fit rules of thumb as the determinant of a model's suitability is also not good practice (see Hu & Bentler, 1999; Marsh et al., 2004). Importantly, individual items all loaded onto the same latent variables as those in MacDermott and colleagues' (2010) original model, suggesting that the factor structure of the ERICA is replicable in this sample. Additionally, both the Emotional Control and Emotional Self-Awareness have acceptable internal consistency (although the Situational Awareness subscale was only marginal).

1B: Comparison of the ERICA with the DERS

Study 1A examined the factor structure of the ERICA as a measure of emotion regulation in our sample. Finding the ERICA to have acceptable model fit, in Study 1B I conducted various mediation analyses to investigate whether longitudinal mediation is appropriate, as well as to explore how much of the relationship between attachment and NSSI is explained by the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) compared to the ERICA. The first waves of the YWS survey measured emotion regulation

using the ERICA because of its development with adolescents, but the DERS was later added

due to concerns around the reliability of the ERICA (e.g., see Study 1A); in particular,

because the DERS is a far more widely used and validated measure (e.g., Weinberg &

Klonsky, 2009). While the DERS was not available for enough waves to be used in a

longitudinal model, I examine it here in order to evaluate the usefulness of the ERICA and to

whether the DERS is preferable for future studies. Based on the literature reviewed in the

introduction, I hypothesised that the ERICA would mediate the relationship between

attachment and NSSI in a cross-sectional sample, with more secure attachment predicting

stronger emotion regulation, which in turn would predict lesser NSSI. With the DERS

measuring the inverse of the ERICA (emotion dysregulation versus emotion regulation,

respectively), I hypothesised that the DERS, when used instead of the ERICA, would also

mediate this relationship.

Method

Participants.

Participants were the same sample used in Study 1A (see p. 18).

Measures.

Emotion regulation. Emotion regulation was measured using the ERICA (see Study

1A method for further details, p. 18). In this wave of the YWS, emotion regulation was also

measured using the DERS (Gratz & Roemer, 2004). This scale consists of 36 items, which

break down into six subscales: Non-Acceptance of Emotional Responses, Difficulties

Engaging in Goal-Directed Behaviour, Impulse Control Difficulties, Lack of Emotional

Awareness, Limited Access to Emotion Regulation Strategies, and Emotional Clarity (see

Appendix C). Example items are "I have difficulty making sense out of my feelings," and

"When I'm upset, I believe that I will remain that way for a long time." Participants indicate

how often items apply to them on a Likert scale ranging from 1 (*almost never*) to 5 (*almost*

always). Contrait items were reverse-coded and total mean scores calculated. Higher scores indicate greater emotion dysregulation (or lesser emotion regulation ability). The DERS showed excellent internal reliability in the present sample ($\alpha = .90$).

    Parental attachment. Parental attachment was measured using an abbreviated version of the *Inventory of Parent and Peer Attachment – Parents* subscale (IPPA; Armsden & Greenberg, 1987). The original scale has 53 items, with separate Trust, Communication, and Alienation subscales for parental and peer attachment (6 subscales total). The parent subscales of the IPPA have demonstrated good internal reliability and psychometric properties ($\alpha = .91, .91,$ and .86 respectively;[14] Armsden & Greenberg, 1987). Later studies, however, indicate that the factor structure of the IPPA resembles a single factor, and so it has been treated as such in the present study (Brennan et al., 1998; Pace et al., 2011; Wilson & Wilkinson, 2012). The IPPA was shortened considerably for the YWS survey due to time constraints. This is a relatively common practice (Wilson & Wilkinson, 2012). The abbreviated scale consists of six items which participants rated on a 5-point Likert scale ranging from 1 (*almost never true*) to 5 (*almost always or always true*). Items include "My parents encourage me to talk about my difficulties," and the reverse item, "I get upset a lot more than my parents know about" (see Appendix C). Internal consistency in the present sample was good (IPPA-Pa $\alpha = .79$; IPPA total $\alpha = .80$) Contrait items were reverse-coded prior to analysis. Item scores were then totalled to provide a final score. Higher scores indicate better quality of attachment to parents (i.e., a more secure attachment). Further references to the IPPA in this thesis are using the Parent subscale only.

    NSSI. Participants completed a screening questioning assessing NSSI history, which asked whether they had ever hurt themselves on purpose, had ever thought about hurting

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[14] α not reported for total parent subscale.

themselves on purpose, or had never hurt themselves on purpose. Those who indicated that they had engaged in NSSI, or had thought about doing so, went on to complete a modified version of the Deliberate Self-Harm Inventory – Short (DSHI-s; Lundh et al., 2007). The original DSHI was a behaviour-based self-report checklist questionnaire which asks participants about their engagement in 17 specific forms of NSSI, developed with young adults (mean age 23; Gratz et al., 2001). The DSHI-s was designed for use with an adolescent population. While Lundh and colleagues removed the absence of suicidal intent from the items (as they were not investigating NSSI, but deliberate self-harm), this was re-introduced in our modified version of the DSHI-s. Several items were also modified to fit an NZ context (e.g., "carved words, pictures, designs or other marks into your skin [*not including* tattoos or tā moko[15]]"); similar items were also combined (see Appendix E for full modified measure).

The modified scale contains 14 items concerning different types of NSSI (with one being open-ended); for example, "Have you ever deliberately (but without wanting to kill yourself)… cut your wrists, arms, or other areas of your body?" Participants choose from one of five possible responses which are assigned a value from 0 to 4: "I have never thought about doing this" (0), "I have thought about this, but have never done it" (1), "I have done this once" (2), "I have done this a few times" (3), or "I have done this many times" (4). Items are totalled and a mean score calculated. A score of 0 indicates an absence of NSSI; higher scores indicate more severe NSSI, in terms of frequency and variety. The original DSHI scale reported good internal reliability (α = .82; Gratz et al., 2001), as did the DSHI-s (α = .82; Lundh & Peña, unpublished, as cited in Lundh et al., 2007). The modified version of the DSHI-s demonstrated good internal reliability in the present sample (α = .87).

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[15] Traditional Māori tattoo

Procedure.

The same cross-sectional dataset from Study 1A was utilised for this study (cleaned

and missing values imputed; see p. 20).

Results

Descriptive statistics.

Participants reported being relatively high in attachment security (*M* = 3.62, *SD* =

0.87) and emotion regulation (*M* = 3.83, *SD* = .46), and relatively low in emotion

dysregulation (*M* = 2.28, *SD* = 0.69).

Correlations.

First, key variables were correlated to test for the hypothesised relationships in the

proposed mediation. All relationships were found in the directions expected: a strong positive

correlation was found between parental attachment and emotion regulation (measured by the

ERICA); strong negative correlations between the ERICA and the DERS, and between the

DERS and parental attachment; a moderate positive correlation was found between the DERS

and NSSI; and a moderate negative correlation was found between the ERICA and NSSI

(Cohen, 1992; see Table 4). All were significantly correlated with one another, indicating that

mediation is likely and appropriate to conduct (Baron & Kenny, 1986).

Table 4

Correlation Matrix of Variables for Cross-Sectional Mediation

	ERICA	DERS	DSHI
DERS	-.62	-	
DSHI	-.21	.38	-
IPPA – Parents	.49	-.55	-.23

Note. All correlations significant at *p* < .001

Cross-sectional mediation.

A preliminary cross-sectional mediation was conducted in Amos 27.0.0 (Arbuckle, 2020) with parental attachment as predictor, emotion regulation (measured by the ERICA) as mediator, and NSSI as outcome (see Figure 7). Parental attachment predicted an increase in emotion regulation, which in turn predicted a decrease in NSSI. As hypothesised, a significant mediation was found, such that the standardised indirect effect of parental attachment on NSSI via emotion regulation was $\beta = -.07$ ($p = .001$; 95% CI [-.06. -.01]). Approximately 29% of the relationship between parental attachment and NSSI was explained by this mediating effect of emotion regulation (as measured by the indirect to total ratio; Jose, 2013). This suggests that the relationship between parental attachment and NSSI is partially explained by poorer emotion regulation skills, although the direct relationship between parental attachment and NSSI remained significant. This indicates that a longitudinal mediation is worth investigating (Baron & Kenny, 1986).

Figure 7

Cross-Sectional Mediation Using the ERICA to Measure Emotion Regulation
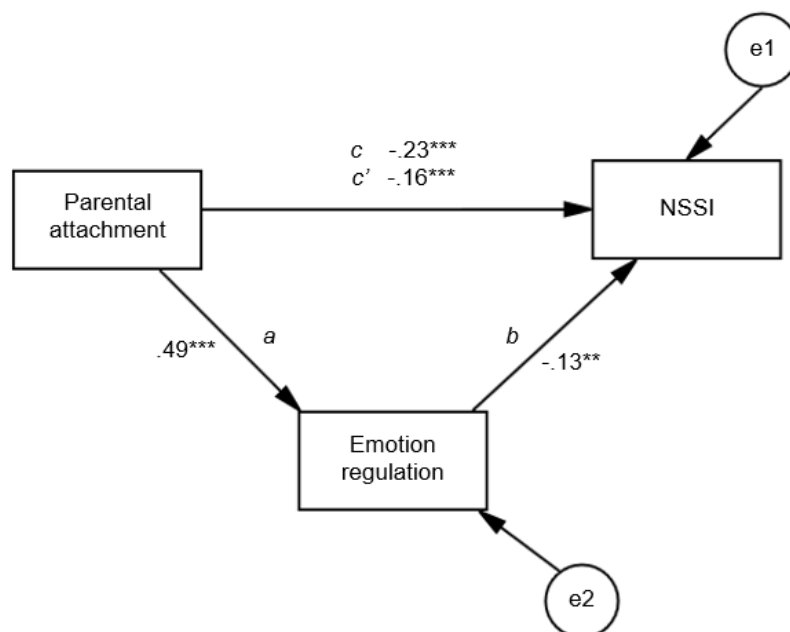
***$p < .001$, ** $p < .01$

Mediation using DERS as emotion regulation measure.

A separate mediation was conducted using the DERS to measure emotion dysregulation (see Figure 8). A similar pattern of results was found to that of the mediation using the ERICA, as expected. Parental attachment predicted lower emotion dysregulation, which in turn predicted greater NSSI (β = -.20, p = .001; 95% CI [-.06, -.01]). 88% of the relationship between parental attachment and NSSI was explained by emotion dysregulation as measured by the DERS. When the mediating effect of the DERS was taken into account, the direct effect of parental attachment on NSSI no longer reached significance (p = .529).

Figure 8

Cross-Sectional Mediation Using the DERS to Measure Emotion Dysregulation
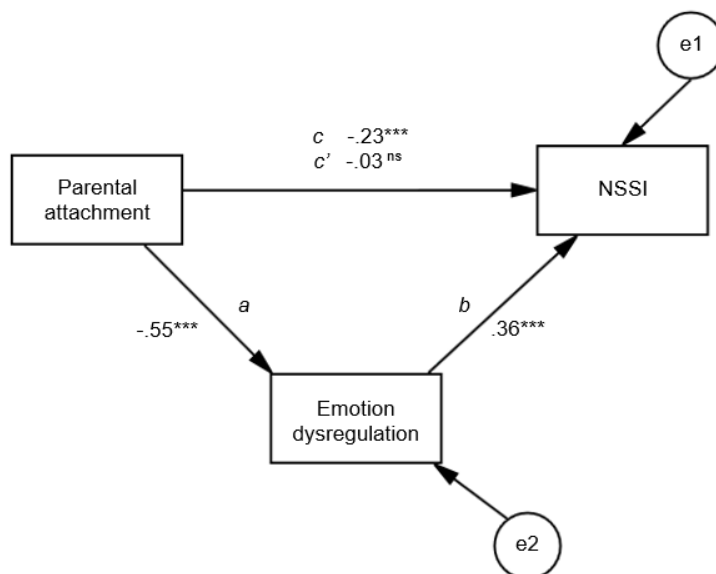
*** p < .001, ns = not significant at p < .05

Multiple mediation with ERICA and DERS as mediators.

Taking into consideration that both separate mediations were significant, but that the DERS appeared to explain a larger amount of variance, an exploratory multiple mediation was conducted in which both the DERS and the ERICA were included as mediating variables

(see Figure 9). A significant association was found in which parental attachment predicted an

increase in emotion regulation as measured by the ERICA and a decrease in emotion

dysregulation as measured by the DERS. The DERS then predicted a significant increase in

NSSI (p = .001), such that 91% of the relationship between parental attachment and NSSI

was accounted for by emotion dysregulation (β = -.21, p = .001, 95% CI [-.15, -.09]). The

ERICA did not significantly mediate the attachment-NSSI relationship when the DERS was

included in the model.

Figure 9

Multiple Mediation Using the ERICA and the DERS
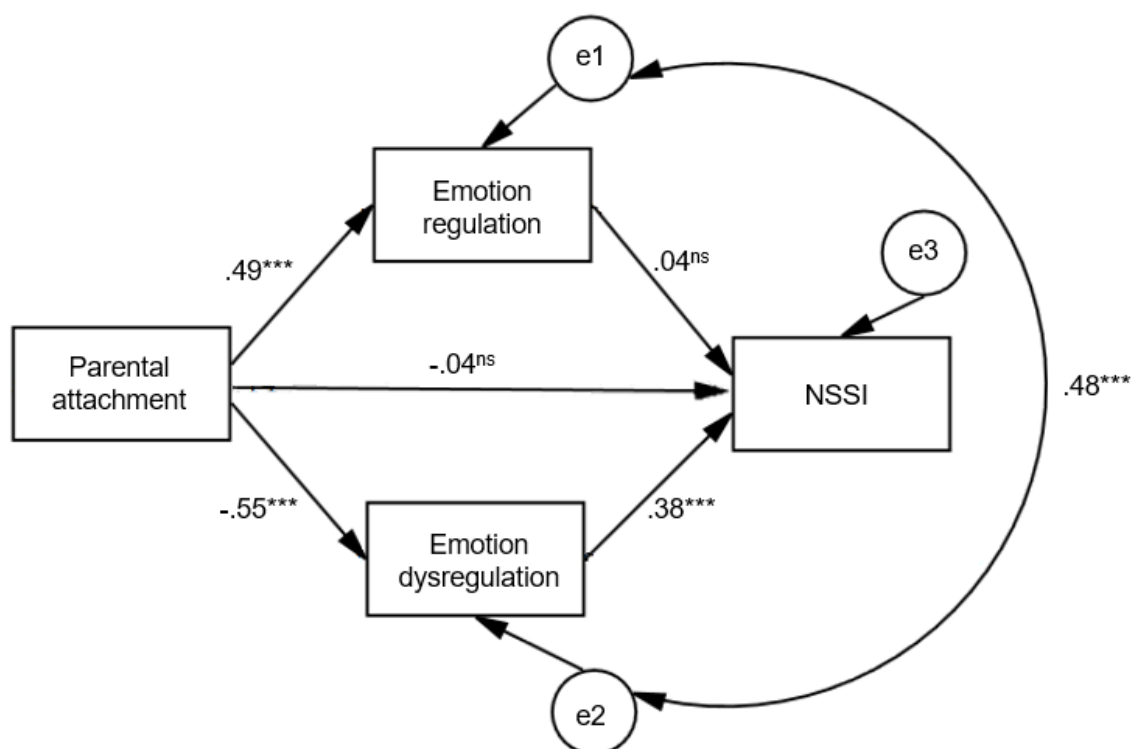
Multiple mediation with ERICA subscales.

After finding that the DERS appears to explain the relationship between parental

attachment and NSSI to a greater extent than the ERICA, I conducted a multiple mediation to

explore whether there was a particular ERICA subscales that was contributing more to the

relationship between parental attachment and NSSI (see Figure 10). Only the Emotional Self-

Awareness factor was predictive of NSSI ($\beta = -.09$, $p = .001$, 95% CI [-.08, -.03]).

Approximately 40% of the relationship between parental attachment and NSSI was explained

by the mediating effect of Emotional Self-Awareness, slightly more than when the total

measure is used.

Figure 10

Multiple Mediation Using ERICA Subscales
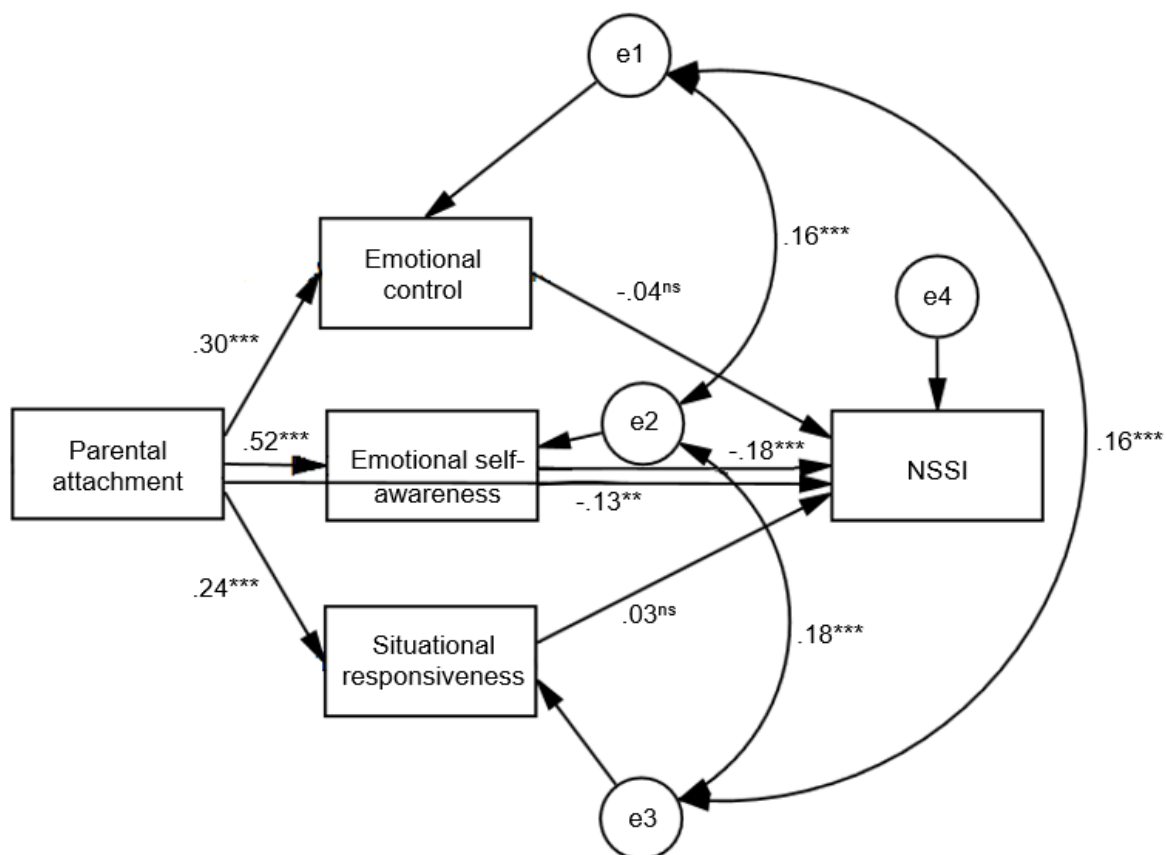
Discussion

In Study 1B, I conducted a series of mediation analyses to examine the validity of the

ERICA. The correlation matrix indicated that mediations were likely; additionally, the strong

negative relationship between the ERICA and the DERS demonstrated discriminant validity

of the ERICA–the ERICA purportedly measures emotion regulation ability, while the DERS

measures the inverse (emotion dysregulation). Interestingly, the DERS had a stronger zero-

order correlation with the DSHI than did the ERICA, which was investigated further in the mediations.

While the ERICA did significantly mediate the relationship between parental attachment and NSSI, as hypothesised, the mediation effect of the DERS (also significant) appeared to explain a greater amount of that relationship. Further examination of this using a multiple mediation with both the ERICA and the DERS as mediators supported this conclusion, with the ERICA no longer having a significant effect once the DERS was included. This suggests that while both the ERICA and the DERS are measuring similar things, the DERS is capturing something above and beyond that of the ERICA. That is, the DERS measures emotion regulation more fully – or at least, aspects of emotion regulation which are specifically associated with NSSI – compared to the ERICA. This makes sense, as not only was the DERS developed with NSSI in mind, it has more items and covers more aspects of emotion regulation with six subscales compared to the ERICA's three. However, while the basic mediation with the DERS rendered the direct path insignificant, in the multiple mediation the DERS only explained 55% of the variance (as compared to the 88% in the DERS only mediation). This suggests that the ERICA may still be capturing unique information that the DERS is not.

Finally, a multiple mediation using the ERICA subscales indicated that the Emotional Self-Awareness factor was the only significant mediator of the relationship between parental attachment and NSSI. This is particularly interesting as Emotional Self-Awareness measures "awareness and modulation of one's emotions;" at face value, it seems to be the only factor that mentions mood ("I am a happy person," "I am a sad person"), while the other subscales are more concerned with controlling impulsive outbursts or empathy. The DERS, in comparison, does not include any items which ask about how the respondent feels on a day-to-day basis–they are all related to how one perceives and reacts to their emotions. It is

possible, then, that the unique variance explained by the ERICA might be this measure of mood. In that case, the DERS would be the superior measure in that it measures emotion regulation rather than mood.

Overall, while these results indicate that the ERICA does appear to be measuring emotion regulation, they also suggest that the DERS may be a more appropriate measure to use in future. While the ERICA does have its strengths in that it was developed specifically for use with adolescents, is relatively short, and has acceptable psychometric properties, overall these results suggest that it may not be capturing all the relevant aspects of emotion regulation. Regardless, it is important to note that the significant mediations found in all three mediation models suggest that emotion regulation is indeed a notable factor in the relationship between parental attachment and NSSI.

Study 2: Investigating NSSI, Attachment, and Emotion Regulation Across Time

Having established that the factor structure of the ERICA is broadly replicable in our sample, and that the ERICA mediates the relationship between parental attachment and NSSI in a cross-sectional sample, I now explore how parental attachment, emotion regulation, and NSSI inter-relate over time in a longitudinal sample of NZ secondary school students using a cross-lagged panel analysis. A complete mediation model is used to examine whether emotion regulation mediates the relationship between attachment and NSSI over time.

Method

Participants

A total of 494 participants completed at least three waves of the YWS survey. At Time 1, age ranged from 12 to 16 ($M = 13.6$, $SD = 0.70$). 59.5% of participants identified as female ($N = 292$), 40.1% as male ($N = 197$), and 0.4% identified their gender as something else ($N = 2$). Regarding ethnicity, 75.7% said that their main ethnic group identification was Pākehā/NZ European ($N = 374$), followed by 4.9% Māori ($N = 24$). 12.9% stated their main

ethnic group identification was something else ($N = 64$).[16] 6.3% ($N = 31$) said they could not

choose a main ethnic group and one person did not report their ethnicity.

Measures

Emotion regulation was measured using the ERICA, as this measure was taken at

each wave (see Study 1A for further detail). Parental attachment was measured using the

IPPA (see Study 1B method for further detail, p. 31).

NSSI was measured using participants' answer to the screening question:

"Sometimes people have thoughts about hurting themselves on purpose, but do not

actually hurt themselves. And sometimes people hurt themselves deliberately (i.e., on

purpose) to cause damage to their body but NOT to kill themselves (e.g. cut, burn, scratch, or

carve their skin, bang or hit themselves, or prevent wounds from healing). Please indicate

whether you have had thoughts about hurting yourself on purpose (but not actually done this),

whether you have hurt yourself on purpose (e.g. punched yourself or objects like walls,

prevented wounds from healing, or cut, burnt, scratched or carved your skin, etc.), or whether

you have never done this."

A Time 1 score for NSSI was created by taking NSSI history at first available time

(i.e., if the participant ticked the "yes, I have hurt myself on purpose" checkbox). A *NSSI*

since Time 1 score was created using the "NSSI since last survey" item for the second

available time point for each participant, and a *NSSI since Time 2* score was created using the

same item for the third available time point for each participant.

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[16] 2% Samoan, 2% Indian, 1.2% Chinese, 1% Filipino, 4.2% other. Pākehā were overrepresented and Māori and Asians underrepresented compared to the general NZ population (Stats NZ, 2019).

Procedure

Waves 1 to 4 were conducted across 2013–2016, with approximately a year between each wave. Data collection was conducted as described in the procedure of Study 1A (see p. 19).

Data Screening and Analysis Plan

A total of four waves of data were available. To maximise the sample size, missing values were first imputed where possible using expectation-maximisation in IBM SPSS Statistics 27.0[17] (IBM Corp, 2020; see Appendix F for descriptive statistics before and after imputation). A composite measure was then created for each variable that had at least 3 time points completed – for example, a participant who had only completed the ERICA at waves 1, 2, and 4 would end up with a Time 1 (T1) score matching their wave 1 score, Time 2 (T2) matching wave 2, and Time 3 (T3) matching wave 4. This was judged to be acceptable as there was no concern about cohort or historical effects, with no obvious events that would have affected data collection (Acock, 2012). The final number of participants was 494. That is, 156 participants completed waves 1, 2, and 3; 34 completed waves 1, 2, and 4; 45 completed waves 1, 3, and 4; 26 completed waves 2, 3, and 4; and 233 completed all four waves.

Results

Reliability Analyses

See Table 5 for reliability coefficients within and across waves. The IPPA demonstrated good internal consistency at each wave, as well as good test-retest reliability. The ERICA also demonstrated good internal consistency and test-retest reliability at each wave. However, breaking the ERICA down into its subscales showed that while the Emotional Control and Emotional Self-Awareness subscales had adequate internal

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[17] Little's MCAR test was not significant, $\chi^2 = 36.37$, DF = 32, $p = .273$.

consistency, the Situational Responsiveness subscale had poor internal consistency (see

Study 1A for why this might be).[18] Importantly, internal reliability did not change much over

each wave for the IPPA or the ERICA.

Table 5

Cronbach's Alpha Reliability Coefficients for the IPPA and ERICA Across Waves 1 to 4

	Wave 1	Wave 2	Wave 3	Wave 4	Test-retest[a]
IPPA - Parent	.90	.91	.81[b]	.82[b]	.72
ERICA	.80	.81	.80	.80	.90
ERICA – Emotional Control	.78	.74	.77	.75	.90
ERICA – Emotional Self-Awareness	.73	.75	.75	.76	.87
ERICA – Situational Responsiveness	.51	.57	.60	.66	.83

[a] Test-retest reliability for all available waves

[b] IPPA cut down to 6 items each scale

Descriptive Statistics

Descriptive statistics for parental attachment, emotion regulation, and NSSI over the

length of the study are reported in Table 6. Overall, participants reported being relatively

securely attached, as well as having relatively strong emotion regulation skills. At T1, 15.2%

of participants reported a lifetime history of NSSI. 21.2% of participants engaged in some

form of NSSI between T1 and T2, and 19.6% between T2 and T3.

Examination of correlations between the proposed variables at all time points

indicated that, consistent with Study 1B, parental attachment, emotion regulation, and NSSI

were significantly correlated across time. This suggests that mediation is likely (see Table 7).

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[18] Note also that Situational Responsiveness has only 4 items; fewer items tends to result in lower Cronbach's α (Cronbach, 1951).

Table 6

Descriptive Statistics for Parental Attachment, Emotion Regulation, and NSSI

Measure	T1		T2		T3	
	M	*SD*	*M*	*SD*	*M*	*SD*
IPPA	3.79	0.82	3.73	0.82	3.69	0.86
ERICA	3.82	0.47	3.76	0.47	3.76	0.49
	%		%		%	
NSSI	15.2		20.6		19.6	

Table 7

Correlation Matrix of Longitudinal Mediation Variables

	NSSI history	NSSI T1 to T2	NSSI T2 to T3	ERICA T1	ERICA T2	ERICA T3	IPPA T1	IPPA T2
NSSI history	-							
NSSI T1 to T2	.48	-						
NSSI T2 to T3	.40	.66	-					
ERICA T1	-.30	-.31	-.20	-				
ERICA T2	-.27	-.34	-.33	.64	-			
ERICA T3	-.23	-.32	-.34	.60	.70	-		
IPPA T1	-.39	-.38	-.34	.57	.45	.42	-	
IPPA T2	-.36	-.46	-.46	.45	.62	.50	.69	-
IPPA T3	-.25	-.38	-.46	.39	.47	.57	.56	.69

Note. All correlations significant at *p* <.001

Cross-Lagged Panel Analysis

Next, a cross-lagged panel analysis was conducted in Amos 27.0.0 (Arbuckle, 2020; see Figure 11 for model, Figure 12 for results). Cross-lagged panel analysis is used to examine how variables predict each other over time (see Kenny, 2014). The model was just identified and therefore model fit could not be assessed.

Each variable demonstrated relative stability over time, with T1 predicting T2, T2 predicting T3, and T1 predicting T3. T1 attachment predicted greater T2 emotion regulation and lesser T2 NSSI, while T2 attachment predicted lesser T3 NSSI but did not predict T3 emotion regulation. Both T1 and T1-T2 NSSI predicted future decreases in attachment security, but did not prospectively predict emotion regulation. Similarly, neither T1 nor T2 emotion regulation predicted attachment at the next time point. Interestingly, T1 emotion regulation did not predict T1-T2 NSSI, although T2 emotion regulation did predict decreases in T2-T3 NSSI. Unexpectedly, T1 emotion regulation predicted *increases* in T2-T3 NSSI, despite emotion regulation ability typically being associated with lower NSSI. That is, controlling for the inter-correlations of attachment, emotion regulation, and NSSI at all time points, emotion regulation was positively associated with NSSI. This was the only significant relationship found in the opposite direction to what was expected.

Longitudinal Mediation

The hypothesised mediation was examined using a complete longitudinal mediation model, in which all three variables are included at each time point, allowing one to examine all possible relationships (Jose, 2016). A significant mediation effect was found, such that emotion regulation mediated the relationship between parental attachment and NSSI over time ($\beta = -.01$, $p = .030$, 95% CI [-.01, .00[19]]). That is, higher parental attachment predicts greater emotion regulation ability, which in turn predicts lesser engagement in NSSI. The indirect to total ratio is 40.3%, indicating that almost half of the variance between T1 parental attachment and T2-T3 NSSI is explained by T2 emotion regulation. Finding a significant mediation across time suggests that there may be a causal mechanism at play.

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[19] Upper 95% was -.0004

Figure 11

Complete Longitudinal Model in a Cross-Lagged Panel Analysis
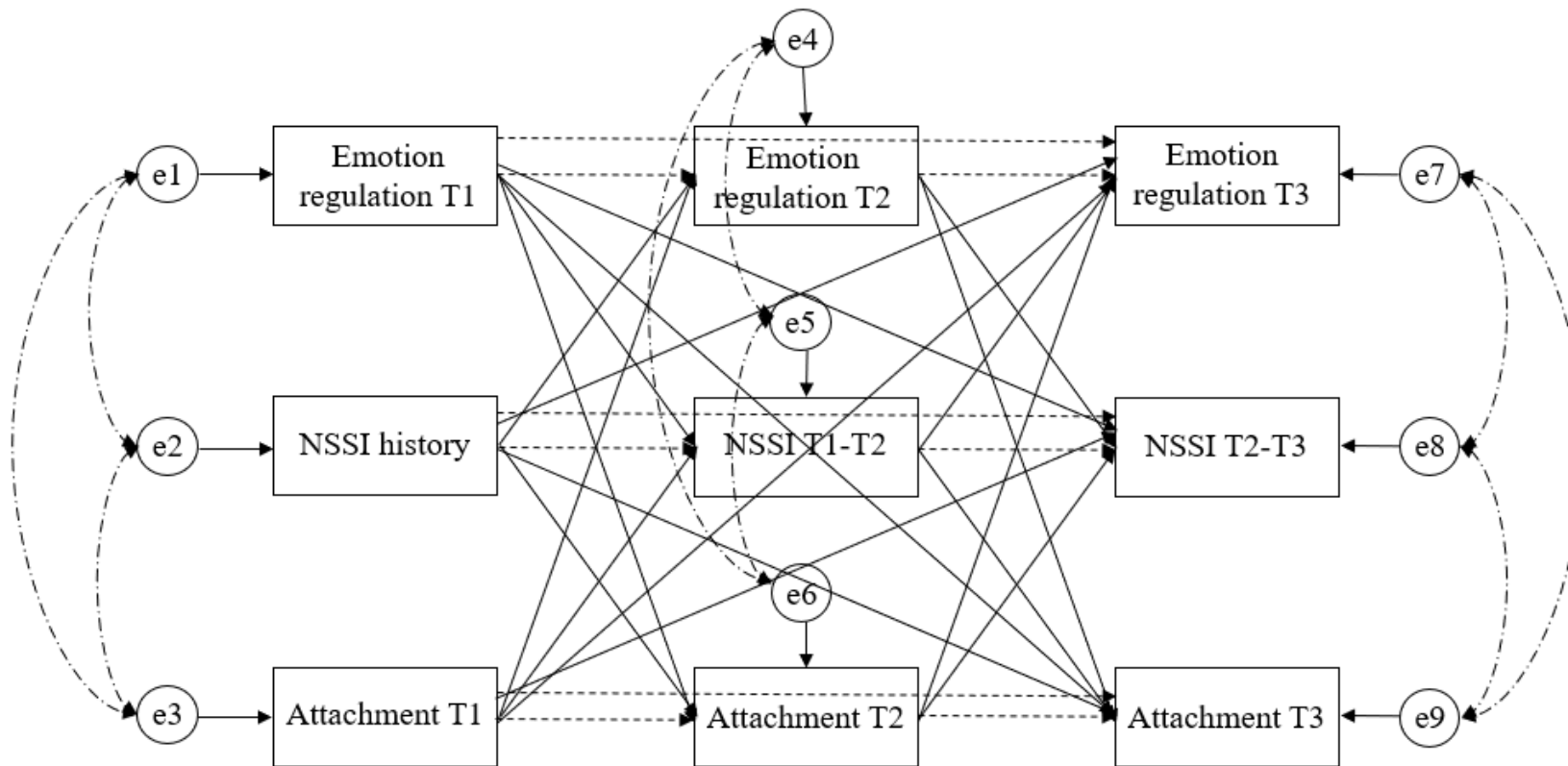
Note. Full model that was tested. – · – · – · = covariance between synchronous error terms. - - - - - = stability relationships. ⸺ = cross-lagged relationships.

Figure 12

Complete Longitudinal Mediation Model with Standardised Regression Weights
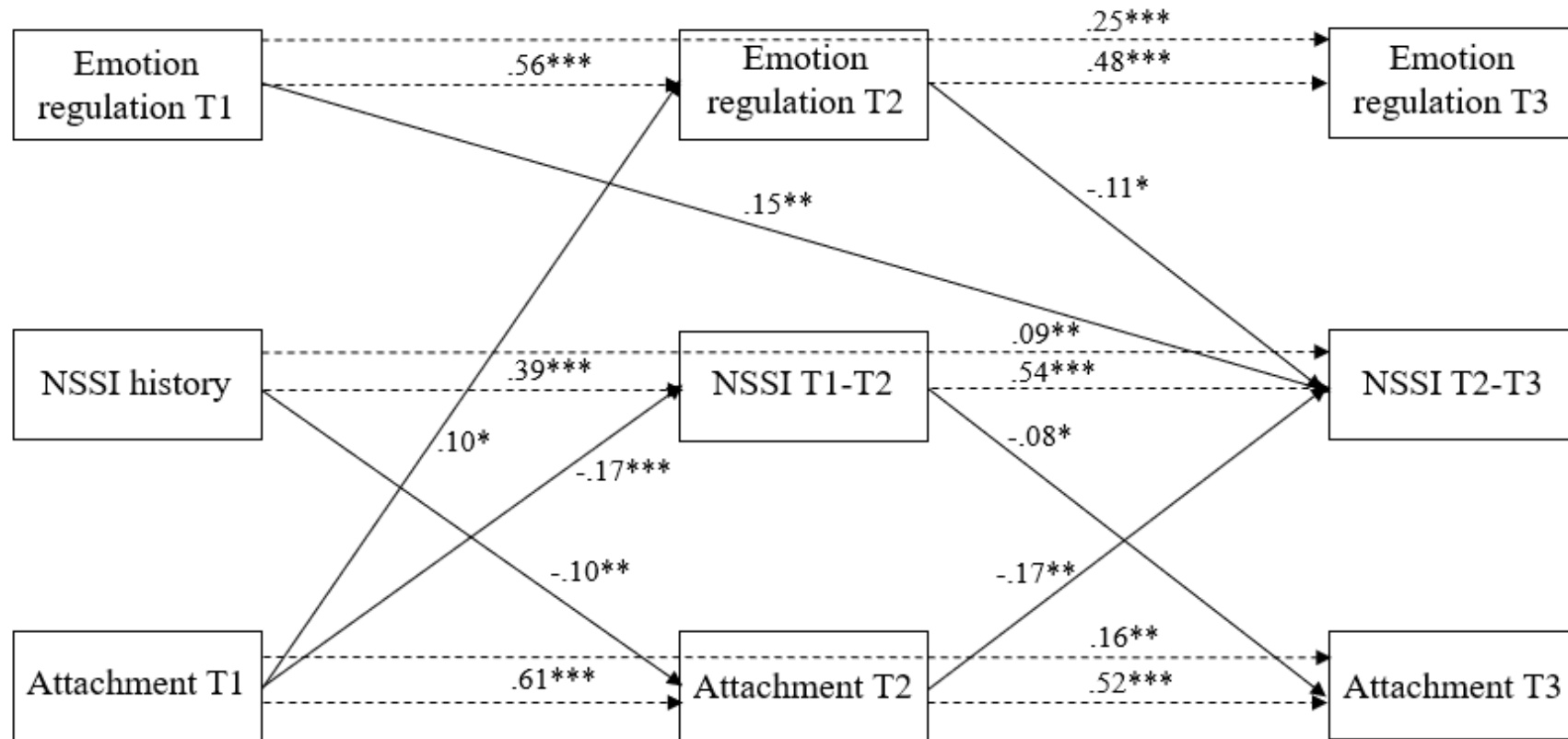
Note. *** indicates *p* < .001; ** indicates *p* < .01; * indicates *p* < .05. Cross-lagged relationships that did not reach significance were removed

for clarity, as were error terms and covariance. All covariances between error terms were significant at the *p* < .001 level.

Discussion

Examining the specific pathways in the panel analysis, all stability coefficients were significant as expected. The majority of significant pathways were predicting subsequent changes in the expected direction; the one exception was that T1 emotion regulation was found to be predicting *greater* T2-T3 NSSI, the opposite of what was expected based on theory. Taking into account that T1 emotion regulation and T2-T3 NSSI were negatively correlated ($r = -.20$), it may be that this positive relationship was spurious. It would be interesting to see if this is replicable in future studies; if so, the possibility that emotion regulation might predict increases in NSSI may require further investigation.

Additionally, when attachment and previous NSSI history were taken into account, T1 emotion regulation was not a significant predictor of T1-T2 NSSI. This suggests that NSSI history and T1 attachment explained enough of the variance in T1-T2 NSSI that emotion regulation was not explaining a significant amount of unique variance – implying that attachment processes may be playing a more important role in adolescent NSSI than emotion regulation. Indeed, the regression weights for attachment to NSSI ($\beta = -.17$ for both paths) were larger than for the T2 emotion regulation to T2-T3 NSSI path ($\beta = -.11$). Alternatively, this might reflect a failure of the ERICA to fully capture relevant aspects of emotion regulation (see Study 1B).

Similarly, while T1 attachment predicted greater T2 emotion regulation, as expected, T2 attachment was not predictive of T3 emotion regulation. This might be explained by the process of aging, with parental attachment becoming less important to emotion regulation ability as peers and romantic partners become significant attachment figures, in addition to normative improvements in emotion regulation that come with age (Allen & Tan, 2016; John & Gross, 2004).

Another interesting result was that T1 NSSI did not prospectively predict T2 emotion regulation; neither did T1-T2 NSSI predict T3 emotion regulation. This was unexpected, as a bidirectional relationship has previously been found between NSSI and emotion regulation (Robinson et al., 2019). Finally, emotion regulation did not predict attachment from T1 to T2, or from T2 to T3, suggesting that the attachment–emotion regulation relationship is unidirectional.

Having explored the inter-relationships between my constructs over time, I then conducted a complete longitudinal mediation using this model. I found that emotion regulation significantly mediated the relationship between parental attachment and NSSI over time as hypothesised. That is, more secure attachment at T1 predicted better emotion regulation at T2, which in turn predicted lesser NSSI at T2-T3. When the mediating effect of emotion regulation was taken into account, nearly half of the relationship between T1 attachment and T2-T3 NSSI was explained by emotion regulation.

Limitations

There were several limitations of my mediation model. Firstly, combining cohorts to create three time points from four waves was not ideal. However, this was judged to be acceptable for my purposes as there was no glaring reason for a cohort effect, and because the chronological course of NSSI is typically more informative than the specific age at which it is occurring during adolescence (Barrocas et al., 2015; Plener et al., 2015). A second limitation was that I was not able to include sex within my model as it would have rendered it underidentified, and thus unable to produce path estimates (Kline, 2015). While sex differences were not directly relevant to my research question, as I would expect the general pattern to remain the same based on the theoretical background, future studies might investigate whether demographic variables such as sex influence the developmental path from attachment to emotion regulation to NSSI.

The most notable limitation was that, while the DSHI was used in the preliminary cross-sectional mediation (see Study 1B), the "DSHI since last survey" measure was not available for each wave of the YWS survey. The decision was made to use the NSSI history item rather than the DSHI in order to maximise sample size. Binary variables, while acceptable for a cross-lagged panel analysis, are typically not recommended for use with mediation (Jose, 2013). The DSHI also provides a lot more information about the nature of a participant's NSSI than a binary measure, such as frequency and form. These aspects of NSSI predict worse wellbeing outcomes and increased suicidality, so would provide more nuance (Stewart et al., 2017; Turner et al., 2013). Finally, the heterogeneity of NSSI measurement makes comparing across studies difficult and is a general issue in NSSI research (Fox et al., 2015). Using the DSHI, an established measure, would make comparison easier.

Unfortunately, the DSHI was simply unavailable for my entire sample. However, the results of the cross-sectional mediation (see Study 1B) imply that similar results to the current ones would be found, with potentially stronger effect sizes. Therefore, future studies would greatly benefit from measuring and utilising the DSHI as the measure of NSSI in a similarly structured longitudinal analysis.

General Discussion

In this thesis, I examined the mediating role of emotion regulation in the relationship between parental attachment and NSSI in NZ adolescents. In Study 1A, I determined that the ERICA (a measure developed for use with adolescents, but with a limited track record of use) was an acceptable measure of NZ adolescent emotion regulation, with adequate model fit to the data. In Study 1B, I found that emotion regulation, as measured with the ERICA, mediates the relationship between parental attachment and NSSI (measured using the DSHI) cross-sectionally as hypothesised. Additional exploration of the ERICA subscales indicated that the Emotional Self-Awareness factor was driving this mediation effect. Further

examination using the DERS (a more commonly used measure of emotion regulation, but one not validated for use with adolescents, and available for only some of our sample) showed that the DERS explains the relationship between parental attachment and NSSI to a greater extent than the ERICA. In Study 2, I examined the mediating effect of emotion regulation on the relationship between parental attachment and NSSI over time, using the ERICA to measure emotion regulation and a binary yes/no measure of lifetime/past-year NSSI. I found that emotion regulation mediates the relationship between parental attachment and NSSI over time as hypothesised. Specifically, more attachment security at T1 predicted higher emotion regulation at T2, which in turn predicted lesser NSSI at T3. Having briefly discussed the results of each study (see discussions for Study 1A, 1B, 2), I will now review the strengths and limitations of how emotion regulation and attachment were measured and the theoretical implications; then consider other potential mediators of the attachment-NSSI relationship; and finally, discuss the possible applications of these findings in NSSI treatment.

Reflections on the Use of the ERICA to Measure Young People's Emotion Regulation

Confirmatory factor analysis indicated that the factor structure found by MacDermott and colleagues (2010) was broadly replicable in our sample, but required some modifications to achieve conventional standards of satisfactory fit. Some adjustments improved model fit, namely allowing covariation among some of the error terms and removal of two items from the third factor, Situational Responsiveness. However, considering that all items loaded onto the same factors as hypothesised, a decision was made to retain the items for later analyses as it allows for consistency across studies (and otherwise the third factor would only have two items, which is not recommended; Little et al., 1999). Overall, this indicates that the ERICA is replicable in a sample of NZ adolescents (the original sample was Australian children and adolescents, aged 9–16 years, $M = 12.09$). However, it does also suggest that the third factor, Situational Responsiveness, is relatively weak, particularly if removing two items from an

already short measure improves the overall model fit. It might be argued that these items

revolve around empathy, potentially lacking face validity as a measure of emotion regulation.

Empathy was included in the ERICA due to its association with various aspects of emotion

regulation such as attentional focus (Eisenberg et al., 1998; MacDermott et al., 2010; Roberts

& Strayer, 1996). Empathy might influence how one reacts to a situation or how one goes

about regulating their emotions, but it is arguably not a key emotion regulation skill and is

rarely conceptualised as such (Gross, 2014).

Other researchers have argued that the ERICA only measures one aspect of emotion

regulation, that being impulsivity (Perez et al., 2012). This brings into question whether the

ERICA is explaining the link between attachment and NSSI mainly through impulsivity,

which theoretically could explain why the DERS explained more variance (i.e., the ERICA is

still explaining a significant amount of variance but is missing other key aspects of emotion

regulation). However, the multiple mediation of the ERICA subscales indicated that the

impulsivity subscale was not the subscale explaining the most of the attachment-NSSI

relationship, despite the theoretical and empirical link of self-reported impulsivity to NSSI

(e.g., Glenn & Klonsky, 2011; Hamza et al., 2015).

The DERS, in comparison, has typically been found to most strongly predict NSSI via

the Limited Access to Emotion Regulation Strategies factor (Kiekens et al., 2017).[20] The

items in this factor mainly refer to feelings that one will not be alleviate their distress

effectively. This is particularly interesting as this is one of the specific ways in which

insecure attachment is predicted to lead to poorer emotion regulation (Bowlby, 1980;

Mikulincer & Shaver, 2016, 2019). However, this could also be a result of self-injuring

individuals knowing that their NSSI is a stigmatised emotion regulation strategy, and thus

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[20] An exploratory multiple mediation of the DERS in my sample (not reported) indicated that the Impulsivity and Limited Access to Emotion Regulation Strategies subscales of the DERS explained the most unique variance.

perceiving themselves as lacking the ability to regulate distressing emotions (Piccirillo et al., 2020).

With the DERS explaining a greater amount of variance in the relationship between attachment and NSSI (as seen in Study 1B basic mediation: 88% by the DERS vs 29% by the ERICA), to the extent that the ERICA's mediating effect is rendered non-significant when placed in the same model as the DERS (Study 1B multiple mediation), it appears that, overall, the DERS is the superior measure, particularly for research investigating NSSI and attachment. It may be that the DERS is measuring additional – and perhaps more relevant – aspects of emotion regulation than the ERICA. Even though the ERICA was developed for a younger sample, the DERS also appears to perform well, if not better. At the same time, we chose to use the ERICA in order to maximise our sample size (as fewer participants were presented with the DERS). Overall, my results suggest that while the ERICA is measuring some relevant aspects of emotion regulation, the DERS may be a more effective measure of adolescent emotion regulation, especially when investigating NSSI.

It is important to keep in mind that while the DERS was more strongly related to both parental attachment and NSSI, I didn't examine the factor structure of the DERS in my sample. Future researchers might still wish to consider the ERICA as it is the shorter measure, making it more practical to include in a survey (particularly for young people), and it has demonstrable reliability as seen in the results of the confirmatory factor analysis. I was also examining the use of the ERICA in examining the relationship between attachment and NSSI specifically – it may be that the DERS simply captures aspects of emotion regulation that are more closely tied to attachment.

Reflections on the Measurement of Adolescent Attachment

Parental attachment was measured using the IPPA (Armsden & Greenberg, 1987). While the IPPA has demonstrated good reliability and psychometric properties, both in

previous studies and the present one, it is explicitly a measure of one's *perceived* communication with, trust in, and alienation from one's parent/s or caregiver/s. While these are certainly related to the attachment bond, labelling it as attachment implies that participants' responses are reflections of a persistent attachment relationship formed from infant experiences with the caregiver. However, the IPPA is only giving us a picture of the adolescent's *perception* of this relationship at this exact moment in time. Indeed, McElhaney and colleagues (2009) have gone so far as to argue that the IPPA does not measure attachment at all, but instead is measuring the current quality of the parent-child relationship. These concerns are unavoidable to a certain extent when measuring attachment via self-report, and the IPPA remains a highly popular measure of adolescent attachment, reliably predicting a range of adolescent wellbeing outcomes (Wilson & Wilkinson, 2012).

Taking this criticism of the IPPA into account, and considering that the present study did not measure attachment from infancy to adolescence, it might be argued that these results do not truly reflect the attachment relationship between the adolescent and their caregiver. However, I argue that there is a body of longitudinal work providing evidence that secure attachment in infancy predicts later secure attachment (and better emotion regulation) in adolescence, while insecure attachment predicts later insecure attachment, and poorer emotion regulation (see Mikulincer & Shaver, 2016). A particularly relevant study is that of Girme and colleagues (2021), who recently published a study using data from the Minnesota Longitudinal Study of Risk and Adaption (Sroufe et al., 2005). They investigated whether secure and insecure infants (those who were categorised as secure or insecure at both 12 and 18 months using the Strange Situation) demonstrated differences in emotion regulation in adulthood. They found that individuals who were classed as insecurely attached in infancy did indeed display poorer emotion regulation later in life when placed in a conflict situation with a romantic attachment figure (as adults aged 20–35 years). My results align with the

theoretical and empirical literature on attachment and emotion regulation, suggesting that while the present study measured perceptions of attachment in adolescence rather than early attachment relationships, this is likely a valid reflection of the attachment bond.

While the question of whether self-report measures of attachment truly reflect the attachment bond is not an issue specific to the IPPA, it does have its own limitations. The most impactful for this thesis is that the IPPA measures attachment as unidimensional (Wilson & Wilkinson, 2012). An IPPA score places the respondent on a scale from more to less secure – however, attachment has been considered to vary along *two* dimensions for several decades. The two-dimensional model of attachment was a major theoretical addition to attachment theory and has serious implications for how (and why) one tends to regulate their emotions in certain ways (see Figure 13; Bartholomew, 1990; Griffin & Bartholomew, 1994; Hazan & Shaver, 1987).

Figure 13

The Two-Dimensional Model of Attachment
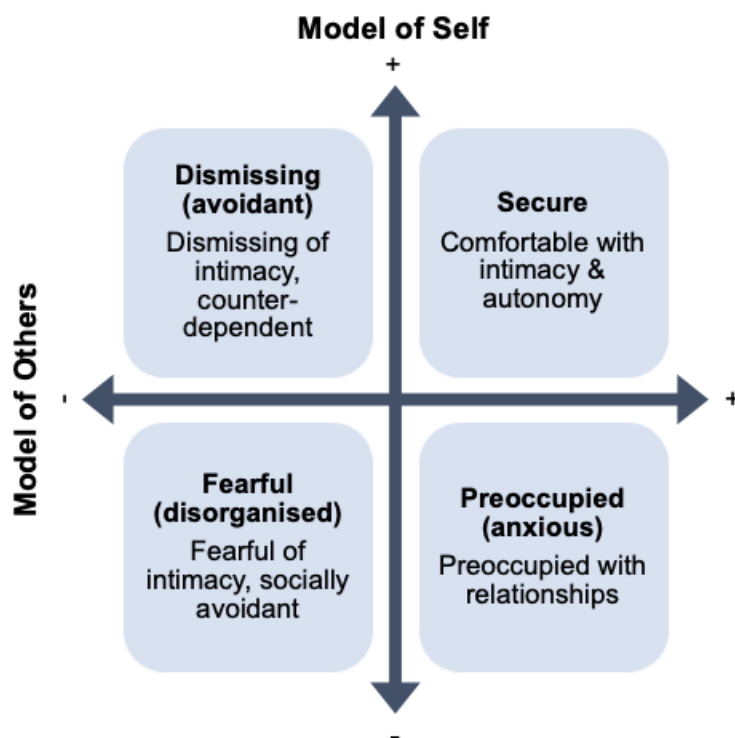
Note. Reproduction from Griffin and Bartholomew (1994).

According to this model, attachment varies along two dimensions – avoidance and anxiety. Attachment avoidance is suggested to reflect a negative model of others, with avoidant individuals having low confidence that others will be responsive and supportive when needed; attachment anxiety reflects a negative model of the self, with low confidence that oneself is competent and worthy of love (Mikulincer & Shaver, 2019). An individual's attachment style is a combination of their level of attachment avoidance and anxiety (e.g., a typically avoidant individual has a positive model of the self, and a negative model of others). We know that how one varies on avoidance and anxiety shapes the way in which they regulate their emotions, over and above simply being classed as insecurely attached (see discussion starting p. 10; Mikulincer & Shaver, 2016, 2019; Wilkinson, 2011). Indeed, standard practice in measuring infant and adult attachment involves breaking attachment insecurity down into anxious and avoidant dimensions, with both the Strange Situation and the Experiences in Close Relationships including this (Ainsworth et al., 1978; Brennan et al., 1998).[21]

Beyond the lack of explicit measurement of avoidance and anxiety, some researchers have also argued that the IPPA does not capture anxiety-related aspects of insecure attachment adequately – that is, the IPPA actually lends itself to measuring a more avoidant style of insecure attachment (Brennan et al., 1998; Mikulincer & Shaver, 2016). This suggests that the IPPA may not be fully capturing adolescent attachment to parents, which would affect the generalisability of the present study's findings. There has not been a systematic review of how attachment anxiety and avoidance relate to NSSI, but as anxious attachment typically is linked to worse outcomes, I would potentially expect that anxious attachment would also be more closely linked to NSSI. For example, Stevens (2014) found

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[21] Although unidimensional measurement is not atypical in the developmental literature, where attachment is often simplified to secure versus insecure because sample sizes that are too small to show differences in insecure subtypes (Girme et al., 2021).

that anxiously-attached individuals struggle more with impulsivity and are more likely to feel overwhelmed by distressing emotions than those who are avoidantly-attached. These are theoretically consistent with the emotional difficulties associated with NSSI (Hamza et al., 2015; Perez et al., 2012).

Future research would benefit from utilising an adolescent attachment measure that assesses the dimensions of attachment and anxiety, for example the Experiences in Close Relationships – Revised – General Short Form (Wilkinson, 2011). Doing so would allow us to examine whether avoidant or anxious attachment were playing a more important role in the relationship between attachment, emotion regulation, and NSSI as I have speculated.

Finally, it is also important to note that participants' responses were not related to a specific caregiver. Participants in our study were asked to answer the IPPA items thinking about their parents, or, if they had multiple caregiver figures (e.g., step-parents, other family members who act as caregivers), to answer thinking about those who they feel have the most influence on them (see Appendix D). While this kept the measure brief within the YWS survey, it may have affected how participants responded, particularly if they felt differently about each parent. It also means that I was unable to examine mother and father attachment individually. In the attachment literature, there are often differential effects of attachment depending on which parent is considered. Gratz and colleagues (2002) found that, in a community sample of young adults, only insecure *father* attachment was associated with female NSSI. Hallab and Covic (2010) reported that father attachment was more protective than mother attachment in a sample of community adolescents. Hilt and colleagues (2008) found that while adolescents who engaged in NSSI actually experienced *increases* in father relationship quality at follow-up. The evidence suggests that father attachment may be more strongly related to NSSI than mother attachment. While researchers have often found mother and father attachment to be concordant (Cook, 2000; Fox et al., 1991), the relationship-

specific nature of attachment means that combining the two in a measure is not ideal, as it may mask the experiences of those who do *not* have similar attachment to both parents (Wilson & Wilkinson, 2012).

Despite these limitations, the IPPA does have its strengths. The IPPA was explicitly tailored to measure adolescents' perception of the quality of their relationship with their attachment figure, based in the changes in attachment associated with adolescence, such as being able to use the symbol of the attachment figure when they are not physically present (Armsden & Greenberg, 1987). Additionally, the IPPA has the benefit of being a relatively short scale, with excellent internal reliability (even after shortening further for the YWS survey). Finally, the IPPA is a very commonly used measure and so can be easily used to compare findings across studies.

What Else Might Explain the Relationship Between Attachment and NSSI?

I found that emotion regulation explained approximately 40% of the relationship between attachment and NSSI. Thus, while emotion regulation did explain a relatively large part of the relationship between attachment and NSSI, this is not the full picture. While using a different measure of emotion regulation would potentially increase the amount of the relationship explained (see Study 1B discussion, starting p. 10), it is also likely that attachment shapes the individual's socioemotional wellbeing ways *other* than emotion regulation, that then affects whether or not one engages in NSSI. I worked within the bounds of what was available from previously collected waves of the YWS survey, which limited the constructs I was able to include in my model. Other potential mediators might include self-esteem, which Marrero-Quevedo and colleagues (2019) suggested is the primary driver of the positive relationship between secure attachment and general psychological wellbeing. Self-efficacy is another potential mediator – both because those who are insecurely attached learn less effective means of regulating their emotions, and because those who self-injure are

typically aware of the stigma around NSSI and do not themselves consider it to be an adaptive means of coping (Piccirillo et al., 2020). Tatnell and colleagues (2014) have previously found that both self-esteem and self-efficacy mediate the attachment-NSSI relationship. However, they investigated these mediators cross-sectionally and in separate mediations; in future, it would be beneficial to integrate all three variables (emotion regulation, self-esteem, and self-efficacy) in a longitudinal model to examine how they might inter-relate to explain how insecure attachment leads to later NSSI.

A Developmental Pathway from Attachment to NSSI via Emotion Regulation

This thesis adds to the literature showing that attachment security is linked to later positive outcomes, showing that secure attachment may act as a buffer against later NSSI. In particular, it suggests that this protective effect occurs through enhanced emotion regulation ability, with secure attachment encouraging the development of more adaptive emotion regulation. This provides further support for one of attachment theory's key points – that the nature of the child's attachment to their primary caregiver shapes the way in which they will regulate their emotions later in life (Bowlby, 1973; Cassidy, 2016; Girme et al., 2021). This suggests that there may be a developmental pathway from attachment to NSSI via emotion regulation. A developmental pathway is "the orderly behavioural development between more than two problem behaviours with individuals differing in their propensity to progress along the successive problem behaviour represented by the pathway during development" (Loeber & Burke, 2011, p. 1). That is, those who are insecurely attached are more likely to develop less adaptive emotion regulation, and those individuals are then more likely to engage in NSSI. Conceptualising the attachment relationship to NSSI as such provides a map for how to prevent the behaviour of concern – theoretically, improvements to either attachment or emotion regulation will provide flow-on effects to lessen the risk of NSSI. This reinforces the importance of giving young people adequate support to work through the particular stresses

of adolescence. That is, even if a certain amount of NSSI is "normal" (e.g. Fox et al., 2015), a focus on fostering secure attachment and developing emotion regulation skills may enable us to lessen its severity or perhaps avoid it altogether.

This also has implications for the treatment of adolescent NSSI. If attachment is having a causal influence on NSSI via emotion regulation, this gives two potential targets for intervention. Attachment might be addressed by working together with the parents and the self-injuring adolescent to improve trust and communication. Alternatively (or in tandem), the adolescent themselves might be taught emotion regulation skills and how to respond more adaptively. These are both common features of NSSI interventions already, both for adolescents and adults (Garisch et al., 2017; Glenn et al., 2019). Importantly, what a developmental pathway model implies is that, even when individuals are put at risk of NSSI by their family environment, addressing emotion regulation skills may mitigate that risk. While in some situations clinicians may not be able to enact meaningful change on parental relationships (e.g., if the parent is unwilling or abusive), helping the adolescent to develop more adaptive emotion regulation skills may help to protect against and/or reduce NSSI.

A developmental pathway from attachment to NSSI also provides a potential causal mechanism behind current NSSI interventions (which, as mentioned above, often target parent relationships and/or emotion regulation). Indeed, the most effective treatments for youth NSSI and suicidal behaviours have been found to be those that target parents or family climate, and those that emphasise development of emotion regulation skills (Bettis et al., 2020). In particular, dialectical behaviour therapy (DBT; Linehan, 1993; Rathus & Miller, 2014) is the most effective evidence-based intervention for adolescent NSSI (Glenn et al., 2019). While the exact mechanism behind this treatment's efficacy is unknown, it involves targeting adolescents' ability to regulate distressing emotions and encouraging validation in their relationship with their parents (Bettis et al., 2020). This thesis suggests a potential

mechanism behind the effectiveness of these interventions. That is, improvements in emotion regulation may be reducing NSSI, while improving the relationship that adolescents have with their parents may also have flow-on effects and enhance the improvement of emotion regulation. A final caveat: emotion regulation did not explain the entirety of the relationship between attachment and NSSI in my model. Thus, while emotion regulation is likely a mechanism through which insecure attachment leads to NSSI, this suggests that the attachment relationship the adolescent has with their parent is still a worthwhile target.

Conclusions

Overall, this thesis provides evidence that the relationship between parental attachment and adolescent NSSI is largely driven by differences in emotion regulation. I was privileged to be able to use longitudinal data collected from a NZ sample of adolescents, the age during which NSSI is a particular issue (Klonsky, 2011; Robinson et al., 2019). While this developmental process is theoretically not culture-specific, the use of a NZ sample makes these results particularly relevant when considering how to prevent and reduce NSSI in NZ adolescents, who have relatively high rates of NSSI. Finally, the use of a longitudinal design means that I was able to show that secure parental attachment predicts better emotion regulation, which in turn predicts lesser NSSI, the first study to demonstrate this specific effect over time. This provides evidence for a potential causal mechanism behind the relationship between attachment and NSSI in a non-clinical adolescent sample, an area which is relatively limited in NSSI research (Arbuthnott & Lewis, 2015). These results underline the importance of attachment processes in the development of NSSI, and can be used to inform its treatment and prevention.

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Appendices

Appendix A

Reliability Coefficients Reported in Studies Using the ERICA to Date

Author/s (date)	α (Total)	α (Emotional control)	α (Emotional self-awareness)	α (Situational responsiveness)
MacDermott et al. (2010)	.75	.73	.60 (.25)*	.64 (.32)*
Hughes et al. (2011)	-	.72	.68	.69
Bunford et al. (2015)	.80	-	-	-
Smith et al. (2017)	-	.75	.62	.51
Baiocco et al. (2017)	From .78 to .80			
David et al. (2019)	-	.70	.57	-
Robinson et al. (2019)	.82 - .83	-	-	-
Fogleman et al. (2019)	.74	-	-	-
Bunford et al. (2020)	-	.78[a] - .86[b]	.62[b] - 74[a]	.21[b] - .64[a]
Creavy et al. (2020)	-	-	-	.76
Margherio et al. (2020)	.81	-	-	-

* Inter-item correlation due to small number of items

[a] high school sample; [b] middle school sample

Appendix B

Descriptive Statistics Before and After Imputing Missing Values in Cross-Sectional Sample

Measure	Original data			Imputed	
	M	*SD*	*N* missing	*M*	*SD*
IPPA	3.56	0.68	11	3.62	.87
ERICA - total	3.73	0.47	4	3.73	.46
ERICA – Emotional Control	3.42	0.67	4	3.42	.67
ERICA – Emotional Self-Awareness	3.64	0.70	4	3.64	0.70
ERICA – Situational Responsiveness	4.39	0.49	4	4.39	0.49
DERS	2.28	0.70	3	2.28	0.69

Appendix C

The Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004)

Scale	Item
1: Nonacceptance of Emotional Responses	When I'm upset, I feel guilty for feeling that way
	When I'm upset, I feel ashamed with myself for feeling that way
	When I'm upset, I become embarrassed for feeling that way
	When I'm upset, I become angry with myself for feeling that way
	When I'm upset, I become irritated with myself for feeling that way
	When I'm upset, I feel like I am weak
2: Difficulties Engaging in Goal-Directed Behaviour	When I'm upset, I have difficulty concentrating
	When I'm upset, I have difficulty focussing on other things
	When I'm upset, I have difficulty getting work done
	When I'm upset, I have difficulty thinking about anything else
	When I'm upset, I can still get things done (r)
3: Impulse Control Difficulties	When I'm upset, I lose control over my behaviours
	When I'm upset, I have difficulty controlling my behaviours
	When I'm upset, I become out of control
	When I'm upset, I feel out of control
	I experience my emotions as overwhelming and out of control
	When I'm upset, I feel like I can remain in control of my behaviours (r)
4: Lack of Emotional Awareness	I am attentive to my feelings (r)
	I pay attention to how I feel (r)
	When I'm upset, I acknowledge my emotions (r)

	When I'm upset, I believe that my feelings are valid and important (r)
	I care about what I am feeling (r)
	When I'm upset, I take time to figure out what I'm really feeling (r)
5: Limited Access to Emotion Regulation Strategies	When I'm upset, I believe that I'll end up feeling very depressed
	When I'm upset, I believe that I will remain that way for a long time
	When I'm upset, I believe that wallowing in it is all I can do
	When I'm upset, it takes me a long time to feel better
	When I'm upset, I believe that there is nothing I can do to make myself feel better
	When I'm upset, I know that I can find a way to eventually feel better (r)
	When I'm upset, my emotions feel overwhelming
	When I'm upset, I start to feel very bad about myself
6: Lack of Emotional Clarity	I have difficulty making sense out of my feelings
	I have no idea how I am feeling
	I am confused about how I feel
	I know exactly how I am feeling (r)
	I am clear about my feelings (r)

Note. (r) = reverse-scored item

Appendix D

The Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987)

The following statements ask about your feelings about your friends, and your parents or the people who act as parents for you. If you have more than one person acting as either your mother or father (e.g. step-parent, or a member of your whānau who looks after you like a parent), please answer the questions for the one you feel has most influenced you.

Please read the following and rate how true (or untrue) each is for you.

1. I get upset a lot more than my parents know about (r)

2. When we discuss things, my parents consider my point of view

3. My parents encourage me to talk about my difficulties

4. I don't know who I can depend on these days (r)

5. I feel that no one understands me (r)

6. If my parents know something is bothering me, they ask me about it

7. My friends encourage me to talk about my difficulties

8. My friends don't understand what I'm going through these days

9. I feel my friends are good friends

10. I trust my friends

11. I get upset a lot more than my friends know about

12. If my friends know something is bothering me, they ask me about it

Note. This study used parent items only (items 1 through 6). (r) = reverse-scored item.

Rating scale: 1 = *almost never or never true;* 2 = *seldom true*; 3 = *sometimes true*; 4 = *often true*; 5 = *almost always or always true*

Appendix E

The Deliberate Self-Harm Inventory (Modified; Gratz & Roemer, 2004)

Sometimes people can hurt themselves on purpose WITHOUT intending or expecting to kill themselves. Please only answer these questions if you MEANT to hurt yourself (not if it was an accident), but WITHOUT intending to kill yourself. Do not answer yes if you did something accidentally (e.g., you tripped and banged your head accidentally).

Have you ever deliberately (but without wanting to kill yourself) …

... cut your wrist, arms, or other areas of your body?

... burned yourself with a cigarette, lighter or match?

... carved words, pictures, designs or other marks into your skin (not including tattoos or ta moko)?

... bitten yourself, to the extent that you broke the skin?

... rubbed sandpaper on your body?

... dripped acid onto your skin?

... used bleach, or oven cleaner to scrub your skin?

... stuck sharp objects such as needles, pins, staples, etc. into your skin (not including tattoos or ta moko, ear or body piercing, or needles for drug use)?

... rubbed glass into your skin?

... broken your own bones?

... prevented wounds from healing?

... severely scratched yourself, to the extent that scarring or bleeding occurred?

... punched yourself, or banged your head against something, to the extent that caused a bruise to appear?

... done anything else to hurt yourself that was not asked about in these questions? If yes, please briefly describe what you did.

Rating scale:

0 = I've never thought about doing this

1 = I've thought about doing this, but never done it

2 = I've done this once

3 = I've done this a few times

4 = I've done this many times

Appendix F

Descriptive Statistics Before and After Imputing Missing Values

		Original		*N* missing	Imputed	
		M	*SD*		*M*	*SD*
Wave 1	IPPA - Parent	3.80	0.82	0	3.80	0.82
	ERICA	3.82	0.47	0	3.83	0.47
Wave 2	IPPA - Parent	3.73	0.85	45	3.73	0.81
	ERICA	3.76	0.49	45	3.76	0.47
Wave 3	IPPA - Parent	3.69	0.83	34	3.68	0.82
	ERICA	3.75	0.48	34	3.75	0.47
Wave 4	IPPA - Parent	3.95	1.55	159	3.80	0.83
	ERICA	3.77	0.47	158	3.76	0.43