

A LONGITUDINAL EXAMINATION OF THE ASSOCIATION BETWEEN NON-  
SUICIDAL SELF-INJURY, EMOTIONAL INTELLIGENCE, AND FAMILY  
CONTEXT IN ADOLESCENTS

by

Alexandra Perloe  
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Committee:

\_\_\_\_\_ Director

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Department Chairperson

\_\_\_\_\_ Program Director

\_\_\_\_\_ Dean, College of Humanities  
and Social Sciences

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Doctor of Philosophy at George Mason University

by

Alexandra Perloe  
Master of Arts  
George Mason University, 2012  
Bachelor of Arts  
Brandeis University, 2006

Director: Christianne Esposito-Smythers, Professor  
Psychology

Summer Semester 2015  
George Mason University  
Fairfax, VA

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## **DEDICATION**

This is dedicated to my parents, Paulette and Sid, and my brother, Gabe, who supported me with the right balance of love and high expectations during my graduate school years.

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I would like to thank the many academic mentors, friends, and relatives who have made this happen. My academic advisor, Christy Esposito-Smythers, supported every step of this research, from taking me on to work on Project SHAPE, helping me develop research questions, encouraging and having confidence in me, helping me hone my academic writing style, and much more. My other committee members, Tim Curby and Tara Chaplin were invaluable; Tim provided humorous, patient and clear guidance on analyses and helped me keep perspective, and Tara provided insightful suggestions on the dissertation proposal that helped focus the final product. Evan Kleiman provided additional statistical guidance with incredible clarity and speed. My cohort at George Mason has done so much for me. We have truly supported each other, and have understood each other's struggles and triumphs better than anyone else can. Lastly, my family and friends earned my vast gratitude by listening, cheering me on, distracting me, and just being there.

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## **ABSTRACT**

### **A LONGITUDINAL EXAMINATION OF THE ASSOCIATION BETWEEN NON-SUICIDAL SELF-INJURY, EMOTIONAL INTELLIGENCE, AND FAMILY CONTEXT IN ADOLESCENTS**

Alexandra Perloe, Ph.D.

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Dissertation Director: Dr. Christianne Esposito-Smythers

Non-suicidal self-injury (NSSI), which peaks in adolescence, is associated with poor psychological health, physical pain, and risk for future suicide attempts, but empirically supported treatment is scarce. Emotional intelligence (EI) – the ability to perceive, understand and manage emotions – captures several factors relevant to the development of NSSI. The present set of studies examined the role of EI in the development of NSSI in a clinical adolescent sample. The first study examined the potential for a reciprocal longitudinal relationship between NSSI and four facets of EI (stress management, intrapersonal, interpersonal, and adaptability) that have theoretical and empirical links to NSSI. It was hypothesized that poor EI would increase the likelihood and frequency of future NSSI, which would in turn prevent adolescents from learning more adaptive coping skills and thus exacerbate their EI deficits. Participants were 91 adolescents ages 13-18 (mean age= 15.5, SD = 1.4; 61% female; 46.1% Caucasian) who were enrolled (along with one parent each) in a randomized controlled trial of a prevention workshop

targeting suicide, HIV and substance abuse. All adolescents had received mental health treatment at baseline. Results of cross-lagged autoregressive models did not support a bidirectional relationship between NSSI and EI over time, suggesting that cross-sectional correlates of NSSI may not hold longitudinal predictive power.

The second study, with the same 91 participants, hypothesized that EI would mediate the association between family context (child maltreatment and parental mental health symptoms) and NSSI. Rates of maltreatment that met or exceeded the level indicating “low to moderate” abuse were relatively high in this clinical sample, with the highest rates reported for emotional forms of maltreatment (59.3% emotional abuse, 50.5% emotional neglect, 42.9% physical abuse, 34.1% physical neglect, 25.3% sexual abuse). Moreover, approximately 16.5% of parents reported clinically significant depressive symptoms and 22.0% reported clinical levels of global mental health impairment. Results did not support the hypothesized mediation model. Emotional neglect predicted the presence of NSSI one year later, but this effect was not mediated by EI. Further, no other forms of maltreatment (physical abuse or neglect, sexual abuse, emotional abuse) or parental mental health symptoms (depression, or global severity index) predicted NSSI over the course of a year, also suggesting a lack of mediation.

Across both studies, null results may be due in part to a relatively small sample size with a low reported rate of NSSI. Future research should continue exploring longitudinal ties between NSSI and coping-related factors such as EI, including in relation to family context. Understanding the directionality and specificity of the relation between NSSI,

EI, and family factors could help clinicians target specific coping deficits and address family-related stressors that may influence this concerning behavior.

# **A LONGITUDINAL EXAMINATION OF NON-SUICIDAL SELF-INJURY AND EMOTIONAL INTELLIGENCE IN ADOLESCENTS**

## **Introduction**

Non-suicidal self-injury (NSSI) is defined as direct and deliberate self-inflicted bodily harm in the absence of intent to die (Nock, 2010). NSSI has been shown to predict suicidal behavior, even above the impact of prior suicidal behavior (Asarnow et al, 2011; Guan, Fox & Prinstein, 2012), which underscores the importance of research in this area. NSSI peaks in adolescence – with an average onset between 11 and 15 years (Whitlock, 2010) – and declines into adulthood (Zanarini, Frankenburg, Hennen, Reich & Silk, 2005), framing adolescence as a period of heightened risk. Prevalence estimates of adolescent NSSI range from 13 to 46% in community samples (Jacobson & Gould, 2007; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007), and 39 to 68% (Guerry & Prinstein, 2010; Lipschitz, et al. 1999) in clinical samples. Gender differences are inconsistent, though rates are generally higher in females (e.g., Howe-Martin, Murrell, & Guarnaccia, 2012; Ross & Heath, 2002; Whitlock, 2010). NSSI occurs alongside a range of psychiatric diagnoses (e.g., Jacobson, Muehlenkamp, Miller & Turner, 2008), and may merit classification as its own disorder (Glenn & Klonsky, 2013; Selby, Bender, Gordon, Nock & Joiner, 2012). Empirically-supported treatment for adolescent NSSI is scant (Brausch & Girresch, 2012; Washburn et al., 2012), though promising interventions are

being delivered and evaluated (e.g., Jacobson & Mufson, 2012; Miller & Smith, 2008; Rathus & Miller, 2002).

Efforts to help individuals manage urges to self-injure can be enhanced by an understanding of intrapersonal and interpersonal factors that shape the development of NSSI. Emotional intelligence (EI) is a construct that may capture several of these factors. EI is a person's ability to perceive, use, understand and manage emotions (Mayer, Salovey, Caruso, & Sitarenios, 2003; Salovey & Mayer, 1990). EI also refers to perceived competency to manage emotion-laden situations (Mayer, Roberts & Barsade, 2008), i.e. "emotional self-efficacy" (Mavroveli, Petrides, Rieffe & Bakker, 2007). EI is associated with the use of adaptive coping— namely, more problem-focused strategies and fewer avoidant strategies (Mavroveli et al., 2007; Mikolajczak, Petrides & Hurry, 2009; Saklofske, Austin, Galloway & Davidson, 2007). Bar-On (1997), who developed a prominent EI model, describes four areas: (1) *stress management*, or affect regulation, (2) *intrapersonal* skills such as emotional awareness and expression, (3) *interpersonal* skills, or the capacity to care about, understand, and relate to others, and (4) *adaptability*, or flexible and effective problem-solving, as well as problem-solving self-efficacy. Overall, EI spans several areas of adaptive skills relevant to NSSI.

### **Theoretical and empirical links between NSSI and EI**

**Stress Management.** Ample theory and research support an association between poor stress management (i.e., emotion regulation) and NSSI. According to the four-function model of NSSI (Nock & Prinstein, 2004; 2005) and review articles exploring functions of NSSI (e.g., Bentley, Nock & Barlow; 2014; Klonsky, 2007), NSSI is most

often motivated by automatic negative reinforcement of unwanted emotion (i.e., “to stop bad feelings”). Further explaining this function of NSSI, the Experiential Avoidance Model (EAM; Chapman, Gratz & Brown, 2006) posits that individuals self-injure to escape seeming emotional torment, and then feel temporary – but reinforcing – relief as this intensity subsides. Relatedly, the Emotional Cascade Model (ECM; Selby, Anestis, & Joiner, 2008; Selby, Franklin, Carson-Wong, & Rizvi, 2013) posits that individuals ruminate on negative affect, feel intensification of that affect, and eventually engage in dysregulated behavior (e.g., NSSI, substance use, binge-eating) to distract from this cascade.

Theories of NSSI converge to suggest that individuals with poor affect regulation skills, feeling awash in unwanted emotions, may engage in NSSI to banish or dampen this distress. Indeed, across self-report and laboratory studies, there is evidence that negative affect precedes NSSI and that this affect is reduced after NSSI (e.g., Arney, Crowther & Miller, 2011; Bresin & Gordon, 2013a; Hamza, & Willoughby, 2015; Laye-Gindhu & Schonert-Reichl, 2005; Nock, Prinstein, & Sterba, 2009). Moreover, individuals who self-injure, versus those who do not, tend to feel this emotional relief more strongly (per studies using painful stimuli as NSSI proxies) and thus are more willing to endure the physical pain of NSSI (Franklin et al. 2013; Franklin, Lee, Puzia, & Prinstein, 2014). Overall, NSSI can become an entrenched behavior in individuals who lack other skills to manage affect.

Consistent with theory, empirical research supports a link between NSSI and poor emotion or affect regulation skills (e.g., Adrian, Zeman, Erdley, Lisa & Sim, 2011; Gratz



& Roemer, 2008; Jenkins & Schmitz, 2012). There is evidence that individuals with borderline personality disorder, who often self-injure, have lower trait EI, and that this stems largely from stress-management deficits (Gardner & Qualter, 2009; Leible & Snell, 2004; Petrides, Perez-Gonzalez & Furnham, 2007; Sinclair & Feigenbaum, 2012). Self-injurers tend to have higher emotional reactivity –experiencing more frequent, intense and lasting emotions (Gratz & Roemer, 2004; 2008) – and struggle to manage those reactions. In a study supporting the ECM (Selby et al., 2013), the interaction between *instability* in rumination and *instability* of negative affect (i.e., fluctuating waves of these phenomena) predicted NSSI.

Research with adolescents echoes these findings. For example, emotion dysregulation has been found to mediate the influence of interpersonal problems on adolescents' NSSI risk (Adrian et al., 2011). Adolescents' use of emotion-focused coping, as opposed to problem-focused coping, has been found to mediate the path from psychopathology to NSSI (McMahon et al., 2013). Relatedly, in an inpatient adolescent group, reports of limited emotion regulation skills accounted for a significant portion of NSSI variance (Perez, Venta, Garnaat, & Sharp, 2012).

**Intrapersonal EI.** As with stress management, theory and research support an association between NSSI and poor intrapersonal EI (i.e., inability to recognize and appropriately express emotion). Similarly to those with broader stress management deficits, individuals with intrapersonal EI deficits may derive automatic negative reinforcement from NSSI as they seek to actively avoid emotions they cannot understand. They may also be motivated by a second function outlined in the four-function model of

NSSI: automatic positive reinforcement of sensation or emotion (i.e., “to feel something”) (Nock & Prinstein, 2004; 2005). Specifically, individuals with poor intrapersonal EI, who perceive emotions as muted or diffuse, may self-injure as a way to generate feelings (Turner, Chapman, & Layden, 2012). Relatedly, some individuals may self-injure for a sense of control or excitement (Nixon, Cloutier, & Aggarwal, 2002), to up-regulate (i.e., amplify emotions) or feel any emotion at all, rather than feel numb (Nixon et al., 2002; Turner et al., 2012). Indeed, NSSI produces an opiate rush that may perpetuate the behavior (Bresin & Gordon, 2013b; Grossman & Siever, 2001; Walsh, 2006).

Empirical research supports the association between NSSI and deficits in emotional awareness and expression. For example, NSSI is consistently associated with alexithymia, i.e. difficulty identifying, understanding and expressing emotions (Borrill, Flynn, Fox, & Roger, 2009). One study suggests that lack of emotional clarity is the largest challenge facing adolescents who self-injure (Bocquee, Zimmer-Gembeck, & Morrissey, 2012). Individuals who self-injure have been found to use fewer self-referential emotional words (Woods, 2012) and have lower verbal fluency, especially following a negative mood induction (Photos, 2011), relative to control groups. Relatedly, the ability to make nuanced distinctions in negative affect (emotional differentiation) has been found to be lower on a daily basis in individuals who self-injure (Bresin, 2014) and to protect against NSSI in individuals with BPD who show high levels of rumination (Zaki, Coifman, Rafaeli, Berenson, & Downey, 2013). Labeling a negative

emotion in specific terms may create distance from emotional intensity and slow the emotional cascade and eventual NSSI that would otherwise be fueled by rumination.

Empirical research also consistently supports an association between emotional avoidance (versus expression) and NSSI (Guerreiro et al., 2013). Across studies, self-injurers report coping with aversive emotions by avoiding or suppressing them (e.g., in adolescents: Bocquee, 2012; Evans, Hawton & Rodham, 2005; Williams & Hasking, 2010; in young adults: Andover, Pepper & Gibb, 2007; Borrill et al., 2009; Chapman, Specht, & Cellucci, 2005; Haines & Williams, 1997; Hasking, Momeni, Swannell, Chia, 2008). For example, in one study, adolescent girls who engaged in NSSI reported higher levels of thought suppression, alexithymia, and “unwanted inner experiences” (Howe-Martin et al., 2012). Moreover, experiential avoidance increased as NSSI frequency increased. Further, emotional acceptance, in contrast to avoidance, is associated with lower likelihood of NSSI (e.g., Anderson & Crowther, 2012). Indeed, acceptance is a focus of many interventions targeting NSSI (e.g., Gratz, Levy & Tull, 2012; Linehan, 1993). Notably, emotional avoidance can also be considered an affect regulation strategy; thus these latter studies also support an association between stress management EI and NSSI.

**Interpersonal EI.** In Bar-On’s model, interpersonal EI is a more loosely defined construct. It encompasses caring about and relating to other people, as well as understanding others’ emotions. In other words, it is an aptitude for empathy and for broader social skills (Kim et al., 2012). Though less cohesive, theoretical and empirical ties to NSSI are still present. The four-function model of NSSI explains that self-injury

also serves a social function, which can be positively or negatively reinforced (Nock & Prinstein, 2004). Nock (2008) writes that NSSI is a “high intensity social signal used when less intense communication strategies fail” (p. 159). In particular, the behavior acts as a “cry for help” that elicits caretaking (positive social reinforcement). Individuals with interpersonal EI deficits often struggle to relate emotionally to others and may thus feel drawn to NSSI for its creation of social bonds with others who self-injure (Nock, 2008). For someone who has otherwise felt isolated or rejected, this positive social reinforcement is powerful. Also rewarding for someone with low interpersonal EI, NSSI offers negative social reinforcement by warding off potential threats (i.e., broadcasting a signal of strength that deters bullies) (Nock, 2008).

Empirical research supports the association between low interpersonal EI and NSSI. Adolescents who self-injure report having worse social skills (Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010) and lower self-efficacy in social problem-solving (Nock & Mendes, 2008). Further, erratic or unfulfilling relationships are associated with NSSI, both cross-sectionally (Claes et al., 2010) and prospectively (Yates, Tracy & Luthar, 2008; You, Leung & Fu, 2012). NSSI is associated with higher levels of attachment-related anxiety and lower levels of perceived social support (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009; Tatnell, Kelada, Hasking, & Martin, 2013). Relatedly, self-injurers report feeling comfortable seeking advice from fewer people (Evans et al., 2005; Muehlenkamp, Brausch, Quigley, & Whitlock, 2013). Interpersonal functions of NSSI appear to have the strongest pull for teens who lack other means of

emotional expression, e.g., those with more internalized anger (Nixon et al., 2002) and poorer peer communication (Hilt, Cha & Nolen-Hoeksema, 2008).

**Adaptability EI.** Lastly, the adaptability domain of EI captures flexibility or perceived confidence in responding to change. Here, too, theory and empirical research supports ties with NSSI, and suggests that individuals with low adaptability EI may see NSSI as the only route to meeting intrapersonal or interpersonal goals (i.e., receiving positive or negative reinforcement in these arenas). In one study, when asked to generate solutions to socially challenging situations, teens reporting NSSI did not show deficits in the quantity or quality of solutions, but tended to select maladaptive responses from their lists, and reported lower self-efficacy about implementing adaptive solutions (Nock & Mendes, 2008). Relatedly, male young adult self-injurers reported lower perceived control over their problems (Haines & Williams, 1997). Further, deficits in “optional thinking ability,” or the ability to generate alternate solutions to interpersonal problems, predicted repeat incidents of NSSI in an emergency-room sample (McAuliffe, Corcoran, Hickey, & McLeavy, 2008). Overall, youth with low adaptability EI may feel trapped by their problems and see NSSI as the most accessible or satisfying solution.

NSSI is also associated with a lack of problem-focused coping, or efforts to directly address the underlying cause of distress, for example through seeking social support (e.g., Andover, Pepper & Gibb, 2007; Evans et al., 2005; Nock & Mendes, 2008; Wester & Trepal, 2010). Someone who becomes increasingly reliant on the short-term fix of NSSI may believe that longer-term solutions are unattainable, and that NSSI is a way to exert control in the face of helplessness. Corroborating this, one study showed that repeated

NSSI was strongly associated with “passive-avoidant” problem-solving (i.e., resigning oneself to a problem), while “active handling” was associated with lower NSSI risk (McAuliffe et al., 2006). In sum, individuals who self-injure are often less adept at resolving problems and less confident in their ability to do so.

### **A need for longitudinal research**

Though substantial research suggests that multiple facets of EI are associated with NSSI, most studies are cross-sectional (Guerreiro et al., 2013). It is therefore unclear whether NSSI is an outcome, a cause, or merely a correlate of poor EI. Teens may initially turn to self-injury because they lack adaptive skills to regulate distress. Engaging in NSSI may, however, also contribute to *future* poor coping, as its reinforcing nature prevents adolescents from learning more effective ways to navigate their emotional worlds. Alternatively, the effects may be reciprocal, with reliance on NSSI exacerbating poor EI, and vice versa.

Researchers have called for longitudinal studies to clarify directionality (e.g., Brown, Williams, & Collins, 2007; Evans et al., 2005; Guerreiro et al. 2013; Hasking et al., 2010; Hilt et al., 2008; Nock & Mendes, 2008). Only a handful of longitudinal studies directly capture EI-related variables. Repeated NSSI over the course of a year has been associated with higher use of passive-avoidant problem-solving, i.e. adaptability EI (McAuliffe et al., 2006) and of emotional suppression, i.e. intrapersonal EI (Andrews, Martin, Hasking, & Page, 2013). These findings echo cross-sectional research on experiential avoidance in NSSI, and suggest that teens who push away aversive emotions may continue using NSSI to cope. The role of broader stress management is unclear: In one study, affective

dysregulation prospectively predicted college students' NSSI (Wilcox et al., 2012), but in another, emotion regulation did not mediate the relationship between adolescents' attachment anxiety and NSSI (Tatnell et al., 2013). Though these studies provide insight into the role of EI-related factors in the trajectory of NSSI, they do not explain the ongoing interaction over time.

### **The present study**

Further longitudinal research, in which relevant predictors and NSSI are each measured at several time points, can help clarify these relationships. Such research can be especially illuminating in clinical samples of adolescents, given their elevated risk for NSSI. The present study explored potential reciprocal effects between EI and NSSI over the course of one year.

**Hypothesis 1.** Deficits in global EI and each EI domain will be associated with higher likelihood and frequency of NSSI at baseline. Stress management and intrapersonal EI will be most strongly associated, given known deficits in emotional regulation and awareness in NSSI.

**Hypothesis 2.** Emotional intelligence (global EI, and each subscale) and NSSI will exert bidirectional effects over the course of time, such that deficits in EI precede increases in NSSI and increases in NSSI precede further deficits in EI. Again, effects are expected to be strongest in the case of stress management and intrapersonal EI. This will be true for (a) NSSI frequency (i.e., number of times engaged in NSSI) and (b) NSSI presence (i.e., any NSSI).

## **Method**

### **Participants**

Participants were 91 adolescents, ages 13-18, and their parents, all of whom participated in a broader study evaluating a prevention program for suicide, substance abuse and HIV (Project SHAPE). Of these, 10 adolescent-parent dyads participated in a pilot trial, and 81 dyads participated in a randomized controlled trial (RCT). In the RCT, dyads were randomly assigned to the prevention workshop or to a wait-list control condition. The intervention consisted of a 12-hour prevention workshop and a 2-hour booster session. Across both arms, the adolescents were receiving community-based mental health treatment at the time of referral. Inclusion criteria for the study were as follows: 1) adolescent enrollment in mental health treatment at the time of referral; 2) parent and adolescent proficiency in English; and 3) parent and adolescent residing in the same home. Exclusion criteria included: 1) a diagnosis of drug or alcohol dependence, 2) current enrollment in a drug or alcohol treatment program; 3) HIV infection; 4) pregnancy; or 5) adolescent cognitive level that would prohibit understanding of study material.

The adolescent sample was 61.8 percent female, ranging in age from 13 to 18 (mean = 15.5 years, SD = 1.4). The sample was racially (46.1% Caucasian, 34.8% African-American, and 18.0% “Mixed race/Other”) and ethnically (80.1% non-Hispanic, 16.9% Hispanic, 2% not indicated) diverse. Parents/guardians ranged in age from 32 to 75 (mean = 44.4 years, SD = 8.2). There was a wide range in family income, with 18% of families reporting incomes of \$30,000 or lower, 35% reporting incomes between \$30,000



and \$70,000, and 44% reporting incomes over \$70,000. (3% of families did not report their income).

## **Procedure**

As noted, all adolescent participants were receiving mental health services in the community at the time of referral. Participants were recruited from five community mental health centers in Northern Virginia (27%), one youth shelter (43%), a private practice (10%), high school counselors (2%), a juvenile court (5%), as well as advertisements posted in local newspapers, on Craigslist, and on a university-based email list (10%). (Recruitment sources were not indicated for the remaining 3% of participants). Parents and adolescents interested in participating in Project SHAPE provided their contact information to a counselor at the recruitment facility or contacted the research team directly based on information provided in the study advertisements or brochure. The project director (a PhD-level researcher) or a graduate-level research assistant screened parent and teen separately for eligibility via phone or in-person and further explained the study. Potential participants were informed that the study would consist of four assessments: baseline, one month, six months, and twelve months post-baseline. They were also told that their involvement would also consist of either a one-and-a half-day group workshop if they were randomized to the treatment group, or the provision of reading materials on substance use, HIV/STDs, and suicide if they were randomized to the wait-list control group. Parent and adolescent were also informed them that they would each receive between \$25 and \$75 at each of the four assessments. If eligibility criteria were met, an appointment was made for the baseline assessment, at which time,

consent and adolescent assent was obtained. The self-report measures used for the proposed study were completed via a computer questionnaire, while interview measures were administered by a graduate-level research assistant. Participants were randomized into workshop or waitlist-control at the completion of their baseline assessment.

(Participants in the waitlist group were invited to participate in a prevention workshop at the completion of the 1-year assessment period.) Randomization groups were matched for gender, suicide status (history of suicide attempt vs. no history) and racial minority status (Caucasian vs. non-Caucasian).

The current study used data obtained at baseline, at 6-month follow-up, and at 12-month follow-up (BL, T2, and T3, respectively). The 1-month follow-up assessment did not assess variables of interest to the current study. BL data provided demographic information, as well as adolescents' self-reported EI and NSSI-related thoughts and behaviors. The BL assessment also included a diagnostic interview that was used to determine whether adolescents met criteria for many common internalizing and externalizing disorders. The longitudinal design allowed for examination of changes in EI and NSSI over the course of one year.

## **Measures**

**Non-suicidal self-injury** was assessed via the relevant section of the short form of the Self-Injurious Thoughts and Behaviors Interview (SITBI-SF; Nock, Holmberg, Photos & Michel, 2007). The SITBI-SF is a 90-item structured clinician-administered interview that assesses the presence, frequency, and characteristics of lifetime and recent self-injurious thoughts and behaviors in five domains: suicidal ideation, suicide plans,

suicide gestures, suicide attempts, and non-suicidal self-injury. The NSSI section is further divided into thoughts about NSSI (i.e., urges to self-injure) and actual self-injury. Each module begins with a screening item that assesses the presence of that thought or behavior. The NSSI thought module includes questions about severity (“On the scale of 0 to 4, at the worst point, how intense were your thoughts of purposely hurting yourself?” and “On average, how intense were the thoughts?”), and duration of thoughts. The NSSI behavior module begins with the screening question, “Have you ever actually purposely hurt yourself without wanting to die?” If the adolescent answers affirmatively to the screening item, the interviewer further assesses the frequency (number of times in life, and in past year, month, and week) as well as age of first and most recent incidents. Participants who endorse NSSI also name the method(s) they used (from a list of 12 common types, with the option to add ‘other’). The SITBI also assesses participants’ estimates of the likelihood future NSSI related thoughts and behaviors (“On a scale of 0 to 4, what do you think the likelihood is that you will purposely hurt yourself without wanting to die in the future?”). At BL, the screening items assessed *lifetime* and past-year presence or absence of thoughts or behaviors; at T2 and T3, the wording was changed to refer to “the last six months.”

The SITBI has demonstrated strong interrater reliability (average  $\kappa = .99$ ,  $r = 1.0$ ) and test-retest reliability (average  $\kappa = .70$ , intraclass correlation coefficient = .44) over a 6-month period in a sample of adolescents and young adults. The SITBI, and the NSSI subscale in particular, has also demonstrated concurrent validity, as evidenced by strong correspondence between the SITBI and other measures of NSSI (average  $\kappa = .87$ ) (Nock

et al., 2007).

**Emotional intelligence** was assessed via the Bar-On Emotional Quotient Inventory: Youth Version (Short) (EQ-i:YV(S); Bar-On, 1997). This 30-item self-report measure assesses intra- and interpersonal coping and stress management skills. It employs a 4-point Likert scale and provides a total EI score and scores in four domains: Stress management (e.g., “When I get angry, I act without thinking”), Intrapersonal (e.g., “I can easily describe my feelings”), Interpersonal (e.g., “I can tell when one of my close friends is unhappy”), and Adaptability (e.g., “I can easily use other ways of solving problems”). The EQ-i:YV(S) was normed on 10,000 youth and has demonstrated strong psychometric properties with adolescents. Bar-On and Parker (2000) report 3-week test-retest subscale reliabilities ranging from .81 to .88. The longer 60-item youth version of the EQ-i has demonstrated convergent validity (correlations with adult emotional intelligence, personality, internalizing and externalizing problems), discriminant validity (distinguishes between gifted and non-gifted students) and predictive validity (predicts problem gambling and academic achievement in adolescence) (Humphrey et al., 2011). Predictive validity of the EQ-i has been tested in numerous studies examining its association with performance in social, work- and school-related interactions, as well as its impact on physical health, psychological health, and subjective well-being (Bar-On, 2006). Across these studies, the average predictive validity coefficient is .57, suggesting that the EQ-i does indeed predict relevant aspects of social and emotional functioning (Bar-On, 2006).

In the current sample, internal consistency on the EQ-i:YV(S) was good, as indicated by Cronbach's  $\alpha$  of .81, .85, and .86 for the total measure at 0, 6, and 12 months, respectively. Internal consistency was also high for each of the four subscales at all three time points, with Cronbach's  $\alpha$  ranging from .75 to .89. Among the subscales, interpersonal EI had the lowest, albeit still acceptable, internal consistency (Cronbach's  $\alpha$  = .75 to .79 across time points).

**Psychiatric diagnosis** was assessed with the Diagnostic Interview Schedule for Children (DISC IV). The DISC IV is a computer-assisted highly structured diagnostic interview that generates DSM-IV diagnoses (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Graduate research assistants administered the DISC IV separately to adolescents and parents, both of whom were interviewed about the adolescents' mental health. Reliability and validity of the DISC IV are acceptable (Schwab-Stone et al., 1996). Diagnoses and symptom counts were derived using the algorithm developed by Shaffer and colleagues (Shaffer et al., 1996). This yielded two sets of diagnoses and symptom counts, as reported by adolescents and parents. If an adolescent met criteria for a given diagnosis by *either* adolescent or parent report, he or she was considered to meet criteria for the purposes of this study. The diagnostic modules for internalizing disorders (Major Depression, Dysthymia, Mania, Hypomania, Generalized Anxiety, Panic Disorder, Social Phobia, Post Traumatic Stress Disorder), externalizing disorders (Attention Deficit Hyperactivity Disorder, Conduct Disorder, Oppositional Defiant Disorder) and substance use disorders (Alcohol, Marijuana, and other Substances) were administered in the present study. The substance use disorder modules were used to

screen out adolescents with DSM-IV alcohol or other substance dependence (though an initial phone screen conducted before the baseline assessment screened out most adolescents with substance dependence).

**Demographic Variables** These were assessed via parent and adolescent self-reports during the baseline assessment. Demographic data collected included gender, age, race, ethnicity, and annual family income, among other variables.

### **Data Analysis Plan and Preliminary Analyses**

Structural equation modeling was used to analyze data. SEM was useful for the present study because it is a flexible approach that allows a given variable to be modeled with multiple simultaneous associations (Curby, Rimm-Kaufman, Abry, 2013). SEM also can account for missing data, in this case, by using Full-Information Maximum Likelihood, which uses all data available at each time point to account for missing data (Allison, 2003). We estimated all models with Mplus version 6.12 (Muthén & Muthén, 1998-2010). Preliminary analyses, including examination of demographic differences in outcomes and zero-order correlations between variables, were conducted in SPSS Statistics 19.0 (IBM Corp., 2010).

Bivariate correlations were used to test Hypothesis 1, which posited a negative association between baseline levels of EI (global EI, and each subscale) and NSSI outcomes. A series of bivariate cross-lagged autoregressive models were used to test Hypothesis 2, which posited reciprocal associations between NSSI and EI over one year. Figure 1 depicts the hypothesized cross-lagged model. Specifically, we tested a series of models in which:

- (a) NSSI frequency at 6 and 12 months was regressed onto EI (total and each subscale) at baseline and 6 months, and (b) EI levels at 6 and 12 months were regressed onto NSSI frequency at baseline and 6 months, respectively.
- (b) NSSI presence at 6 and 12 months was regressed onto EI (total and each subscale) at baseline and 6 months, and (b) EI levels at 6 and 12 months were regressed onto NSSI presence at baseline and 6 months.

Fit indices were used to evaluate the relative fit of nested models. For each pairing of variables, chi-square change tests were used to examine the relative fit of adding one set of cross-lags (either NSSI→EI or EI→NSSI), to the original unconditional model (which had no cross-lags). A significant change in chi-square values, relative to changes in degrees of freedom, indicated that a given unidirectional model provided a better fit for the data. Next, the bidirectional model (with both sets of cross-lags added) was compared to the best-fitting unidirectional model, again using chi-square change tests to evaluate significant improvement in fit. Once the best-fitting model was identified, significant paths were examined in that model.

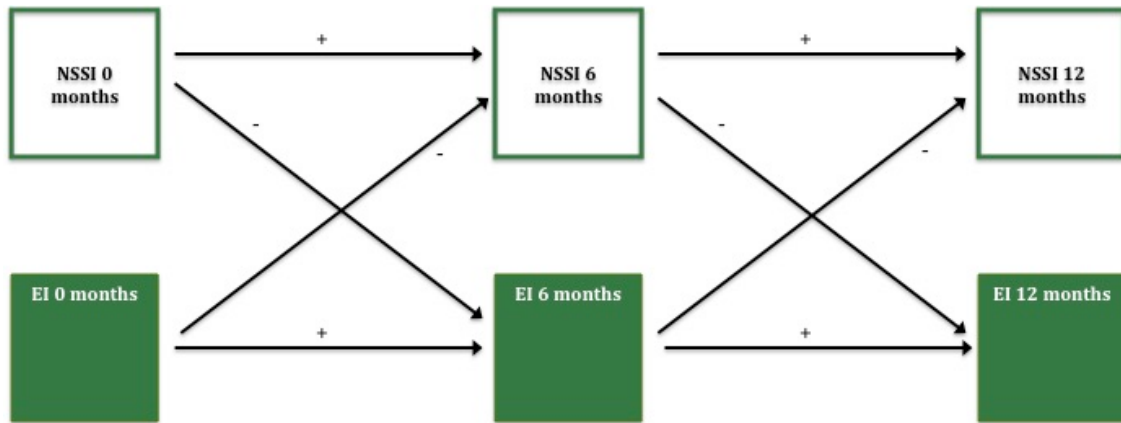


Figure 1. Hypothesized EI-NSSI Cross-Lagged Autoregressive Model

As outlined in Ferrer & McArdle (2003), cross-lagged models allowed us to examine the interrelations between the two variables over time. The autoregressive aspect refers to the fact that the level of each variable is predicted by that variable at the previous time point (Curby et al., 2013). For example, T2 EI is predicted, at least in part, by BL EI. The cross-lagged aspect refers to the fact that each variable is also predicted by *another* variable at the previous time point (Curby et al., 2013). The cross-lag paths tested if either variable was a leading indicator of the other, or whether the NSSI and EI had a bidirectional relationship.

Several decisions were made in setting up the cross-lagged models, each of which considered theoretical issues and characteristics of the study data.

**Operationalizing NSSI.** NSSI frequency was specified as a count variable. This number was adolescent’s report on the SITBI of the “number of times in the past year” (at baseline) or “number of times in the last six months” (at T2 and T3) that “you have purposely hurt yourself without wanting to die.” (Nock et al., 2007). The distribution of NSSI frequency scores was highly non-normal, characterized by a high frequency of zeros and strong positive skew. These distributions are typical for low base-rate



behaviors, especially in adolescents (e.g., self-injury, substance use, sexual activity), in which a sizable portion of the population has not engaged in the behavior at all (Atkins, Baldwin, Zheng, Gallop & Neighbors, 2013; Karazsia & van Dulmen, 2008). In these cases, ordinary least squares (OLS) regression is not appropriate, given the violation of fundamental assumptions. Zero-inflated negative binomial (ZINB) regression, however, is designed for distributions of this nature (Atkins & Gallop, 2007; Atkins et al., 2013), and was accordingly chosen to conduct the current analyses. ZINB combines a logistic regression and a count regression to examine two separate kinds of variance. In the present study, the ZINB regressions investigated: (a) factors predicting the probability that someone engaged in NSSI at all, and (b) among those who did engage in NSSI, factors predicting the amount of NSSI behavior (Atkins & Gallop, 2007; Atkins et al., 2013). This analytic technique has been used in other studies of NSSI (e.g., Kleiman et al. 2015, Weismoore, 2011) and of related outcomes such as childhood injury (Karazsia & van Dulmen, 2008).

A Poisson regression, a special case of the negative binomial model (Atkins et al., 2013), was not appropriate for these data. In a Poisson distribution (and regression), the variance approximately equals the mean. When the variance exceeds the mean, as is often the case, the data are considered overdispersed relative to the Poisson distribution. Dispersion is defined by the ratio of the variance to the mean. Thus when the dispersion parameter is significantly different than 1, the data are overdispersed and do not fit a Poisson model (Atkins et al., 2013). In the current study, the dispersion statistic for baseline NSSI frequency was significantly different than 1 ( $p < .05$ ), suggesting that a

negative binomial model was a more appropriate fit.

Separately, NSSI was modeled as a dichotomous outcome (presence vs. absence at each time point) in a series of cross-lagged panels using logistic regressions. These models involving logistic regressions were run twice: first using maximum likelihood (ML) estimation, and second using Bayesian estimation. Bayesian models, in comparison to frequentist models, can help overcome the barriers posed by skewed distributions and small sample sizes by providing the whole distribution, referred to as the posterior distribution, without assuming that a parameter is fixed nor that the distribution of the parameter estimate is normal (Muthén & Asparouhov, 2012). Given the current study's relatively small sample size and the fact that statistical power is not determined directly or entirely by sample size using Bayesian estimation, this approach provided a valuable additional analysis tool.

NSSI thoughts (i.e., urges to self-injure) were also considered as a dependent variable. Descriptive analyses showed, however, that the distribution of NSSI thoughts very closely mirrored that of actual NSSI behavior. Thus this variable did not add meaningful value and was not investigated further.

**Estimating additional parameters.** EI and NSSI variables were not correlated with each other at each time point because this is not possible for count or categorical variables in Mplus 6.12.

Autoregressive and cross-lag pathway parameters were not fixed as equal across time points, to allow models to best fit the data. On a theoretical level, it is reasonable to expect different relationships between EI and NSSI during the first six months of the

study versus the latter six months, given that all participants were in mental health treatment (or were recently discharged from treatment) at baseline, but some terminated treatment over the course of the study.

**Controlling for covariates.** Socio-demographic and clinical history variables that have been reliably associated with NSSI in prior research were considered as potential covariates in analyses. These included psychiatric diagnosis (internalizing and externalizing disorders; Jacobson et al., 2008), gender (e.g., Howe-Martin et al., 2012), and other socio-demographic characteristics. Of these, only internalizing disorders and gender were found to be significantly associated with NSSI, and thus were controlled for in analyses. Specifically, results of Chi-square analyses suggested that individuals with an internalizing disorder (versus those without an internalizing disorder) were significantly more likely at T2 to report engaging in NSSI since BL (Fisher's exact test,  $p < .05$ ). Similarly, results of an Independent Samples Mann-Whitney U Test indicated significant differences in NSSI frequency at T2 (incidents of NSSI since baseline) between those with and without an internalizing disorder (Mann-Whitney U,  $p < .05$ ). For gender, females were significantly more likely than males to report any NSSI at T2 (Fisher's exact test,  $p < .01$ ), and reported a higher NSSI frequency at T2 (Kruskal-Wallis Test,  $p < .05$ ).

Notably, gender could not be uniformly controlled for in all analyses because only females reported engaging in NSSI between baseline and the 6-month follow-up (T2), which prevented some models from converging in Mplus. Thus, all analyses were run twice: once controlling for gender, and once without controlling for gender. When

controlling for gender, Mplus often fixed certain pathways instead of estimating them freely, limiting interpretation of those models.

Analyses also controlled for treatment condition (workshop versus waitlist control). Though Chi-square and nonparametric tests did not reveal differences in NSSI outcomes based on treatment condition, the prevention workshop may have indirectly affected thoughts, behaviors and emotions relevant to NSSI, and thus was a potential confounding variable.

## **Results**

### **Descriptive results**

To characterize this clinical adolescent sample, Table 1.1 summarizes the reported frequency of NSSI thoughts and behaviors as reported on the SITBI-SF. At baseline, 40.7% ( $n = 37$ ) of the full sample reported that they had engaged in NSSI in their lifetimes, and 26.4% ( $n = 23$ ) reported engaging in NSSI in the past year. The proportions of adolescents who reported NSSI *thoughts* (i.e., urges to self-injure) and actual self-injury *behaviors* mirrored each other at all time points, suggesting that most adolescents in this clinical sample who contemplated self-injury did act on these thoughts at some point. Interestingly, at baseline, NSSI behaviors were endorsed slightly more frequently than were NSSI thoughts, suggesting that some adolescents self-injured “without thinking,” (i.e. they were not fully aware of the thoughts or feelings leading to their NSSI). At T2 and T3, however, the rate of NSSI thoughts slightly exceeded that of NSSI behaviors at those points, which suggests that some adolescents are able to manage self-injury urges without acting on them. At each time point, the proportion of adolescents

that predicted any likelihood of future NSSI was equal to, or greater than, the proportion that reported recent NSSI (i.e., past year at baseline, or past 6 months at T2 and T3). Notably, however, fewer adolescents predicted future self-injury than reported any *lifetime* NSSI, implying that some participants with a history of NSSI were confident that they could control impulses to self-injure.

Table 1.1 Frequency of NSSI Behaviors and Thoughts

	Frequency (Percent of non-missing participants)		
	Female	Male	Full Sample
Baseline (BL)	N = 55 <sup>a</sup>	N = 34 <sup>a</sup>	N = 91 <sup>b</sup>
Any lifetime NSSI behavior	28 (50.9)	9 (26.5)	37 (40.7)
Any past-year NSSI behavior	18 (32.7)	5 (14.7)	23 (25.3)
Any lifetime NSSI thoughts	26 (49.1)	8 (23.5)	34 (38.2)
Any past-year NSSI thoughts	16 (30.8)	7 (21.2)	23 (26.4)
Any prediction of future NSSI behavior	22 (40.0)	5 (14.7)	27 (29.7)
Six-month follow-up (T2)	N = 40 <sup>a</sup>	N = 25 <sup>a</sup>	N = 66
Any NSSI behavior since BL	10 (24.4)	0 (0)	10 (15.2)
Any NSSI thoughts since BL	12 (29.3)	0 (0)	12 (18.2)
Any prediction of future NSSI behavior	11 (27.5)	1 (4.0)	12 (18.5)
Twelve-month follow-up (T3)	N = 39 <sup>a</sup>	N = 24 <sup>a</sup>	N = 63
Any NSSI behavior since T2	7 (17.9)	3 (12.0)	10 (15.6)
Any NSSI thoughts since T2	10 (25.6)	3 (12.0)	13 (20.3)
Any prediction of future NSSI behavior	13 (33.3)	5 (20.8)	18 (28.6)

*Note.* All answers were reported on the Self-Injurious Thoughts and Behaviors Interview (SITBI). Percentages are calculated as percentages of the given population for that variable at that time point (i.e., percent of non-missing data).

<sup>a</sup> This is the number of participants who provided any SITBI data at this time point. Some responses are missing for certain items.

<sup>b</sup> Gender data are missing for two participants.

Table 1.2 provides further descriptive information about NSSI phenomenology in the current sample. Baseline data are presented to provide the most robust information.

Cutting/carving the skin was by far the most common method of NSSI. When asked how long they typically thought about NSSI before acting on the thought, the modal response – endorsed by more than a third of adolescents reporting any lifetime NSSI – was 0 seconds. In other words, a sizable group of adolescents reported that they self-injured immediately when having an urge to do so. This echoes the observation noted earlier about rates of NSSI actions surpassing NSSI thoughts.

Table 1.2. Phenomenology of NSSI at Baseline

	<u><i>n (% self-injurers)</i></u>
Method of NSSI (could choose >1)	
Cut or carved skin	28 (75.7)
Hit self on purpose	15 (40.5)
Picked skin to draw blood	9 (24.3)
Burned skin	3 (8.1)
Inserted sharp objects into nails/skin	4 (10.8)
Scraped skin to draw blood	5 (13.5)
Other	1 (2.7)
Typical time from NSSI thought to behavior	
0 seconds	15 (36.6)
1-60 seconds	3 (7.3)
2-15 minutes	11 (26.8)
16-60 minutes	6 (14.6)
1-2 days	2 (4.9)
More than 2 days	2 (4.9)
Wide range (spans > 2 responses)	2 (4.9)
Received Medical Treatment for NSSI	7 (18.4)
Age of NSSI onset	<u><i>Years</i></u>
Mean (SD)	13.4 (3.0)
Range (low-high)	7-17

Table 1.3. Descriptive Statistics and Intercorrelations Among Variables of Interest

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>N</i>	89	91	91	88	91	91	66	64	65	63	64	56	63	61
<i>M</i>	.38	.41	.25	1.70	.57	78.78	.15	.72	.38	80.17	.16	3.71	.49	79.56
<i>SD</i>	.49	.49	.44	6.36	1.05	11.40	.36	2.56	.91	12.38	.37	14.07	.91	13.13
Baseline (BL)														
1. Gender	–	-.24*	-.20	-.01	-.24*	.14	-.33**	-.21	-.30*	-.03	-.08	.10	-.17	-.14
2. Any lifetime NSSI (1 =yes)		–	.70**	.34**	.56**	-.07	.25*	.24	.34**	-.04	.43**	.33*	.17	.07
3. Any past-year NSSI BL (1 = yes)			–	.46**	.43**	-.13	.25*	.05	.30*	-.01	.15	.29*	-.06	-.04
4. Past-year NSSI frequency (# of times)				–	.48**	-.14	.21	.07	.23	-.02	.48**	.75**	.13	-.02
5. NSSI prediction BL (0-4 scale)					–	-.17	.31*	.16	.38**	-.21	.44**	.37**	.35**	-.08
6. Total EI BL						–	-.18	-.11	-.17	.42**	-.07	.03	-.15	.46**
Six-month follow-up (T2)														
7. Any NSSI since BL (1 = yes)							–	.66**	.79**	-.13	.28*	-.10	.10	-.16
8. NSSI frequency since BL (# of times)								–	.74**	-.19	.43**	-.06	.26	-.14
9. NSSI prediction T2 (0-4 scale)									–	-.11	.40**	-.02	.17	-.05
10. Total EI T2										–	-.14	-.02	-.31*	.74**
Twelve-month follow up (T3)														
11. Any NSSI since T2 (1 = yes)											–	.57**	.63**	-.12
12. NSSI frequency since T2 (# of times)												–	.33*	.01
13. NSSI prediction T3 (0-4 scale)													–	-.32*
14. Total EI T3														–

Note. \*  $p < .05$ . \*\*  $p < .01$ .

### **Correlations between Emotional Intelligence and NSSI**

We predicted in Hypothesis 1 that global EI and each EI subscale would be negatively associated at baseline with NSSI presence and frequency, and that these associations would be strongest in the case of stress management and intrapersonal EI. As shown in Table 1.3, which presents zero-order correlations of key study variables, this hypothesis was not supported. The BL level of global EI was not significantly correlated with any BL measurement of NSSI (any lifetime, any past-year, frequency, or behavioral forecasts). Though not outlined in Table 3, we also investigated zero-order correlations between each subscale of BL EI and NSSI behaviors. Here, too, correlations were non-significant. In particular, we did not support the hypothesis that stress management and intrapersonal EI would show especially strong correlations to NSSI.

### **Bidirectional Relationship between Emotional Intelligence and NSSI**

We hypothesized that EI would show a reciprocal relationship over one year with: (2a) NSSI frequency and (2b) NSSI likelihood, and that this relationship would be strongest for intrapersonal and stress management EI. This hypothesis was not supported. A series of cross-lagged autoregressive models were used to investigate this hypothesis, first using Chi-square change tests to identify the best-fitting model among nested models, and next examining any significant autoregressive or cross-lag paths in the best-fitting model. Results are outlined in Tables 1.4 to 1.6 and explained below.

**NSSI Frequency.** Cross-lag models using zero-inflated negative binomial (ZINB) regressions with maximum likelihood estimation investigated the longitudinal



relationships between NSSI frequency, NSSI likelihood, and EI (Hypotheses 2a and 2b). As shown in Table 1.4, chi-square change tests indicated that the unconditional model provided the best relative fit in all cases (except when the unconditional model could not converge at all). Given that the addition of cross-lag paths did not significantly improve fit in any cases, the coefficients of these paths could not be meaningfully interpreted. In cases with a non-converged unconditional model, the unidirectional models did not suggest a better fit, since cross-lag paths were not significant.

Table 1.4. NSSI Frequency and Presence in Relation to EI: Fit Comparisons

Model	Controlling for Gender			Not Controlling for Gender		
	-2LL	$\Delta df^a$	$\Delta -2LL$	-2LL	$\Delta df^a$	$\Delta -2LL$
EI Total x NSSI frequency and presence						
Unconditional	Did not converge	--	--	Did not converge	--	--
NSSI → EI*	Did not converge	-- <sup>b</sup>	-- <sup>b</sup>	-1170.21	4	-- <sup>b</sup>
EI → NSSI	Did not converge	-- <sup>b</sup>	-- <sup>b</sup>	-1166.61	4	-- <sup>b</sup>
Bidirectional	Did not converge	-- <sup>b</sup>	-- <sup>b</sup>	-1166.13	4	-4.08
EI Intrapersonal x NSSI frequency and presence						
Unconditional*	-989.32	--	--	-937.07	--	--
NSSI → EI	-988.48	4	-.84	-936.96	4	-.11
EI → NSSI	-984.62	4	-4.70	Did not converge	4	-- <sup>b</sup>
Bidirectional	-984.47	4	-.15	-932.38	4	-4.58
EI Interpersonal x NSSI frequency and presence						
Unconditional*	Did not converge	--	--	-855.60	--	--
NSSI → EI	Did not converge	4	-- <sup>b</sup>	-854.45	4	-1.15
EI → NSSI	-902.31	4	-- <sup>b</sup>	-851.97	4	-3.63
Bidirectional	-901.47	4	-.84	-852.75	4	.78
EI Stress Management x NSSI frequency and presence						
Unconditional*	Did not converge	--	--	-927.44	--	--
NSSI → EI	Did not converge	4	-- <sup>b</sup>	-925.66	4	-1.78
EI → NSSI	-972.66	4	-- <sup>b</sup>	-920.01	4	-7.43
Bidirectional	-970.74	4	-1.92	-918.27	4	-1.74
EI Adaptability x NSSI freq.						
Unconditional*	-951.03	--	--	-900.69	--	--
NSSI → EI	-950.86	86	-.17	-900.51	4	-.18
EI → NSSI	-947.41	4	-3.62	-895.48	4	-4.71
Bidirectional	-947.00	4	-.41	-895.83	4	.13

*Note.* \* Best-fitting model. -2LL = -2 Log likelihood, df = Degrees of freedom. Models marked as “did not converge” produced the following error message in Mplus 6.12: “Fatal Error. Negative binomial value is greater than 5000.” All regressions used zero-inflated negative binomial regressions with maximum likelihood estimation. All models controlled for treatment condition and internalizing disorders, and controlled for gender as indicated. Due to zero variability of NSSI by gender at 6 months, the models were run both with and without the gender control. Stability and cross-lag pathway parameters were estimated freely, rather than constrained as equal across time points, to allow models to best fit the data.

<sup>a</sup> For unidirectional models: compared to unconditional model; for bidirectional model: compared to best-fitting unidirectional model.

<sup>b</sup> Could not calculate due to lack of convergence.

The autoregressive paths in the unconditional models, however, could be interpreted. For global EI and each EI subscale, the estimates for EI stability paths were significant and positive, both from BL to T2, and from T2 to T3. This indicates that higher levels of EI at one time point were related to higher levels of EI at the subsequent time point. For NSSI presence (the logistic portion of the model) and NSSI frequency (the count portion of the model), coefficients and significance of stability paths followed a less consistent pattern. First, the estimates differed somewhat between models involving NSSI and each facet of EI, with the same NSSI paths having statistically significant estimates in one model but not in another. Second, in models where the NSSI stability paths were significant, their coefficients were unexpectedly negative, suggesting that presence of NSSI at one point is related to a *lower* likelihood of NSSI at the next point (logistic portion) and that a higher frequency of NSSI at one point is related to a *lower* frequency of NSSI at the next point (count portion). Figure 1.2 shows one example of an unconditional model using ZINB regressions, in this case for intrapersonal EI.

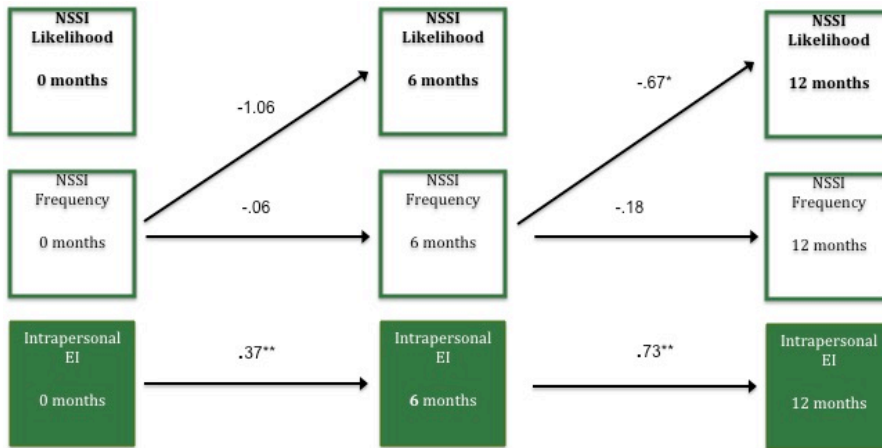


Figure 2. Unconditional Autoregressive Model of Intrapersonal EI and NSSI

A depiction of the unconditional model, which was the best-fitting model, between Intrapersonal EI and NSSI using zero-inflated negative binomial (ZINB) regression. The ZINB regression estimates logistic and count outcomes for NSSI. Though this unconditional model includes cross-lags between the two measurements of NSSI, it does not include cross-lags between Intrapersonal EI and NSSI. The model controlled for gender, internalizing disorder, and treatment condition; the controls are not depicted in the model. *Note.* \*  $p < .05$ . \*\*  $p < .01$ .

**NSSI Likelihood.** To examine the longitudinal relationship between NSSI likelihood and EI (Hypothesis 2b), a series of cross-lagged autoregressive models was run using a dichotomous variable indicating presence or absence of NSSI in the designated time period (past-year at BL; past six months at T2 and T3). These models were run with maximum likelihood estimation (Table 1.5) and with Bayesian estimation (Table 1.6).

Table 1.5. NSSI Presence in Relation to EI: Fit Comparisons in Logistic Regressions

Model	Controlling for Gender			Not controlling for gender		
	-2LL	$\Delta df^a$	$\Delta -2LL$	-2LL	$\Delta df^a$	$\Delta -2LL$
EI Total x NSSI presence						
Unconditional <sup>+</sup>	-1117.73	--	--	-1064.81	--	--
NSSI → EI	-1116.89	2	-0.84	-1064.45	2	-.36
EI → NSSI	-1126.26	2	8.53*	-1061.58	2	-3.23
Bidirectional	-1125.82	2	8.93*	-1061.06	2	-.52
EI Intrapersonal x NSSI presence						
Unconditional <sup>+</sup>	-885.78	--	--	-833.27	--	--
NSSI → EI	-882.37	2	-3.41	-830.52	2	-2.75
EI → NSSI	-885.12	2	-0.66	-832.33	2	-.94
Bidirectional	-881.61	2	-.76	-829.47	2	-1.05
EI Interpersonal x NSSI presence						
Unconditional <sup>+</sup>	-800.35	--	--	-750.78	--	--
NSSI → EI	-800.13	2	-0.22	-750.08	2	-.70
EI → NSSI	-799.71	2	-0.64	-750.18	2	-.60
Bidirectional	-799.49	2	-0.22	-749.47	2	-.61
EI Stress Management x NSSI presence						
Unconditional <sup>+</sup>	-872.13	--	--	-796.86	--	--
NSSI → EI	-870.71	2	-1.42	-796.76	2	-.10
EI → NSSI	-870.44	2	-1.69	-795.24	2	-1.62
Bidirectional	-869.01	2	-1.43	-795.13	2	-.11
EI Adaptability x NSSI presence						
Unconditional <sup>+</sup>	-848.35	--	--	-796.86	--	--
NSSI → EI	-848.04	2	-0.31	-796.76	2	-.10
EI → NSSI	-844.63	2	-3.72	-795.24	2	-1.62
Bidirectional	-844.29	2	-.34	-795.13	2	-.11

Note. \*p < .05. \*\* p < .01. <sup>+</sup> = Best-fitting model. -2LL = -2 Log likelihood, df = Degrees of freedom. A significant change in -2LL, relative to change in df, suggests significantly improved fit. All regression paths were estimated with logistic regressions using maximum likelihood estimation. Stability and cross-lag pathway parameters were estimated freely, rather than constrained as equal across time points, to allow models to best fit the data. All models controlled for treatment condition and internalizing disorders, and controlled for gender as indicated. Due to no variability of NSSI by gender at 6 months, the models were run both with and without the gender control.

<sup>a</sup> For unidirectional models: compared to unconditional model; for bidirectional model: compared to best-fitting unidirectional model.

**Maximum likelihood (ML) estimation.** As presented in Table 1.5, the cross-lag models using ML estimation with the dichotomous NSSI variable yielded similar results to the ZINB regressions. In all cases, the unconditional model again provided the best relative fit for the data, suggesting that EI is not associated with the likelihood of NSSI over one year. In the model that included global EI, the addition of the unidirectional EI→NSSI pathway, as well as the addition of bidirectional cross-lag pathways, did result in a significant change in model fit when controlling for gender, treatment condition, and internalizing disorder, but unexpectedly, the fit was *worse* in these directional models than in the unconditional model (EI→NSSI model: chi-square change: 8.53, df change: 2,  $p < .05$ ; Bidirectional model: chi-square change: 8.93, df change: 2,  $p < .05$ ). In the models with global EI and with each subscale, the best-fitting models again showed strong stability of EI over time, as indicated by positive and significant autoregressive paths. None of the stability paths for NSSI were significant in these models.

**Bayesian estimation.** To address potential limitations caused by sample size, Bayesian estimation was used to re-investigate Hypothesis 2b, as presented in Table 1.6. In Bayesian analyses, a statistical test is not available to test comparisons of relative fit between nested models; thus only the bidirectional models were examined. Model fit in Bayesian analyses can be evaluated via the posterior predictive  $p$ -value (PPP), for which values close to .5 are typical of a correct model, and are considered to indicate good fit (Gelman, Meng, & Stern, 1996; Lee & Song, 2003). Using this indicator, each of the models (global EI, and each subscale) had relatively good fit, with PPP values between .43 and .57. Controlling for gender improved fit in three models (global EI, intrapersonal

EI, adaptability EI), and worsened fit in two models (stress management EI; interpersonal EI). The cross-lag paths were not significant, however, in any of these models. Thus Hypothesis 2b was not supported with Bayesian estimation, either.

Table 1.6. Bayesian Estimations of NSSI Presence and EI

Model	Controlling for Gender		Not Controlling for Gender	
	<i>PPP</i>	<i>Sig. cross-lags (B)</i>	<i>PPP</i>	<i>Sig. cross-lags (B)</i>
EI Total x NSSI frequency				
Bidirectional	.48	None	.45	None
EI Intrapersonal x NSSI presence				
Bidirectional	.54	None	.57	None
EI Interpersonal x NSSI presence				
Bidirectional	.46	None	.51	None
EI Stress Management x NSSI presence				
Bidirectional	.44	None	.50	None
EI Adaptability x NSSI presence				
Bidirectional	.47	None	.43	None

*Note.* \* $p < .05$ . \*\* $p < .01$ . PPP = Posterior Predictive P. All models used logistic regressions with Bayesian estimation. Significant paths are those in which the 95% credible interval does not pass through 0 (i.e., 95 percent of likely values are different than 0). The PPP provides indication of fit, where values close to .5 (in either direction) suggest good fit. Bayesian estimation does not allow for relative fit comparisons between models; thus results are reported for the bidirectional models only. Stability and cross-lag pathway parameters were estimated freely, rather than constrained as equal across time points, to allow models to best fit the data. All models controlled for treatment condition and internalizing disorders, and controlled for gender as indicated. Due to no variability of NSSI by gender at 6 months, the models were run both with and without the gender control.

Interestingly, though, autoregressive paths for NSSI likelihood were significant and in the expected positive direction in these Bayesian models—which stands in contrast to results in the ZINB and non-Bayesian logistic models. Specifically, in all models except that with Adaptability EI, the NSSI autoregressive path from T2 to T3 was significant

and positive. In the model with global EI, the autoregressive path for NSSI likelihood from BL to T2 was also significant and positive. In the model with Adaptability EI, only the earlier NSSI autoregressive path (BL to T2) was significant, and again, was positive. These significant and positive stability pathways for NSSI indicate that a higher likelihood of NSSI at one time point is related to a higher likelihood of NSSI at the subsequent time point. As in the previously reported models, the autoregressive paths for global EI and each EI factor were significant and positive.

***NSSI behavioral forecasts.*** We also considered using a third dependent variable, the adolescent's self-reported forecast of future NSSI likelihood, as a proxy for NSSI behavior itself. Given the longitudinal study design, we were able to examine whether adolescents' own predicted likelihoods of future NSSI were associated with their actual likelihood of engaging in future self-injury. A series of logistic regressions demonstrated that study adolescents were relatively accurate in predicting their future NSSI (e.g., higher predicted likelihoods at baseline were associated with significantly higher odds of reported NSSI at T2 or T3), but that most of these associations were reduced to trends or non-significance after controlling for baseline presence/absence of NSSI. Thus, this behavioral forecast variable did not add meaningful value over the other dependent variables and was not used in study analyses.

## **Discussion**

This study explored the longitudinal relationship between non-suicidal self-injury and emotional intelligence over the course of one year in adolescent psychiatric outpatients. Theories of NSSI suggest that EI deficits may contribute to the use of NSSI as a



maladaptive coping skill. While the cross-sectional association between NSSI and many aspects of EI is supported by past research, few studies have explored the longitudinal relationship, limiting our understanding of EI as a potential cause, correlate, or consequence of NSSI. We hypothesized that EI and NSSI would be negatively associated at baseline, and that EI and NSSI would have a bidirectional relationship over time, such that deficits in EI would be associated with greater likelihood and frequency of future NSSI and higher levels of NSSI would, in turn, be associated with further deficits in EI. We also hypothesized that these relationships would be strongest for stress management and intrapersonal EI, given the most robust evidence linking these domains to NSSI. Hypotheses were not supported: NSSI and EI were not significantly correlated at baseline, nor did the two variables interact reciprocally over time. Possible explanations for these null results are explained below, after a discussion of NSSI characteristics in the current sample.

### **Phenomenology of NSSI**

This study is unique in providing NSSI prevalence rates in a clinical adolescent outpatient sample – most prior studies assess either community samples or clinical inpatient samples – and thus can enrich our knowledge of the scope of NSSI in youth. The finding that approximately 40% of the current sample endorsed lifetime NSSI at baseline suggests, unsurprisingly, that adolescents in any type of mental health treatment (a study inclusion criterion) are more likely to self-injure than those in the broader community, where most studies find prevalence rates in the range of 13 to 23% (Jacobson & Gould, 2007). Also unsurprisingly given that we did not recruit from psychiatric

inpatient units, the past-year NSSI prevalence of 25% in the current outpatient sample is notably lower than the past-year NSSI prevalence of ~ 60% found in some adolescent inpatient samples (DiClemente, Ponton & Hartley, 1991; Guerry & Prinstein, 2010). In the current study, as in the small body of longitudinal research on NSSI (e.g., Guerry & Prinstein 2010), rates of recent NSSI decreased at the follow-up assessments, with approximately 15% of retained participants endorsing NSSI at both 6 and 12 months. Notably, most of this drop was driven by a drop in males reporting NSSI at these time points.

In this vein, the current study echoed other data suggesting that adolescent girls are generally more likely to report NSSI than adolescent boys (e.g., Howe-Marin et al., 2012; Ross & Heath, 2002; Whitlock, 2010). Prior research suggests that among older adolescents (ages 15-19), the female:male ratio of NSSI is 3 to 1 (Hawton & Harriss, 2008). Indeed, in the current study, rates of lifetime NSSI among 15-18 year-olds approached this ratio at baseline (25 females versus 7 males; 3.5 to 1 ratio). For younger adolescents in the current study (ages 13-14), the rates of NSSI were too low for a meaningful comparison by gender (3 females and 2 males in this age group endorsed NSSI at baseline).

Other descriptive findings further suggest that self-injurers in this sample were relatively representative of the larger population of self-injuring adolescents in the United States. Cutting/carving the skin was the most commonly endorsed method of NSSI, which is consistent with prior research (e.g., Klonsky & Muehlenkamp, 2007; Whitlock, Eckenrode & Silverman, 2006). The average age of NSSI onset in this sample, 13.4

years, falls squarely in the 11-15 range found in previous research (e.g., Whitlock, 2010). Also mirroring other studies on NSSI (e.g., Jacobson et al., 2008), self-injurers in the current study presented with a range of internalizing and externalizing disorders, as assessed via structured clinical interview (DISC IV; Shaffer et al., 2000). The current finding that internalizing disorders, but not externalizing disorders, differentiated self-injuring and non-self-injuring adolescents, is also consistent with prior research (Perez et al., 2012).

Study results also shed light on the relationship between NSSI thoughts and behavior. The greatest proportion of self-injurers (more than one-third) reported *no time* between their typical NSSI thoughts and NSSI behaviors, indicating that the behavior is often very impulsive and difficult to stop once the thought arises. The second-most commonly cited duration of NSSI thoughts was “2 to 15 minutes,” endorsed by about one-quarter of self-injurers at BL in the current sample. The perceived immediacy of NSSI is more prevalent in the current sample than it was for adolescents who provided real-time data on NSSI thoughts and behaviors over two weeks (Nock et al., 2009); in that group, 1-30 minutes emerged as the most common duration of NSSI thoughts (in 40.8% of self-injurers), whereas only 16.5% of self-injurers reported that thoughts lasted under five seconds. Given the different data collection methods between that study (ecological momentary assessment on a handheld computer; Nock et al., 2009) and the current study (retrospective interview reports), this contrast may in fact be informative. Perhaps some adolescents retrospectively recall their self-injurious thoughts as escalating instantly from nonexistent to uncontrollable, but in the actual moment of NSSI can notice the slightly

more gradual escalation from urge to action. This possibility has promising treatment implications, which will be discussed later.

### **Correlations between NSSI and EI at baseline**

Counter to Hypothesis 1 and to past research suggesting cross-sectional associations between NSSI and EI-related constructs, we did not find a significant relationship at baseline between NSSI and global EI or any EI subscales. These findings are inconsistent with several theoretical models of NSSI positing that this behavior is a maladaptive effort to avoid or regulate overwhelming or unwanted emotions. For example, this function of NSSI is a central tenet of the experiential avoidance model of NSSI (Chapman et al., 2006) and the emotional cascade model (Selby et al., 2008). Moreover, an extensive body of literature supports these theoretical assertions, demonstrating that individuals who self-injure show deficits in emotional awareness, emotion regulation and broader coping and problem-solving skills (see Guerreiro et al., 2013, Hamza & Willoughby, 2015 for reviews).

### **Longitudinal relationship between NSSI and EI**

Drawing from theories of NSSI explaining its automatic and social reinforcing properties (e.g., Nock & Prinstein, 2004; Chapman et al., 2006; Selby et al., 2008; Franklin et al., 2013), we hypothesized that EI deficits and NSSI would exacerbate each other over time, such that poor EI would increase the appeal and reward of NSSI, and that reliance on NSSI would further deprive an adolescent of the opportunity to bolster coping skills. Contrary to study hypotheses, results did not indicate a reciprocal relationship between NSSI and EI over the course of year. Rather, in a series of nested structural

equation models examining this longitudinal relationship, the addition of bidirectional cross-lag pathways (NSSI  $\rightarrow$  EI and EI  $\rightarrow$  NSSI) failed to improve model fit in any case. In one case, the addition of unidirectional cross-lag paths from EI to NSSI significantly improved model fit, but still did not yield significant parameter estimates for this pathway. In all other cases, the unconditional model, which only included autoregressive pathways (prior levels of each variable predicting future levels of that variable), was the best fit for the data. The lack of a bidirectional relationship was consistent across several analytic approaches: (1) ZINB regressions to account for the skewed and zero-inflated nature of the NSSI frequency counts, (2) logistic regressions with ML estimation, and (3) logistic regressions with Bayesian estimation.

The finding that NSSI and EI were not related to each other over time in this sample is inconsistent with a nascent body of longitudinal NSSI research, which has found that certain EI-related characteristics are related to future NSSI. For example, passive-avoidant problem-solving (McAuliffe et al., 2006), emotional suppression (Andrews et al., 2013), and affective dysregulation (Wilcox et al., 2012) have been associated prospectively with NSSI. Results do, however, echo other researchers' findings that many cross-sectional correlates of NSSI do not prospectively predict NSSI (Glenn & Klonsky, 2011). As in prior longitudinal studies (Glenn and Klonsky, 2011; Janis & Nock, 2008), the only variables in the current study to predict future NSSI were NSSI history (though only in the Bayesian models) and participants' forecast of future NSSI. Also consistent with those prior studies, participants' behavioral forecasts did not improve prediction

beyond NSSI history. It seems, unfortunately, that some adolescents with prior NSSI who predicted no likelihood of future NSSI may have been overly optimistic.

The unconditional models, which provided the best fit for the data, bear further mention. In all of the models, whether using Bayesian or traditional frequentist estimation, the EI autoregressive (i.e., stability) pathways were significant and positive, suggesting that higher levels of EI at one point are associated with higher levels of EI at a subsequent point. This is unsurprising, and suggests that adolescents with adaptive coping skills are able to build on these skills and continue strengthening them over time. In contrast, the NSSI stability pathways differed between the Bayesian and frequentist models. In models with Bayesian estimation, the NSSI stability pathways were significant and positive. In the non-Bayesian models, which used maximum likelihood estimation, the NSSI stability paths were not consistently significant. When they were significant, however, they unexpectedly had negative coefficients, suggesting that higher levels of NSSI at one point were associated with *lower* levels of NSSI at the next point. This may reflect the fact that many participants remained in mental health treatment throughout the study. If these adolescents disclosed their self-injury in therapy, they may then have focused on this behavior in treatment and thus reduced the behavior by the subsequent time point. Though this finding and explanation is plausible, Bayesian estimation addresses some of the barriers that may have limited other analyses, and thus positive NSSI autoregressive paths in the Bayesian models may provide a more accurate reflection of the trajectory of NSSI over time.

### **Understanding non-significant results**

The lack of expected cross-sectional or longitudinal associations between NSSI and EI may stem from several causes. First, it is possible that low power due to a small sample size and very low base rate of NSSI may explain the lack of statistically significant associations. Post-hoc power analyses using the G\*Power 3.1 software (Faul, Erdfelder, Lang & Buchner, 2009), support this assertion: Given the sample size of 91 and  $\alpha = .05$ , the power ( $1 - \beta$ ) to find a significant small effect (.2) in a bivariate correlation is .61, which is smaller than the conventionally recommended minimum power of .8 (Cohen, 1992). Thus we may indeed have made a Type II error in failing to reject the null hypothesis. Notably, G\*Power suggests that a sample of 91 *is* large enough to detect a medium effect (.3) in bivariate correlations, with a calculated power of .91 (since a larger effect is easier to detect). Thus we can interpret the current study's non-significant correlation coefficients to state (with 95% confidence) that even with a larger sample size, we would not have found a medium-sized (or larger) association between NSSI and EI. This is meaningful, and suggests the two variables are indeed not strongly associated in this sample. It is difficult to determine an expected effect size based on past research, given that EI itself has rarely been examined in relation to NSSI. Rather, research has explored related but not identical constructs (e.g., alexithymia, emotion differentiation, emotion regulation, avoidant coping, problem-solving skills, etc.), with a range of effect sizes.

More strikingly, in relation to the cross-lagged autoregressive models, G\*Power indicated that the power to detect an effect in a negative binomial distribution was .23,

and the power to detect an odds ratio of 1.5 in a logistic regression was .39. This suggests that the current study was vastly under-powered to detect longitudinal effects in these regressions. Given the low base rate of NSSI, a small sample size may be especially detrimental in studies of this behavior.

Apart from questions of sample size and statistical power, the lack of hypothesized associations may also stem from limitations inherent in methods used to measure NSSI and EI in the current study. In assessing NSSI, a face-to-face interview (SITBI; Nock et al., 2007) was chosen to allow researchers to detect imminent suicide risk and conduct further risk assessment and safety planning when needed. Participants may, however, may have felt less comfortable disclosing NSSI during an in-person interview than they would have felt on a written self-report measure. Indeed, in a past study (Weismore, 2011) that utilized an NSSI self-report measure (Functional Assessment of Self-Mutilation; FASM; Lloyd, Kelley & Hope, 1997) in addition to the SITBI, participants were more likely to report NSSI on the FASM (16.4%) than on the SITBI (4.3%). This suggests that NSSI may have been under-reported in the current study. Future research should employ a multi-method approach to measuring NSSI.

The measurement of EI also raised several questions. First, rates of EI were highly stable over time in the current study, which suggests either that (a) EI is a relatively static trait or (b) we did not use an adequate tool to measure changes in EI. Regardless of its cause, this limited variability of EI was a barrier to detecting bidirectional effects between NSSI and EI. It is nearly impossible for EI deficits and NSSI levels to exacerbate each other over time if EI does not change. It is somewhat surprising that EI



showed little variability over time. The short form of the Bar-On EQ-i YV is designed for repeat administrations to detect change (MHS, 2013), and it seems reasonable to expect that adolescents in mental health treatment might show these changes. Moreover, training in EI has shown preliminary promise (Mayer et al., 2008), suggesting that EI can fluctuate. Still, it appears that in the current study, EI was more of a trait than a malleable skill.

Another issue may arise from Bar-On's theoretical model of EI. Mayer and colleagues (2008) assert that so-called mixed models of EI (combining single-ability and integrated models) are too diffuse, and are not truly measuring EI. Indeed, though the factor structure of the EQ-i YV(S) has been confirmed in a sample of adolescents (using a Hungarian translation), this was only true after dropping two items each from the intrapersonal and interpersonal scales (Kim et al., 2012). Specifically, on the intrapersonal EI scale, researchers dropped two reverse-coded items ("It is hard to talk about my deep feelings" and "I have trouble telling others about my feelings"), and on the interpersonal EI scale, researchers dropped two items about recognizing others' emotions ("I can tell when one of my close friends is unhappy" and "I know when people are upset, even when they say nothing."). The authors contend that these two interpersonal EI items, though capturing an important aspect of relating to others, seem to cover a different content area than the other four items, which describe empathy and caring about others (e.g., "I feel bad when other people have their feelings hurt."). Given that the current study used the full EQ-i YV(S) without dropping these items, we may have been capturing a less cohesive construct than intended.

Moreover, this self-report measure of EI is capturing *perceived* EI, rather than objective abilities. Future research with performance-based measures of EI (e.g., Mayer-Salovey-Caruso Emotional Intelligence Test; MSCEIT; Mayer, Salovey, Caruso & Sitarenios, 2003) could address this issue. A performance-based measure of EI was not feasible in the current study, which was part of a larger RCT that had an extensive baseline assessment including a full clinical interview and numerous self-report measures. A future study, in which data collection is more focused on EI, however, could utilize multiple methods to assess the construct.

#### **Other limitations and future directions**

Discussion of the study's relatively small sample size deserves elaboration. The sample size was limited by the challenges inherent in recruiting and retaining families who were experiencing high levels of emotional (and often financial) stress. Statistical power was further limited at the 6- and 12-month follow-up points, given attrition of study participants. Attrition rates were similar or better, though, to those cited in other longitudinal studies in similar populations (e.g., Guerry & Prinstein, 2010). Moreover, this was a unique sample in several ways: (1) it is a clinical sample recruited from a range of residential and outpatient settings, (2) it is ethnically, racially and socioeconomically diverse, (3) the gender distribution is relatively balanced, and (4) it includes adolescent and parent data. We utilized Bayesian estimation in one set of analyses in efforts to mitigate limitations stemming from the sample size. Still, future research would be enriched by a larger sample size, perhaps facilitated by a multi-site study.

This study did not assess the functions of NSSI for each participant, which limited the potential conclusions about ties between EI and NSSI. As with the choice of the EQ-i YV(S), the decision to administer the short form of the SITBI (90 items), rather than the full version that also assesses NSSI function, was made with participant burden in mind. Still, given evidence that NSSI serves different functions for different profiles of adolescents (e.g., Hilt et al., 2008; Lloyd-Richardson et al., 2007; Nock & Prinstein, 2005), further exploration of NSSI function as it relates to EI could help illuminate particular coping deficits that contribute to distinct motivations for self-injury.

### **Clinical Implications**

Even without support for primary hypotheses, results can inform NSSI prevention and treatment efforts. The finding that many adolescents report acting on their NSSI thoughts immediately (i.e., after 0 seconds) has strong implications for treatment. Specifically, this result suggests an alarming lack of perceived control over NSSI behavior and highlights the value of teaching adolescents mindfulness strategies to *notice* their NSSI urges before acting, coupled with distress tolerance strategies to “ride out” the urges until they fade. These approaches are key components of dialectical behavior therapy (DBT; Rathus & Miller, 2002), a widely used treatment to target NSSI in adolescents. Also in DBT, adolescents complete a “chain analysis,” or a detailed functional analysis, each time they engage in NSSI (or other maladaptive target behaviors) to identify vulnerability and precipitating factors and to identify more adaptive responses to break this chain in the future. Given previous evidence that in real-time reports, a greater number of adolescents report a longer duration of NSSI thoughts (Nock et al., 2009), there is promise that

adolescents could extend this time even longer – ultimately learning to tolerate the urges until they dissipate – by learning relevant coping skills. Future research might examine whether adolescents report longer durations of NSSI thoughts, which would suggest enhanced mindfulness and distress tolerance, after learning relevant skills.

Findings also have implications for NSSI risk assessment. As in past research (Glenn & Klonsky, 2011; Janis & Nock, 2008), participants' behavioral forecasts did not improve prediction of future NSSI beyond the use of NSSI history. Thus clinicians should rely mostly on NSSI history in assessing the risk of future NSSI behavior. This does not negate the utility of relapse prevention planning with adolescents (i.e., discussion of triggers for repeated NSSI and how to manage them), but rather suggests that the risk of future NSSI may remain higher than adolescents themselves predict.

## **Conclusions**

NSSI is a concerning and harmful behavior in adolescents that causes significant emotional distress and predicts future suicidal behavior. This study aimed to fill an important gap in the literature by exploring the longitudinal (rather than cross-sectional) relationship between multiple facets of emotional intelligence as it relates to adolescent NSSI over the course of one year. This longitudinal analysis built on the known association between several EI-related constructs and NSSI, and allowed for an exploration of directionality. Though results did not suggest an association over time between EI and NSSI, this may be due to low power and/or imperfect measurement of the constructs and behaviors of interest. That said, the study did have sufficient power to detect a medium-sized correlation between EI and NSSI, and yet results did not indicate

such an association. This suggests that EI (at least as defined by Bar-On) may be distinct enough from other aspects of emotion-related coping that it is not meaningful in understanding NSSI. It seems premature, however, to rule out any possible connection at this point, given study limitations that likely affected results. Future research, with a larger sample and potentially a different measure of EI, should continue to explore intra- and interpersonal risk factors that predict NSSI over time.

With a better understanding of the ways in which EI deficits affect, and are affected by, the development of NSSI, clinicians can make targeted treatment decisions in helping youth who self-injure. Understanding of the directionality of these effects could be especially powerful. For example, if we learn that current NSSI affects *future* EI levels – suggesting that increased reliance on NSSI is a risk factor for continued poor coping – this would heighten the importance of prevention programming for youth at risk for NSSI and of early intervention with those who self-injure. The potential to inform treatment is especially important given the current lack of empirically supported treatments for adolescent NSSI (Braush & Girresch, 2012; Washburn et al., 2012) and ongoing efforts to better understand and treat this disconcerting behavior.

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# **EMOTIONAL INTELLIGENCE AS A POTENTIAL MEDIATOR IN THE PATH FROM CHILD MALTREATMENT AND PARENTAL PSYCHOPATHOLOGY TO ADOLESCENT NON-SUICIDAL SELF-INJURY**

## **Introduction**

Non-suicidal self-injury (NSSI) is defined as direct and deliberate self-inflicted bodily harm in the absence of intent to die (Nock, 2010). NSSI has been shown to predict suicidal behavior, even above the impact of prior suicidal behavior (Asarnow et al, 2011; Guan, Fox & Prinstein, 2012), which underscores the importance of research in this area. NSSI peaks in adolescence – with an average onset between 11 and 15 years (Whitlock, 2010) – and declines into adulthood (Zanarini, Frankenburg, Hennen, Reich & Silk, 2005), framing adolescence as a period of heightened risk. Prevalence estimates of adolescent NSSI range from 13 to 46% in community samples (Jacobson & Gould, 2007; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007), and 39 to 68% (Guerry & Prinstein, 2010; Lipschitz, et al. 1999) in clinical samples. Gender differences are inconsistent, though rates are generally higher in females (e.g., Howe-Martin, Murrell, & Guarnaccia, 2012; Ross & Heath, 2002; Whitlock, 2010). NSSI occurs alongside a range of psychiatric diagnoses (e.g., Jacobson, Muehlenkamp, Miller & Turner, 2008), and may merit classification as its own disorder (Glenn & Klonsky, 2013; Selby, Bender, Gordon, Nock & Joiner, 2012). Empirically-supported treatment for adolescent NSSI is scant (Brausch & Girresch, 2012; Washburn et al., 2012), though promising interventions are being delivered and evaluated (e.g., Jacobson & Mufson, 2012; Miller & Smith, 2008;

Rathus & Miller, 2002). Understanding factors that shape the development of NSSI can inform and enhance treatment.

### **Family context as a risk factor for NSSI**

The family environment is critical in the development of NSSI, as it influences adolescents' socioemotional and behavioral functioning, including their use of coping skills. Two important family-related stressors with ties to NSSI are child maltreatment and parental psychopathology.

**Child maltreatment.** Child maltreatment, which includes sexual, physical, and emotional abuse and neglect, is an interpersonal stressor with documented associations to presence and frequency of NSSI (for reviews, see Klonsky & Moyer, 2008; Lang & Sharma-Patel, 2011). Child sexual abuse, in particular, has received frequent attention in the NSSI literature, though findings are inconsistent. One study suggests that sexual abuse, but not physical or psychological abuse, is independently associated with NSSI (Briere & Gil, 1998). Other studies, however, suggest that physical abuse and neglect have the strongest unique relationships with NSSI (Whitlock, Muehlenkamp, & Eckenrode, 2008; Zoroglu et al., 2003), while still others suggest that emotional neglect is the strongest predictor of self-injury (Dubo, Zanarini, Lewis, & Williams, 1997; van der Kolk, Perry & Herman, 1991). A longitudinal study suggested that child sexual abuse predicted recurrent self-injury, while physical abuse predicted intermittent self-injury (Yates, Carlson, & Egeland, 2008). Overall, the observed associations between abuse and NSSI are complex and merit further study (Muehlenkamp, Kerr, Bradley, Larsen 2010).

**Parental psychopathology.** Adolescents whose parents struggle with mental illness, and with depression in particular, are also vulnerable to NSSI. Parental psychopathology is a well-established risk factor for a range of adolescent mental health problems (e.g., Biederman et al., 2001; Cummings, Keller & Davies, 2005; Goodman & Gotlib, 1999; Hammen & Brennan, 2003; Lewinsohn, Olin & Klein, 2005). Parental depression, especially, increases adolescents' vulnerability to both internalizing and externalizing disorders (Goodman et al., 2011), contributing to earlier onset of mood disorders (Weissman et al., 1987) and wide-ranging impairment in adolescence (Weissman, Warner, Wickramaratne, Moreau & Olfson, 1997) and into adulthood (Weissman, et al., 2006). Children of depressed parents are also at increased risk for suicidal behavior (King, Kerr, Passarelli, Foster & Merchant, 2010), particularly if a parent completed or attempted suicide (Christiansen, Goldney, Beautrais, & Agerbo, 2011). Though part of this association is genetic, parenting behaviors also play a role (e.g., Eley et al., 2004).

A handful of studies have explored the relation between parents' and children's mental health with NSSI as a specific outcome, though the associations are inconsistent. For example, maternal depression has prospectively predicted adolescent NSSI in some studies (Hankin & Abela, 2011; Wilcox et al., 2012), but not in others (Deliberto & Nock, 2008; Esposito-Smythers et al., 2010). A family history of impulsivity-related disorders may pose a particular risk for the development of NSSI, as suggested by a study in which adolescents who engaged in NSSI had a higher family history of substance abuse, violence and suicidal ideation (Deliberto & Nock, 2008). This association may stem partly from the genetic transmission of impulsivity and self-regulatory capacity

(Eisenberg Spinrad, Eggum, 2010), but may also arise because parents with impaired impulse-control skills are less able to impart adaptive emotion regulation tactics to their children (Deliberto & Nock, 2008). Relatedly, genetically predisposed teens are most likely to self-injure if their family environment is high in negativity and conflict (Crowell et al., 2008).

### **Emotional intelligence as a potential mediator in the association of family context and NSSI**

As is evident, the observed relationships between family context and NSSI are inconsistent. Moreover, the nature of the pathway from child maltreatment and/or parental psychopathology to NSSI is unclear. Emotional intelligence (EI), or a person's ability to perceive, use, understand and manage emotions (Mayer, Salovey, Caruso, & Sitarenios, 2003; Salovey & Mayer, 1990), may mediate this trajectory. In particular, four areas of EI may be impaired: (1) *stress management*, or emotion regulation, (2) *intrapersonal* skills such as emotional awareness and expression, (3) *interpersonal* skills, or relational competence (i.e., the capacity to care about, understand, and relate to others), and (4) *adaptability*, or problem-solving competence and confidence (i.e., flexible and effective problem-solving) (Bar-On, 1997). Child maltreatment and parental psychopathology may help shape adolescents' social-emotional competence across these areas, which in turn, may influence the degree to which adolescents develop maladaptive coping strategies such as NSSI. Below, literature that supports a relation between family context (child maltreatment, parental mental health), EI, and NSSI is reviewed.

**Child maltreatment, EI, and NSSI.** Some authors have posited that emotion regulation may be a mediator in the abuse-NSSI pathway, given associations between emotion regulation and both abuse and NSSI (Muehlenkamp et al., 2010). This is consistent with a developmental psychopathology model that frames NSSI as an adaptation to childhood trauma (Yates, 2004; 2009). Specifically, this model posits that child maltreatment disrupts the adaptive development of self-regulatory skills, including those related to managing emotions, forming social connections, and trusting one's own abilities, and that self-injury develops as a compensatory regulatory strategy. Yates (2009) described three primary developmental pathways that are shaped by early caretaking exchanges, and thus are disturbed by the experience of abuse: regulatory, representational/interpersonal, and reactive. In reviewing the literature, Lang and Sharma-Patel (2011) posited that the regulatory pathway is the most critical to NSSI, given that affect regulation is the most common function of NSSI. They write that child maltreatment may leave youth with “high affect regulation and interpersonal needs, and simultaneously undermine development of healthy skills for satisfying those needs” (Lang & Sharma-Patel, 2011, p. 29).

In line with this theoretical model, the experience of abuse has been shown to affect a range of EI-related coping deficits, which in turn have been associated with the development of NSSI. For example, maltreated children have been shown to have a poor understanding of negative emotions (e.g., Shipman, Zeman, Penza, & Champion, 2000). Similarly in a clinical adult sample, self-injurers with an abuse history, relative to controls, showed impairments in tolerating emotions (Deiter, Nicholls & Pearlman,

2000). EI-related factors have been directly examined as mediators of the abuse-NSSI pathway, with some evidence for mediation via alexithymia, or difficulty identifying and expressing emotions (Paivio & McCullough, 2004; Swannell et al. 2012), dissociation (Gratz, Conrad & Roemer, 2002; Rallis, Deming, Glenn, & Nock, 2012; Rodriguez-Srednicki, 2002; Swannell et al., 2012; Yates et al., 2008), self-criticism (Glassman, Glassman, Weierich, Hooley, Deliberto, & Nock, 2007), and self-blame (Swannell et al., 2012). One research group (Muehlenkamp et al., 2010) explored the potential for unique paths from different abuse types to NSSI, and found that self-injuring college students reported poorer emotion regulation skills, compared to non-self-injurers, if they had a history of physical abuse or of both physical and sexual abuse, but not of sexual abuse alone.

In each case, the authors hypothesize that child maltreatment impedes the emotional socialization process, consistent with theoretical models of trauma-induced deficits in adaptive development (Yates 2004, 2009; Lang & Sharma-Patel, 2011). For example, emotional abuse could lead to a tendency to internalize self-directed criticism and, in turn, use NSSI as a form of self-punishment in the face of stressful events (Glassman et al., 2007). Notably, nearly all of this research is cross-sectional, limiting causal inferences (Klonsky & Moyer, 2008). Further longitudinal research can help clarify gaps in the EI profile of adolescents who have experienced maltreatment, especially in relation to the trajectory of NSSI over time.

**Parental psychopathology, EI, and NSSI.** Parental psychopathology, too, has documented associations to emotion-regulation deficits that, in turn, incur risk for NSSI.

Parents in frequent psychological distress are often less able to offer emotional support or teach effective ways of understanding, expressing or managing emotions, thus hindering their children's EI growth. Adolescents with stunted EI may then be more likely to use NSSI to cope with distress.

There is evidence that pivotal emotion-related parenting behaviors – which affect a child's own emotional competence – are impaired in parent-child dyads with a depressed parent. First, depression can interfere with a parent's ability to respond attentively to a child's emotional needs. Sensitive and supportive parental responses to children's emotions are associated with stronger self-regulatory capacities in children and adolescents (Eisenberg et al., 2010); in turn, deficits in this responsiveness are associated with regulatory deficits in children. Parents with depression, who are less warm and consistent in reactions to their children's affect (e.g., Field, Healy, Goldstein, & Guthertz, 1990; Goodman & Gotlib, 1999), may send confusing or damaging messages about emotions. Second, depressed parents often show deficits in their own emotion regulation skills (Gross & Muñoz, 1995; Valiente et al., 2006), thus limiting their ability to model, teach or reinforce adaptive strategies. Parents who display a wide range of emotions and emotion-regulation approaches impart information about the utility of these reactions across settings (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997). Depressed parents, meanwhile, may model or teach more restricted and less effective responses, thus limiting their children's still-developing repertoire of EI strategies.

Empirical research supports the disruption of emotion-regulation socialization in offspring of depressed parents. Children of depressed mothers, and especially daughters,

exhibit a more passive and less effective style of regulating emotions than do children of non-depressed mothers (Garber, Braafladt, & Zeman, 1991; Silk, Shaw, Skuban, Oland & Kovacs, 2006). This emotion regulation style may, in turn, place children at risk for resorting to NSSI in an effort to cope.

No research has examined this underdeveloped emotional competence in relation to NSSI in particular. One relevant study, however, explored the route to NSSI from a behavior that can surface in depressed parents: expressed emotion (EE) (Wedig & Nock, 2007). In this community adolescent sample, EE – a critical, hostile, and emotionally over-involved communication style – was associated with adolescent NSSI. Self-criticism moderated this relationship, suggesting that harsh parenting exerts the strongest influence on the development of NSSI in teens who are harshest with themselves. Since adolescents with poor EI may criticize the intense emotions they feel, this study also suggests a mediating role of EI in the path from parenting behaviors to NSSI.

Importantly, most research on the role of parental depression in the socialization of emotion regulation has focused on young children, leaving questions about how this process changes as children grow older (Morris, Silk, Steinberg, Myers & Robinson 2007). In comparison to younger children, whose parents might directly intervene in moments of emotional distress, adolescents are more independent and also more likely to look to their peers as guides (Zeman & Shipman, 1997). Still, they continue to refer to parental cues and internalized messages from earlier childhood (Morris et al., 2007), and may feel lost if these messages are harsh or unclear.



**Low EI as a risk factor for NSSI.** As explained above, the experience of being maltreated or cared for by a depressed parent can thwart the development of an adolescent's emotional competence and adaptive coping (i.e., emotional intelligence), which in turn, may increase risk for NSSI. In addition to this association of EI and NSSI in the context of family stressors, ample empirical evidence supports the association between EI and NSSI in more general samples. In regard to emotion regulation (i.e., stress management EI), substantial evidence indicates that individuals who engage in NSSI experience intense emotional reactions and struggle to regulate them (e.g., Adrian, Zeman, Erdley, Lisa & Sim, 2011; Gratz & Roemer, 2008; Jenkins & Schmitz, 2012). Relatedly for emotional awareness (i.e., intrapersonal EI), there is evidence that individuals who self-injure have difficulty describing and expressing emotions (e.g., Bresin, 2014; Bocquee et al., 2012; Woods, 2012, Zaki, Coifman, Rafaeli, Berenson, & Downey, 2013) and that they use NSSI to avoid or escape overwhelming emotions (e.g., Evans, Hawton & Rodham, 2005; Hamza & Willoughby, 2015; Howe-Martin, Murrell, & Guarnaccia, 2012; Williams & Hasking, 2010). In regard to relational competence (i.e., interpersonal EI), NSSI is associated with poor social skills, strained relationships, low perceived social support, and discomfort seeking advice from others (e.g., Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010; Heath, Ross, Toste, Charlebois, & Nedecheva, 2009; Muehlenkamp, Brausch, Quigley, & Whitlock, 2013; Nock, 2008). Lastly, problem-solving competence and confidence (i.e., adaptability EI) is associated with NSSI in studies showing poor problem-solving self-efficacy (Nock & Mendes, 2008), lack of perceived control over problems (Haines & Williams, 1997), and an

overall lack of problem-focused coping (Guerreiro et al., 2013). Taken together, this research supports a view of NSSI as a maladaptive coping skill used in the absence of more effective strategies.

### **The Present Study**

EI is a construct that captures several coping skills that are relevant to NSSI, and is likely to be lower in adolescents whose social learning has been compromised in the face of child maltreatment or parental psychopathology. These adolescents with lower EI may, in turn, be more likely to use NSSI as a maladaptive avoidant coping strategy to manage emotional distress (e.g., Chapman, Gratz, & Brown, 2006), particularly that fostered by an invalidating environment. The present study examines the potential mediating role of four domains of EI in the pathway from family-related risk factors to NSSI over one year.

**Hypothesis 1.** Child maltreatment (overall, and each type) will be associated with higher likelihood and frequency of NSSI at baseline (BL), 6-month follow-up (T2) and 12-month follow-up (T3)

**Hypothesis 2.** Parental depression and overall psychopathology will each be associated with higher likelihood and frequency of NSSI at BL, T2, and T3.

**Hypothesis 3.** EI will mediate the influence of two family stressors on NSSI, such that:

Adolescents reporting higher levels of child maltreatment at BL will have lower EI levels (global EI, emotion regulation, emotional awareness/expression, relational competence, problem-solving competence and confidence) at T2, and will report higher NSSI likelihood and frequency at T3.

Adolescents whose parents have higher levels of depression and overall psychopathology at BL will have lower EI levels (global EI, emotion regulation, emotional awareness/expression, relational competence, problem-solving competence and confidence) at T2, and will report higher NSSI likelihood and frequency at T3.

## **Method**

### **Participants**

Participants were 91 adolescents, ages 13-18, and their parents, all of whom participated in a broader study evaluating a prevention program for suicide, substance abuse and HIV (Project SHAPE). Of these, 10 adolescent-parent dyads participated in a pilot trial, and 81 dyads participated in a randomized controlled trial (RCT). In the RCT, dyads were randomly assigned to the prevention workshop or to a wait-list control condition. The intervention consisted of a 12-hour prevention workshop and a 2-hour booster session. Across both arms, the adolescents were receiving community-based mental health treatment at the time of referral. Inclusion criteria for the study were as follows: 1) adolescent enrollment in mental health treatment at the time of referral; 2) parent and adolescent proficiency in English; and 3) parent and adolescent residing in the same home. Exclusion criteria included: 1) a diagnosis of drug or alcohol dependence, 2) current enrollment in a drug or alcohol treatment program; 3) HIV infection; 4) pregnancy; or 5) adolescent cognitive level that would prohibit understanding of study material.

The adolescent sample was 61.8 percent female, ranging in age from 13 to 18 (mean = 15.5 years, SD = 1.4). The sample was racially (46.1% Caucasian, 34.8% African-

American, and 18.0% “Mixed race/Other”) and ethnically (80.1% non-Hispanic, 16.9% Hispanic, 2% not indicated) diverse. Parents/guardians ranged in age from 32 to 75 (mean = 44.4 years, SD = 8.2). There was a wide range in family income, with 18% of families reporting incomes of \$30,000 or lower, 35% reporting incomes between \$30,000 and \$70,000, and 44% reporting incomes over \$70,000. (3% of families did not report their income).

### **Procedure**

As noted, all adolescent participants were receiving mental health services in the community at the time of referral. Participants were recruited from five community mental health centers in Northern Virginia (27%), one youth shelter (43%), a private practice (10%), high school counselors (2%), a juvenile court (5%), as well as advertisements posted in local newspapers, on Craigslist, and on a university-based email list (10%). (Recruitment sources were not indicated for the remaining 3% of participants). Parents and adolescents interested in participating in Project SHAPE provided their contact information to a counselor at the recruitment facility or contacted the research team directly based on information provided in the study advertisements or brochure. The project director (a PhD-level researcher) or a graduate-level research assistant screened parent and teen separately for eligibility via phone or in-person and further explained the study. Potential participants were informed that the study would consist of four assessments: baseline, one month, six months, and twelve months post-baseline. They were also told that their involvement would also consist of either a one-and-a half-day group workshop if they were randomized to the treatment group, or the provision of

reading materials on substance use, HIV/STDs, and suicide if they were randomized to the wait-list control group. Parent and adolescent were also informed that they would each receive between \$25 and \$75 at each of the four assessments. If eligibility criteria were met, an appointment was made for the baseline assessment, at which time, consent and adolescent assent was obtained. The self-report measures used for the proposed study were completed via a computer questionnaire, while interview measures were administered by a graduate-level research assistant. Participants were randomized into workshop or waitlist-control at the completion of their baseline assessment.

(Participants in the waitlist group were invited to participate in a prevention workshop at the completion of the 1-year assessment period.) Randomization groups were matched for gender, suicide status (history of suicide attempt vs. no history) and racial minority status (Caucasian vs. non-Caucasian).

The current study used data obtained at baseline, at 6-month follow-up, and at 12-month follow-up (BL, T2, and T3, respectively). BL data provided demographic information, as well as adolescents' self-reported EI, NSSI-related thoughts and behaviors, and history of child maltreatment. At BL, parents also completed a measure of their own mental health. The BL assessment also included a diagnostic interview to determine whether adolescents met criteria for many internalizing and externalizing disorders. The longitudinal design allowed for examination of EI in the path from family-related stressors to NSSI over the course of one year.

## Measures

**Non-suicidal self-injury** was assessed via the NSSI section of the short form of the Self-Injurious Thoughts and Behaviors Interview (SITBI-SF; Nock, Holmberg, Photos & Michel, 2007). The SITBI-SF is a 90-item structured clinician-administered interview that assesses the presence, frequency, and characteristics of lifetime and recent self-injurious thoughts and behaviors in five domains: suicidal ideation, suicide plans, suicide gestures, suicide attempts, and non-suicidal self-injury. The NSSI section is further divided into thoughts about NSSI (i.e., urges to self-injure) and actual self-injury. Each module begins with a screening item that assesses the presence of that thought or behavior. The NSSI thought module includes questions about severity (“On the scale of 0 to 4, at the worst point, how intense were your thoughts of purposely hurting yourself?” and “On average, how intense were the thoughts?”), and duration of thoughts. The NSSI behavior module begins with the screening question, “Have you ever actually purposely hurt yourself without wanting to die?” If the adolescent answers affirmatively to the screening item, the interviewer further assesses the frequency (number of times in life, and in past year, month, and week), age of first and most recent incidents. Participants who endorse NSSI also name the method(s) they used (from a list of 12 common types, with the option to add ‘other’). The SITBI also assesses participants’ estimates of likelihood of future such thoughts and behaviors (“On a scale of 0 to 4, what do you think the likelihood is that you will purposely hurt yourself without wanting to die in the future?”). At BL, the screening items assessed *lifetime* and past-year presence or absence

of thoughts or behaviors; at T2 and T3, the wording was changed to refer to “the last six months.”

The SITBI has demonstrated strong interrater reliability (average  $\kappa = .99$ ,  $r = 1.0$ ) and test-retest reliability (average  $\kappa = .70$ , intraclass correlation coefficient = .44) over a 6-month period in a sample of adolescents and young adults. The SITBI, and the NSSI subscale in particular, has also demonstrated concurrent validity, as evidenced by strong correspondence between the SITBI and other measures of NSSI (average  $\kappa = .87$ ) (Nock et al., 2007).

**Emotional intelligence** was assessed via the Bar-On Emotional Quotient Inventory: Youth Version (Short) (EQ-i:YV(S); Bar-On, 1997). This 30-item self-report measure assesses intra- and interpersonal coping and stress management skills. It employs a 4-point Likert scale and provides a total EI score and scores in four domains: Stress management or emotion regulation (e.g., “When I get angry, I act without thinking”), Intrapersonal or emotional awareness/expression (e.g., “I can easily describe my feelings”), Interpersonal or relational competence (e.g., “I can tell when one of my close friends is unhappy”), and Adaptability or problem-solving competence and confidence (e.g., “I can easily use other ways of solving problems”). The EQ-i:YV(S) was normed on 10,000 youth and has demonstrated strong psychometric properties with adolescents. Bar-On and Parker (2000) report 3-week test-retest subscale reliabilities ranging from .81 to .88. The longer 60-item youth version of the EQ-i has demonstrated convergent validity (correlations with adult emotional intelligence, personality, internalizing and externalizing problems), discriminant validity (distinguishes between gifted and non-

gifted students) and predictive validity (predicts problem gambling and academic achievement in adolescence) (Humphrey et al., 2011). Predictive validity of the EQ-i has been tested in studies examining its association with performance in social, work- and school-related interactions, as well as its impact on physical and psychological health (Bar-On, 2006). Across these studies, the average predictive validity coefficient is .57, suggesting that the EQ-i does indeed predict relevant aspects of social and emotional functioning (Bar-On, 2006).

In the current sample, internal consistency on the EQ-i:YV(S) was good, as indicated by Cronbach's  $\alpha$  of .81, .85, and .86 for the total measure at 0, 6, and 12 months, respectively. Internal consistency was also high for each of the four subscales at all three time points, with Cronbach's  $\alpha$  ranging from .75 to .89. Among the subscales, interpersonal EI had the lowest, albeit still acceptable, internal consistency (Cronbach's  $\alpha$  = .75 to .79 across time points).

**Child maltreatment** was assessed (at BL only) by the Childhood Trauma Questionnaire (CTQ), a 28-item self-report measure of a teen's history of physical, sexual and emotional abuse, as well as physical and emotional neglect (Bernstein et al., 2003). The measure provides a subscale score for each domain as well as an overall maltreatment score. Items begin with the stem, "When I was growing up," and are followed by statements describing maltreatment of each type. *Physical abuse* refers to bodily assaults on a child by an older person that cause injury, or pose a risk of injury (e.g., "People in my family hit me so hard that it left me with bruises or marks"). *Sexual abuse* refers to any sexual contact between a child and an older person, including direct



coercion (e.g., “Someone tried to touch me in a sexual way, or tried to make me touch them”). *Emotional abuse* refers to humiliating, threatening, or demeaning verbal assaults on a child (e.g., “I thought that my parents wished I had never been born”). *Physical neglect* refers to the failure to provide basic physical needs, such as food, shelter, or safety (e.g., “My parents were too drunk or high to take care of my family”). *Emotional neglect* refers to the failure of caregivers to provide basic psychological and emotional needs (e.g., reverse-coded: “There was someone in my family who helped me feel that I was important and special”). Items are rated on a 5-point scale (‘never true’ to ‘very often true’). Strong internal consistency ( $\alpha = .89$ ) and sufficient test-retest reliabilities ( $r = .80$  over 3.6 months) have been demonstrated (Bernstein & Fink, 1998). In the current sample, the CTQ demonstrated good to excellent internal consistency, both for the full measure (Cronbach’s  $\alpha = .84$ ), and for each subscale (Emotional Abuse,  $\alpha = .80$ ; Physical Abuse,  $\alpha = .73$ ; Sexual Abuse,  $\alpha = .95$ ; Emotional Neglect,  $\alpha = .91$ ; Physical Neglect,  $\alpha = .71$ ).

**Parental psychopathology** was assessed (at BL only) with the Brief Symptom Inventory (BSI; Derogatis, 1993), and in particular with the Global Severity Index (GSI) and the Depression subscale. The BSI is a 53-item self-report measure assessing the presence and severity of a range of psychiatric symptoms. The 6-item depression subscale assesses depressive symptom severity over the last week using a 5-point Likert scale (‘not at all’ to ‘extremely’); the composite GSI provides an indication of overall psychopathology. The BSI has strong psychometric properties, including acceptable internal consistency ( $\alpha$  for subscales range from .71 to .85; Derogatis, 1993). In the

current sample, internal consistency on the BSI was very high for the GSI ( $\alpha = .98$ ) and the Depression subscale ( $\alpha = .88$ ).

**Demographic Variables** were assessed via parent and adolescent self-reports during the baseline assessment. Demographic data collected included gender, age, and race, ethnicity, and annual family income, among other variables.

### **Data Analysis Plan**

Structural equation modeling was used to analyze data. SEM was useful for the present study because it is a flexible approach that allows a given variable to be modeled with multiple simultaneous associations (Curby, Rimm-Kaufman, Abry, 2013). SEM also can account for missing data, in this case, by using Full-Information Maximum Likelihood, which uses all data available at each time point to account for missing data (Allison, 2003). We estimated all path analysis models with Mplus version 6.12 (Muthén & Muthén, 1998-2010). Preliminary analyses, including examination of demographic differences in outcomes and correlations between variables, were conducted in SPSS Statistics 19.0 (IBM Corp., 2010).

First, zero-order correlations were used to explore the associations between child maltreatment (overall, and each subtype) and NSSI outcomes at each time point (Hypothesis 1), as well as those between parental psychopathology (Depression and GSI) and NSSI outcomes at each time point (Hypothesis 2).

The focus of this study was to examine whether EI mediated the relation between these family-related risk factors and change in NSSI over one year (Hypothesis 3). As an initial step, following common procedures (e.g., Baron & Kenny, 1986; Nesbitt, Farran,

& Fuhs, 2015), we estimated the direct effects of each family-related predictor on NSSI likelihood and frequency at T3, controlling for the equivalent BL NSSI outcome and for treatment condition. Then, for relations in which this direct effect (Path c) was significant, we estimated direct and indirect effects, with T2 EI as mediator, to residualized T3 NSSI (controlling for BL NSSI) through path analysis in Mplus. Specifically, these models estimated the direct effect from BL reports of child maltreatment and parental psychopathology to T3 NSSI (Path c'), as well as the direct effects from these family-related independent variables to the mediator of EI (Path a), and the effects from the mediator of EI to T3 NSSI (Path b). All analyses controlled for treatment condition.

Given the sample size of 91, the standard errors may not have been stable enough to provide reasonable tests of mediation. Thus bootstrapping (1,000 draws) was used to obtain bootstrap standard errors for indirect effects. The final reported estimate was the midpoint of the ordered samples. Mplus also provided 95% bootstrap confidence intervals for the model parameter estimates. Bayesian estimation was also considered, given that statistical power is not determined directly by sample size using Bayesian estimation. It is not possible, however, to use Bayesian estimation for bootstrapped indirect models in Mplus.

We intended to run all mediation models twice in order to explore pathways to two different NSSI-related outcomes at T3: (1) NSSI presence, and (2) NSSI frequency (the number of reported NSSI incidents). The distribution of NSSI frequency scores was highly non-normal, characterized by a high frequency of zeros and strong positive skew.

These distributions are typical for low base-rate behaviors, especially in adolescents (e.g., NSSI, substance use, sexual activity), in which a sizable portion of the population has never engaged in the behavior (Atkins, Baldwin, Zheng, Gallop & Neighbors, 2013; Karazsia & van Dulmen, 2008). The best fit would be zero-inflated negative binomial (ZINB) regressions, which are designed for count variables with distributions of this nature (Atkins et al., 2013). Unfortunately, however, Mplus does not allow for estimation of indirect effects with count variables, and thus NSSI frequency was modeled as a typical continuous variable (with maximum likelihood estimation).

Analyses controlled for treatment condition (workshop vs. waitlist control), but did not control for gender, psychiatric diagnosis, age, race, ethnicity, family income, nor study cohort, given results of Chi-square tests and nonparametric tests (Mann-Whitney U and Kruskal-Wallis) indicating no group differences in reported NSSI presence or frequency at T3.

## **Results**

### **Frequency of child maltreatment and parental psychopathology**

Table 2.1 presents frequencies of elevations on the CTQ and the BSI. In order to capture cases with even a low severity of childhood trauma, this table uses cut-off scores indicating at least “low to moderate” exposure to each type of maltreatment, as has been done in other studies using the CTQ (e.g., Tietjen et al., 2010) (sexual abuse  $\geq 6$ ; emotional abuse  $\geq 9$ ; emotional neglect  $\geq 10$ ; physical abuse  $\geq 8$ ; physical neglect  $\geq 8$ ). For the BSI, clinical levels were indicated by standard cutoff raw scores of 1.11 on the depression scale and .70 on the GSI (Derogatis, 1977; Klaassens et al., 2009). A majority

of participants reported levels at or above these thresholds for emotional abuse (59.3% overall; 74.5% of girls; 35.3% of boys) and emotional neglect (50.5% overall; 56.4% of girls; 38.2% of boys). Sexual abuse was reported least often among abuse types, but a sizable minority of participants still reported levels of sexual abuse at or above the threshold of concern (35.3% of the overall sample; 32.7% of girls; 14.7% of boys). As for parental psychopathology, about one-fifth of parents (22.0%) reported clinical elevations in global symptom severity, and 16.5% reported clinically elevated depressive symptoms.

Table 2.1. Frequency of Child Maltreatment and Parental Psychopathology

	Frequency (Percent of non-missing)		
	Female	Male	Full Sample
Child maltreatment: “low to moderate” or higher	N = 55	N = 34	N = 91 <sup>a</sup>
Sexual Abuse ( $\geq 6$ )	18 (32.7)	5 (14.7)	23 (25.3)
Emotional Abuse ( $\geq 9$ )	41 (74.5)	12 (35.3)	54 (59.3)
Emotional Neglect ( $\geq 10$ )	31 (56.4)	13 (38.2)	46 (50.5)
Physical Abuse ( $\geq 8$ )	26 (47.3)	13 (38.2)	39 (42.9)
Physical Neglect ( $\geq 8$ )	17 (30.9)	12 (35.3)	31 (34.1)
Parental psychopathology: clinical level			
Depression (raw score $> 1.11$ )	7 (12.7)	6 (17.6)	15 (16.5)
Global Severity Index (raw score $> .70$ )	11 (20.0)	7 (20.6)	20 (22.0)

### **Associations between family-related stressors and NSSI**

Table 2.2 presents descriptive statistics and zero-order correlations for relevant study variables. These results provide partial support for Hypotheses 1 and 2, which posit significant positive associations between family-related stressors and NSSI.

Table 2.2. Descriptive Statistics and Intercorrelations Among Variables of Interest

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>N</i>	89	91	91	91	91	91	91	91	91	91	91	66	64	63	63	63	63	63	64	56
<i>M</i>	.38	.25	1.74	51.29	6.71	10.17	11.00	8.24	7.04	.51	.49	.15	.72	80.17	14.84	18.92	16.73	17.17	.16	3.71
<i>SD</i>	.49	.49	6.36	13.39	4.47	4.54	5.59	3.54	3.11	.73	.62	.36	2.56	12.38	4.66	3.62	4.15	4.01	.37	14.07
<i>BL (Baseline)</i>																				
1. Gender (1=Male)	--	-.20	-.01	-.26*	-.26*	-.34**	-.17	-.04	-.08	.19	.14	-.33**	-.21	-.03	.07	-.27*	.29*	-.15	-.08	.10
2. Any past-year NSSI		--	.46**	.17	.19	.23*	.15	-.13	.11	-.06	-.12	.25*	.05	-.01	-.19	.07	.19	-.07	.15	.29*
3. Past-year NSSI freq.			--	.12	.01	.17	.12	.05	.06	.14	.11	.21	.07	-.02	-.11	.01	.06	-.03	.48**	.75**
4. Total CM				--	.61**	.78**	.74**	.62**	.70**	.03	.04	.31*	.37**	-.24	-.18	-.13	-.07	-.31*	.16	.10
5. Sexual abuse					--	.37**	.18	.21*	.20	-.09	-.06	.31*	.10	-.11	-.08	.01	-.02	-.18	-.03	-.09
6. Emotional abuse						--	.51**	.54**	.42**	.00	-.01	.27*	.32*	-.01	-.06	.19	-.15	-.01	.23	.16
7. Emotional neglect							--	.30**	.66**	.03	.05	.21	.24	-.30*	-.19	-.32*	.06	.37**	.27*	.08
8. Physical abuse								--	.26*	.01	.04	.05	.25*	-.06	.01	.08	-.13	-.13	.11	.15
9. Physical neglect									--	.07	.07	.31*	.54**	-.27*	-.23	-.26*	-.05	-.27*	.12	.03
10. Parent depression										--	.93**	-.09	-.07	-.07	-.15	-.17	.05	-.10	.04	.25
11. Parent GSI											--	-.10	-.09	-.06	-.15	-.15	.06	-.05	.03	.29*
<i>T2 (6 months)</i>																				
12. Any NSSI since BL												--	.66**	-.13	-.13	.14	-.26*	-.05	.28*	-.10
13. NSSI freq. since BL													--	-.19	-.22	.06	-.26*	-.04	.43**	-.06
14. Total EI														--	.73**	.66**	.42**	.79**	-.14	-.02
15. Intrapersonal EI															--	.32*	.11	.48**	-.10	.01
16. Interpersonal EI																--	-.05	.61**	.11	.01
17. Stress Man. EI																	--	.05	-.27*	-.02
18. Adaptability EI																		--	-.05	-.10
<i>T3 (12 months)</i>																				
19. Any NSSI since T2																			--	.57**
20. NSSI freq. since T2																				--

Note. \*  $p < .05$ , \*\*  $p < .01$

**Child maltreatment (Hypothesis 1).** As shown in Table 2.2, at BL, only one type of child maltreatment (emotional abuse) was significantly and positively associated with NSSI. Associations at T2 were more robust: Several types of maltreatment (sexual abuse, emotional abuse, physical abuse, physical neglect) as well as overall maltreatment, were significantly and positively associated with NSSI likelihood or frequency. At T3, only emotional neglect was significantly and positively associated with an NSSI outcome.

**Parental psychopathology (Hypothesis 2).** As shown in Table 2.2, parental depression and overall psychopathology showed no significant associations with NSSI at BL or T2. At T3, parents' Global Severity Index had a positive and significant association with NSSI frequency. This lack of consistent associations suggests that adolescent NSSI has a relatively weaker association to parental psychopathology than it does to child maltreatment.

### **Mediation models**

Direct and indirect effects were estimated to examine the hypothesized role of EI as a mediator in the pathway from family-related risk factors to NSSI (Hypothesis 3). As outlined above, mediation was only examined for pathways in which a significant direct effect existed.

**Child maltreatment (Hypothesis 3a).** Preliminary analyses indicated that the direct effect of child maltreatment (tested separately for total maltreatment and each type) on residualized T3 NSSI (Path c) was significant in only one case, which was when estimating the relation between emotional neglect (EN) and NSSI likelihood ( $\beta = .389$ ,  $p$

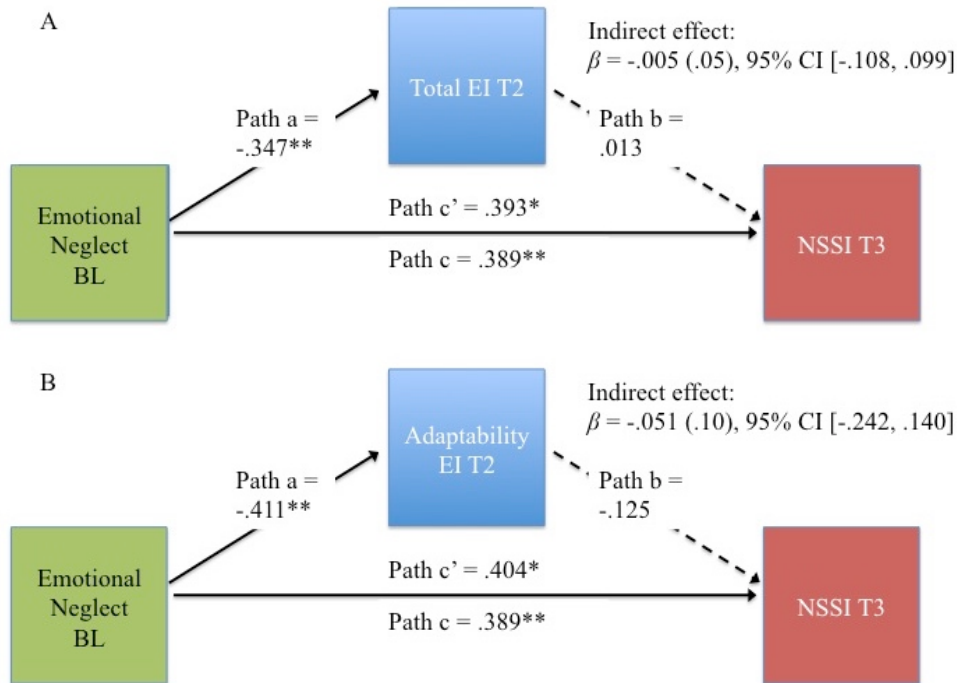
< .01). The direct effects from overall child maltreatment to T3 residualized NSSI likelihood or frequency were not statistically significant, nor were the direct effects from other types of maltreatment to T3 residualized NSSI likelihood or frequency. Given the relative scarcity of direct effects, we also estimated these direct effects without controlling for BL NSSI, i.e., estimating absolute levels of T3 NSSI likelihood and frequency rather than residualized T3 NSSI. In these analyses, too, only the direct effect from EN to NSSI likelihood was significant. Thus future analyses controlled for BL NSSI.

Given this single direct effect, the mediating role of EI was only examined for the relation between EN and residualized NSSI likelihood. We ran five separate models to evaluate the potential mediating role of global EI and of each facet of EI (stress management, intrapersonal, interpersonal, and adaptability). Results, shown in Figure 3, did not support mediation (Hypothesis 3a). Consistent with hypotheses, adolescents reporting higher levels of EN at BL reported significantly lower levels of total EI at T2 (Figure 3A; Path a) and T2 adaptability EI (Figure 3B; Path a). This relationship showed a trend toward statistical significance for T2 Intrapersonal EI (Figure 3C, Path a), and was not significant for T2 stress management EI (Figure 3D) or T2 interpersonal EI (Figure 3E). Adolescents with lower levels of Total EI or adaptability EI at T2 did not, however, report higher levels of residualized NSSI at T3 (Figure 3A and 3B, respectively; Path b). Moreover, the estimates of indirect effects (i.e., the change in NSSI for every unit change in EN that is mediated by EI) were not statistically significant in either case. Thus mediation was not supported. These results suggest that adolescents



reporting higher levels of emotional neglect do report lower subsequent levels of overall emotional intelligence (Total EI) and problem-solving flexibility (Adaptability EI), but that these EI deficits are not in turn significantly associated with future NSSI.

Notably, Path b (EI → NSSI) was statistically significant in the case of stress management EI (Figure 3D), suggesting that adolescents with lower levels of stress management EI at T2 were more likely to report NSSI at T3. Though this finding is consistent with overall study hypotheses that low EI is a risk factor for NSSI, it also does not suggest mediation, given that the preceding pathway (EN→EI) was not significant in this model, nor was the indirect effect.



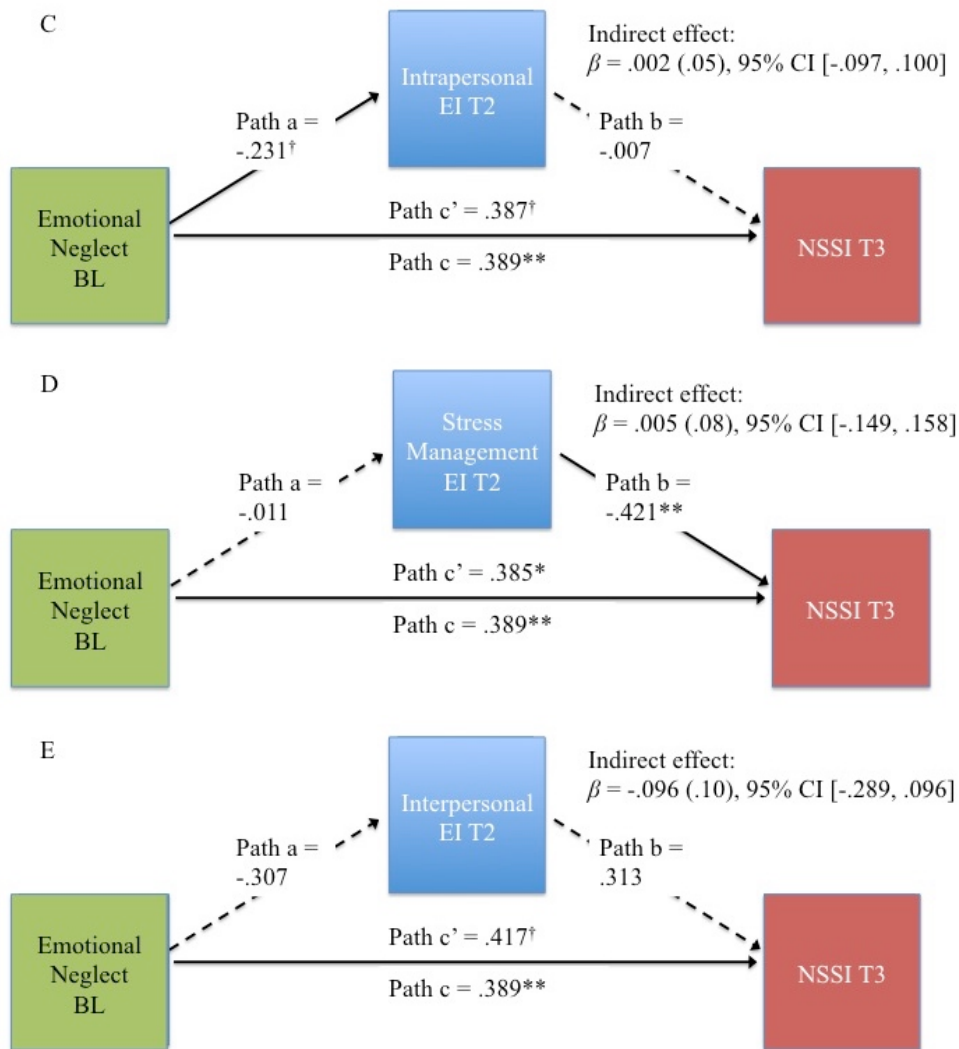


Figure 3. Testing Emotional Intelligence as a Potential Mediator

Path analysis of direct effects among adolescents' reports of Emotional Neglect, (A) Total EI, (B) Adaptability EI, (C) Intrapersonal EI, (D) Stress Management EI, (E) Interpersonal EI, and NSSI change over 12 months. For simplification, the covariates of BL NSSI and treatment condition are not reported in this figure. Standardized (SE) path coefficients are provided on the straight, single-headed arrows.

CI = Confidence Interval.

$^{\dagger} p < .10$ .  $^{*} p < .05$ .  $^{**} p < .01$ .

We were not able to assess model fit, as Mplus does not calculate fit indices for bootstrapped models, aside from the Weighted Root Mean Square Residual (WRMR), which is an experimental statistic that cannot be validly interpreted (Muthén, 2014).

**Parental psychopathology (Hypothesis 3b).** Preliminary analyses indicated that the direct effect of parental depression on residualized T3 NSSI (Path c) was not statistically significant, nor was the analogous direct effect of parents' global symptom severity. These effects were non-significant with either NSSI likelihood or frequency as the dependent variable. Moreover, the effects remained non-significant when analyses were repeated without controlling for BL NSSI (i.e., examining absolute, rather than residualized, levels of T3 NSSI likelihood and frequency). These findings suggest that parents' self-reported psychopathology did not significantly predict adolescents' NSSI a year later. Given this lack of relations between parental depression or GSI with subsequent adolescent NSSI, mediation models were not examined for these pathways.

## **Discussion**

This study explored the potential mediating role of emotional intelligence in the pathway from two family-related stressors (child maltreatment and parental psychopathology) to NSSI over the course of one year in an outpatient adolescent clinical sample. Research supports associations between child maltreatment and NSSI, though the observed relations are not consistent across studies, and the mechanisms of this pathway are not fully understood. Similarly, parental psychopathology, and especially depression, is a known risk factor for adolescent mental health problems, but the association with NSSI in particular is unclear. There is some empirical support for the theory (Yates 2004;

2009) that NSSI is a response to disrupted development of self-regulation and emotional awareness (i.e., EI deficits) that arises in the face of abuse or parental psychopathology. In line with this theory, we hypothesized that NSSI would show positive associations with child maltreatment and parental psychopathology, and that EI would mediate the pathway from these family-related risk factors (at baseline) to likelihood and frequency of NSSI one year later. Hypotheses were minimally supported: There were few significant associations between NSSI and the family variables, and EI did not mediate the pathway in any models. Possible explanations for these results, as they relate to existing research and to characteristics of the present study, are explained below.

### **Correlations between family-related variables and NSSI**

In partial support of Hypothesis 1, we found a handful of significant zero-order correlations between child maltreatment and NSSI outcomes, but did not find the consistent associations we hypothesized. Only emotional abuse was significantly and positively associated with NSSI at BL. Sexual abuse, emotional abuse, physical abuse, physical neglect, and overall maltreatment were significantly and positively associated with NSSI likelihood and/or frequency at T2. Further, only emotional neglect was significantly and positively associated with an NSSI outcome at T3. One tentative conclusion is that “emotional” forms of maltreatment, compared to other types of maltreatment, are more consistently associated with NSSI across time. Emotional abuse may be more proximally related to NSSI because sexual and physical abuse at the hands of a caretaker tend to decrease as children grow older and stronger (e.g., Finkelhor, 1991), or as abuse is brought to the attention of authorities, but emotional abuse may

persist and intensify over time. It is also possible that this relatively more consistent association stems from a higher prevalence of emotional relative to physical or sexual abuse, leading to greater variability and thus ability to detect effects. Overall, these mixed results do not paint a clear picture of the connections between child maltreatment and NSSI and require further study.

The mixed pattern of associations found between various forms of maltreatment and NSSI does, however, echo existing research in this area, which also offers contradictory and inconsistent evidence. For example, in some studies, sexual abuse has been found to incur a direct risk on the likelihood of self-harm, above the impact of depression (Gladstone et al., 2004). In contrast, a meta-analysis by Klonsky and Moyer (2008) suggested that the association between sexual abuse and NSSI is weakened or becomes non-significant when controlling for other relevant variables. Moreover, Nock and Kessler (2006) found that sexual abuse was associated with suicide attempts, but not with NSSI. Studies also suggest an association between physical abuse and NSSI (e.g., Brodsky, Cloitre, & Dulit, 1995; Matsumoto et al., 2004; Weideman, Sansone, & Sansone, 1999), with some demonstrating that physical abuse has a significant association with NSSI above that of other relevant variables (Evren & Evren, 2005; Gratz et al., 2002). In two studies of adults with borderline personality disorder, however, emotional neglect was the strongest predictor of self-injury (Dubo et al., 1997; van der Kolk, Perry & Herman, 1991). Unfortunately, current results do not conclusively clarify these findings.

Results do shed light on the nature of child maltreatment overall, apart from its relation to NSSI. Participants in the present study endorsed the highest levels of emotional abuse and neglect, compared to other types of maltreatment (as indicated by highest frequencies in Table 2.1 and mean scores in Table 2.2). The high endorsement of emotional abuse and neglect is consistent with previous research; for example, in one study, only two participants (of 147) who endorsed a history of physical and/or sexual abuse did not also report emotional abuse (Muehlenkamp et al., 2010). This relative ubiquity of emotional abuse may in part reflect the fact that *any* form of child maltreatment is emotionally painful, and thus individuals who experience overt abuse (i.e., physical or sexual) are likely to feel emotionally wounded as well. Emotional abuse, as captured on the CTQ, refers to verbal assaults on children's worth or well-being, or any demeaning or threatening verbal behavior. Emotional neglect refers to caretakers' failure to provide love, encouragement, and a sense of belonging. Given these definitions, it is evident that emotional abuse and neglect can be embedded in other forms of maltreatment and thus may be more consistently experienced by adolescents, relative to physical and sexual maltreatment.

Counter to Hypothesis 2, results indicated few significant associations between parental depression or overall psychopathology and NSSI. One significant correlation arose, indicating a positive relation between parents' Global Severity Index at BL and adolescents' NSSI frequency at T3. The lack of more widespread associations stands in contrast to a body of literature demonstrating higher risk for internalizing and

externalizing disorders in children of parents with mental health issues (e.g., Goodman et al., 2011; Weissman et al., 1987; 1997; 2006).

Notably, adolescent NSSI itself (rather than broader mental health issues) has shown equivocal associations with parental psychopathology, with maternal depression predicting adolescent NSSI in some studies (Hankin & Abela, 2011; Wilcox et al., 2012), but not in others (Deliberto & Nock, 2008; Esposito-Smythers et al., 2010). Thus the current results add to the latter group of studies. Perhaps parental depression, despite having a documented association with offspring depression and general psychological distress, has a more diffuse association with particular maladaptive coping skills such as NSSI. Future research might investigate whether parents' own choices of coping skills are associated with their children's coping skills; perhaps adolescents are more likely to gravitate toward NSSI if their parents have (currently or previously) done the same. This assertion is consistent with findings that children of depressed parents are at highest risk for suicidal behavior if their parents have attempted or completed suicide (Christiansen, et al., 2011), and that adolescent NSSI (an impulsive behavior) is associated with impulsivity-related challenges in parents (Deliberto & Nock, 2008).

### **Mediating role of EI**

Results did not support the hypothesis that EI would mediate the relationship between child maltreatment and/or parental psychopathology and NSSI. Consistent with common practice, mediation models were only explored for family predictors that exerted significant direct effects on NSSI; emotional neglect was the only such predictor. Moreover, this effect arose only in the case of NSSI likelihood (rather than frequency).

Results indicated significant negative associations (as hypothesized) between emotional neglect and some facets of EI (global EI and problem-solving competence/confidence, i.e. adaptability EI), and a trend toward a negative association with emotional awareness/expression, i.e., intrapersonal EI. The pathway from the mediator to outcome (EI→ NSSI), however, was not significant, thereby failing to support the role of EI as a mediator of the pathway from emotional neglect to NSSI. Interestingly, the EI→NSSI pathway was significant and negative (as hypothesized) for emotion regulation (i.e., stress management EI), but this model did not indicate a significant path *to* EI, and thus also failed to support mediation.

These results are inconsistent with most existing literature on NSSI, family-related risk factors, and EI. First, as outlined above in relation to correlation analyses, the lack of direct effects between most types of abuse and NSSI diverges from studies suggesting that sexual and physical abuse show associations with NSSI (e.g., Klonsky & Moyer, 2008). Similarly, the lack of direct effects between parental psychopathology and NSSI is surprising in light of documented associations between parent and adolescent mental health issues (e.g., Goodman et al., 2011). Second, the lack of significant effects between most types of EI and NSSI is inconsistent with research linking EI deficits with increased use of NSSI to cope (for a review of coping and NSSI, see Guerreiro et al., 2013). Notably, the single significant EI→NSSI effect, that of stress management EI, does echo evidence that emotion regulation is the most common function of NSSI (e.g., Nock & Prinstein, 2004; Klonsky, 2007) and that emotion dysregulation is salient in self-injurers



(e.g., Adrian, Zeman, Erdley, Lisa & Sim, 2011; Gratz & Roemer, 2008; Jenkins & Schmitz, 2012).

Lastly, the lack of support for EI as a mediator deviates from theory suggesting that NSSI develops as a compensatory strategy in the face of disrupted emotional competence facilitated by abusive or neglectful caregiving (Yates 2004; 2009), and from related assertions that emotion regulation may mediate the abuse-NSSI pathway (Muehlenkamp et al., 2010). Beyond theory, current study results are inconsistent with burgeoning empirical support for EI-related coping deficits as mediators in this relationship. For example, alexithymia (e.g., Paivio & McCullough, 2004; Swannell et al. 2012), dissociation (Gratz et al. 2002; Rallis et al., 2012; Rodriguez-Srednicki, 2011; Swannell et al., 2012; Yates et al., 2008), self-criticism (Glassman et al., 2007), and self-blame (Swannell et al., 2012), have shown promise as mediators. Results are also at odds with those in another relevant study, in which emotion dysregulation mediated the influence of family- and peer-related interpersonal problems on adolescents' risk of engaging in NSSI (Adrian et al., 2011).

### **Explaining non-significant results**

The lack of consistent associations between NSSI and family-related risk factors, or for EI as a mediator, may stem from several causes. First, it is possible that low power due to a small sample size and low base rate of NSSI may explain the lack of statistically significant associations. Post-hoc power analyses using the G\*Power 3.1 software (Faul, Erdfelder, Lang & Buchner, 2009), support this assertion: Given the sample size of 91 and  $\alpha = .05$ , the power ( $1 - \beta$ ) to find a significant small effect (.2) in a bivariate

correlation is .61, which is smaller than the conventionally recommended minimum power of .8 (Cohen, 1992). With the smaller sample size at T2 and T3 due to attrition ( $n = 66$  and  $63$ , respectively), power was limited even further. G\*Power indicates that correlation analyses had power of .37 and .36 to detect small effect sizes, and .71 and .69 to detect medium effect sizes (.3) at T2 and T3, respectively.

Thus we may indeed have made a Type II error in failing to reject the null hypothesis for certain correlation analyses, such as those involving parental depression. Notably, G\*Power suggests that a sample of 91 *is* large enough to detect a medium effect (.3) in bivariate correlations, with a calculated power of .91 (since a larger effect is easier to detect). Thus we can interpret the current study's non-significant correlation coefficients to state (with 95% confidence) that even with a larger sample size, we would not have found a medium-sized (or larger) association between parental depression and NSSI. This is meaningful, and suggests that even with a larger sample, the data would not support hypothesis.

Even more strikingly, in relation to the mediation models, G\*Power indicated that the power to detect an effect in a logistic regression with T3 NSSI as the outcome and  $n = 63$  was .11, which is far below the recommended .8 (Cohen, 1992). This suggests that the current study was vastly under-powered to detect longitudinal effects in these regressions. It seems that given the low base rate of NSSI, a small sample size is especially detrimental in studies of this behavior.

Apart from questions of sample size and statistical power, the lack of hypothesized associations may also stem from limitations inherent in methods used to measure NSSI,

EI, and child maltreatment in the current study. In assessing NSSI, a face-to-face interview (SITBI; Nock et al., 2007) was chosen to allow researchers to detect imminent suicide risk and conduct further risk assessment and safety planning when needed. Participants may, however, may have felt less comfortable disclosing NSSI during an in-person interview than they would have felt on a written self-report measure. Indeed, in a past study (Weismore, 2011) that utilized an NSSI self-report measure (Functional Assessment of Self-Mutilation; FASM; Lloyd, Kelley & Hope, 1997) in addition to the SITBI, participants were more likely to report NSSI on the FASM (16.4%) than on the SITBI (4.3%). This suggests that NSSI may have been under-reported in the current study. Future research should employ a multi-method approach to measuring NSSI.

The measurement of EI also raised questions arising from Bar-On's theoretical model of EI. Mayer and colleagues (2008) assert that so-called mixed models of EI (joining single-ability and integrated models) are too diffuse and are not truly measuring EI. Indeed, though the factor structure of the EQ-i YV(S) has been confirmed in adolescents (using a Hungarian translation), this was only true after dropping two items each from the intrapersonal and interpersonal scales (Kim et al., 2012). Specifically, on the intrapersonal scale, researchers dropped two reverse-coded items ("It is hard to talk about my deep feelings" and "I have trouble telling others about my feelings"), and on the interpersonal scale, researchers dropped two items about recognizing others' emotions ("I can tell when one of my close friends is unhappy" and "I know when people are upset, even when they say nothing."). The authors contend that these two interpersonal items, though capturing an important aspect of relating to others, cover a different content area

than the other four items, which describe empathy and caring about others (e.g., “I feel bad when other people have their feelings hurt.”). Given that the current study used the full EQ-i YV(S) without dropping these items, we may have been capturing a less cohesive construct than intended.

Moreover, this self-report measure of EI is capturing *perceived* EI, rather than objective abilities. Future research with performance-based measures of EI (e.g., Mayer-Salovey-Caruso Emotional Intelligence Test; MSCEIT; Mayer, Salovey, Caruso & Sitarenios, 2003) could address this issue. A performance-based measure of EI was not feasible in the current study, which was part of a larger RCT that had an extensive baseline assessment including a full clinical interview and numerous self-report measures. A future study, in which data collection is more focused on EI, however, could utilize multiple methods to assess the construct.

Lastly, the measurement of child maltreatment was limited in some ways. Though the CTQ is a widely used and well-validated measure of child maltreatment that operationalizes specific abuse/neglect experiences in clear terms (Bernstein et al., 2003), it does rely on adolescents’ retrospective reports of childhood events, which is subject to recall bias (Maughan & Rutter, 1997). Moreover, the CTQ does not assess whether the maltreatment was recent, nor how long it lasted or who perpetrated it. It is likely that the associations between maltreatment, NSSI, and EI differ based on these factors, but the CTQ does not capture this variance. Research on the validity of adults’ retrospective reports of child abuse suggest that false negatives are more common than false positives

(Hardt & Rutter, 2004), which may translate to adolescent reports too, and suggests that abuse/neglect may have been slightly under-reported.

Another factor impeding adolescents' accurate reporting on the CTQ may have been fear of consequences for revealing abuse. During the informed consent process, adolescents were told of limits to confidentiality in the case of risk of harm to self or others. Specifically, graduate-level research assistants reviewed participants' CTQ responses at the completion of the baseline assessment. A research assistant then spoke privately with adolescents who reported a history of any physical or sexual abuse to clarify the nature and recency of the event, and to determine whether these adolescents were presently at risk for further harm. In consultation with the study's principal investigator, research assistants then initiated follow-up discussions with caregivers or made calls to child protective service agencies as needed. Though these steps served to protect participants, teens may have feared this outcome and thus withheld information.

### **Other limitations and future directions**

Discussion of the study's relatively small sample size deserves elaboration. The sample size was limited by the challenges inherent in recruiting and retaining families who were experiencing high levels of emotional (and often financial) stress. Statistical power was further limited at the 6- and 12-month follow-up points, given attrition of study participants. Attrition rates were similar or better, though, to those cited in other longitudinal studies in similar populations (e.g., Guerry & Prinstein, 2010). Moreover, this was a unique sample in several ways: (1) it is a clinical sample recruited from a range of inpatient and outpatient settings, (2) it is ethnically, racially and socioeconomically

diverse, (3) the gender distribution is relatively balanced, and (4) it includes adolescent and parent data. We utilized bootstrapping to mitigate limitations stemming from the sample size. Still, future research would be enriched by a larger sample size that allows ample power to detect effects.

This study did not assess the functions of NSSI for each participant, which limited the potential conclusions. As with the choice of the EQ-i YV(S), the decision to administer the short form of the SITBI (90 items), rather than the full version that also assesses NSSI function, was made with participant burden in mind. Still, there is evidence that NSSI serves different functions for different clinical profiles of adolescents (e.g., Hilt, Cha, & Nolen-Hoeksema, 2008; Lloyd-Richardson et al., 2007; Nock & Prinstein, 2005). Moreover, adolescents' engagement in recurrent versus intermittent NSSI has been shown to differ based on the motives driving self-injury, such that recurrent NSSI is more often tied to intrapersonal motivations, while intermittent NSSI is more often tied to interpersonal motivations (Yates et al., 2008). The nature of emotion regulation deficits has also been shown to differ based on types of child maltreatment experienced (Muehlenkamp et al., 2010). Thus further exploration of NSSI function as it relates to EI and to the family environment could help illuminate particular coping deficits and interpersonal stressors that contribute to distinct motivations for self-injury.

### **Clinical implications**

Despite lack of support for study hypotheses, results can inform treatment for NSSI. First, results illuminate the prevalence of perceived emotional abuse or neglect in adolescents; a majority of participants in this outpatient clinical sample reported a history

of one or both. Secondly, emotional neglect, as reported at baseline, was the only type of maltreatment that showed a direct effect on NSSI likelihood one year later. These findings are concerning, since non-visible forms of maltreatment may be the hardest to detect and may not be severe enough to warrant a report to child protective services. This relatively high prevalence, and the tie to later NSSI, should alert clinicians to the importance of assessing the emotional contours of an adolescent's family environment early in treatment.

Results also highlight the value of addressing family-related interpersonal stressors that may provoke or perpetuate an adolescent's engagement in NSSI. Indeed, this is the theoretical basis of Interpersonal Therapy for Adolescent Self-Injury (IPT-ASI; Jacobson & Mufson, 2012), which has shown promise in a pilot study. Further, results speak to the merit of directly involving parents in their adolescents' mental health treatment. This could take one or more forms, including occasional joint parent-teen sessions, concurrent but separate individual therapy for parents (e.g., Foster et al., 2008), marital therapy to facilitate effective co-parenting, and of course family therapy. Parental involvement in treatment might mitigate some of the impact of a strict or critical parenting style on adolescents' social-emotional development. Family involvement has not been studied in the context of NSSI treatment in particular, but related research shows promise. For example, in a family-based cognitive behavioral depression prevention program, increases in positive parenting mediated intervention effects on adolescent internalizing and externalizing symptoms, accounting for approximately half of the effect on youth outcomes (Compas et al., 2010). Critically, these treatment implications only apply in the

context of invalidating or harsh family environments that do *not* necessitate intervention from a child protective services agency. The recommendations are moot in the face of moderate to severe abuse or neglect, where immediate safety takes precedence.

The longitudinal association between low stress management EI and NSSI also carries treatment implications. Specifically, this association corroborates the value of existing treatments for adolescent NSSI that teach emotion regulation skills, most prominently dialectical behavior therapy (DBT; Miller & Smith, 2008; Rathus & Miller, 2002). Further research exploring the longer-term impact of DBT and similar approaches will be vital in understanding whether improved emotion regulation ability translates to a reduction in NSSI.

## **Conclusions**

NSSI is a concerning and harmful behavior that peaks in adolescence, causes significant emotional distress, and predicts future suicidal behavior. Family context, and especially child maltreatment and parental psychopathology, may affect the development of NSSI. This study aimed to fill an important gap in the literature by exploring the potential mediating role of emotional intelligence in the longitudinal pathway from these family-related risk factors to adolescent NSSI. This study built on the documented (but inconsistent) association between these parenting variables and NSSI, on the known detriment of a harsh or abusive family environment in the socialization of emotion regulation, and lastly on the known (but cross-sectional) associations between several EI-related constructs and NSSI. Though results did not support the mediation hypothesis, this may be due to low power and/or imperfect measurement of the constructs and



behaviors of interest. That said, the study did have sufficient power to detect medium-sized correlations, and yet results did not indicate such an association. This suggests that EI (at least as defined by Bar-On) may be distinct enough from other aspects of emotion-related coping that it is not meaningful in understanding NSSI. This conclusion would be premature at this point, however, given study limitations that likely affected results.

Future research, with a larger sample and multi-modal assessments of NSSI, EI and child maltreatment, should continue to explore intra- and interpersonal risk factors that influence the trajectory of NSSI in the face of family stressors. This research could inform clinicians' efforts to maximize parental involvement in adolescents' treatment and, when needed, direct parents to additional treatment for themselves or the family. Ultimately, this could lead to more tailored or effective interventions for NSSI.

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## **APPENDIX: LITERATURE REVIEW**

Non-suicidal self-injury (NSSI) is defined as direct and deliberate self-inflicted bodily harm in the absence of intent to die (Nock, 2010). Most often, NSSI takes the form of cutting or carving the skin, though burning, scratching and hitting are also common (Klonsky & Muehlenkamp, 2007). Paradoxically, self-injury creates physical pain, yet is often used to reduce or regulate emotional pain. This behavior, which seems to contradict our innate drive for self-preservation, is associated with significant psychological and physical harm (Nock, 2010). NSSI has been shown to predict suicidal behavior, even above the impact of prior suicidal behavior (Asarnow et al, 2011; Guan, Fox & Prinstein, 2012), which underscores the threat that it poses and the importance of research in this area.

NSSI peaks in adolescence – with an average age of onset between 11 and 15 years (Whitlock, 2010) – and declines into adulthood (Zanarini, Frankenburg, Hennen, Reich & Silk, 2005), framing adolescence as a period of heightened risk. Prevalence estimates of adolescent NSSI range from 13 to 46% (with an upper estimate of 28% for moderate/severe NSSI) in community samples (Jacobson & Gould, 2007; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007), and 39% (Lipschitz, et al. 1999) to 68% (Guerry & Prinstein, 2010) in clinical samples. Gender differences are not always consistent, though rates generally appear higher in females (e.g., Howe-Martin, Murrell, & Guarnaccia, 2012; Ross & Heath, 2002; Whitlock, 2010). The gender discrepancy in

NSSI is starkest in young adolescents (ages 10-14), when the female:male ratio has been shown to be 8:1, and in later adolescence (ages 15-19), when the ratio is approximately 3:1, with the gap narrowing significantly in adulthood (Hawton & Harriss, 2008). NSSI occurs in individuals with a range of psychiatric diagnoses, such as depression, anxiety, borderline personality disorder and eating disorders (e.g., Jacobson, Muehlenkamp, Miller & Turner, 2008), and recent evidence suggests that it may merit classification as its own disorder (Glenn & Klonsky, 2013; Selby, Bender, Gordon, Nock & Joiner, 2012). Though NSSI has previously been classified as a symptom of borderline personality disorder (American Psychiatric Association, 2000), the latest edition of the Diagnostic and Statistical Manual of Mental Disorders, DSM-5, lists NSSI as a “condition for further study” (APA, 2013), signaling the potential of its future adoption as a distinct disorder (Bentley, Nock, & Barlow, 2014). Most who self-injure report doing so in private (Nock, Prinstein & Sterba, 2009), using more than one method, and injuring on multiple body parts (Whitlock, Eckenrode & Silverman, 2006). Empirically-supported treatment for adolescent NSSI is scant (Braush & Girresch, 2012; Washburn et al., 2012), though several promising interventions are currently being delivered and evaluated (e.g., Jacobson & Mufson, 2012; Miller & Smith, 2008; Rathus & Miller, 2002).

Efforts to help individuals manage urges to self-injure may be most effective if they are guided by an understanding of intrapersonal and interpersonal factors that shape the development of NSSI. Emotional intelligence (EI) is a construct that may capture several of these factors. EI, broadly, is defined as a person’s ability to perceive, use, understand and manage one’s emotions and those of others (Ciarrochi, Deane & Anderson, 2002;

Salovey & Mayer, 1990). EI also entails a person's ability to use emotions to guide reasoning and behavior, as well as perceived competency to manage emotion-laden situations (Mayer, Roberts & Barsade, 2008). In this vein, EI can also be called "emotional self-efficacy" (Mavroveli, Petrides, Rieffe & Bakker, 2007). EI is associated with the use of adaptive coping— namely, more problem-focused strategies and fewer avoidant strategies (Mavroveli et al., 2007; Mikolajczak, Petrides & Hurry, 2008; Saklofske, Austin, Galloway & Davidson, 2007) – to regulate a range of emotions, including stress, anger, sadness, fear, jealousy, and shame (Mikolajczak, Nelis, Hansenne & Quoidbach, 2008). Overall, a person with higher emotional and social intelligence can more effectively "manage personal, social, and environmental change by realistically and flexibly coping with the immediate situation, solving problems, and making decisions" (Bar-On, 2006).

Theoretical approaches to EI address the capacity to "join intelligence and emotion to enhance thought," either focusing on specific emotion-related abilities or on a more cohesive, global EI (Mayer et al., 2008, p. 511). Specific-ability models, for example, focus on emotion perception (e.g., Nowicki & Duke, 1994), emotional decision-making (e.g., Lyubomirsky et al., 2005), and emotional appraisal and understanding (e.g., MacCann et al., 2004). Among integrative models of EI, one seminal theory views EI as joining abilities from four areas: (1) accurately perceiving emotion, (2) using emotions to facilitate thought, (3) understanding emotion, and (4) managing emotion (Mayer, Salovey, Caruso, & Sitarenios, 2003). According to this model, individuals develop these

skills from childhood onwards, with growth in each area affecting growth in other areas (Mayer et al., 2008).

A third general approach to EI, often called a mixed-model approach (Mayer, 2008), encompasses a more expansive range of social-emotional skills and attributes. Bar-On (1997), who developed a prominent model that follows this approach, divides EI into four areas: (1) *intrapersonal skills* such as emotional self-awareness and expression (e.g., “I can easily describe my feelings,” “It is easy to tell people how I feel”), (2) *interpersonal skills*, or a person’s capacity to care about and understand others and relate accordingly (e.g., “I can tell when one of my close friends is unhappy,”) (3) *stress management*, or a person’s belief in his or her ability to regulate affect (e.g., “I get too upset about things,” “When I get angry, I act without thinking”), and (4) *adaptability*, which is a belief in one’s ability to adapt and solve problems effectively (e.g., “I can easily use different ways of solving problems”). Overall, EI spans several areas of adaptive skills relevant to NSSI.

### **Theories of NSSI**

One of the most well-known and comprehensive theoretical models of NSSI is the four-function model (FFM) proposed by Nock and Prinstein (2004). According to this model, NSSI develops and is maintained through various types of reinforcement. Specifically, the functions of NSSI fall along two dimensions: reinforcement that is either negative (i.e., “to stop bad feelings”) or positive (i.e., “to feel something” or “to get some attention”), and consequences that are either automatic (reinforced by oneself) or social (reinforced by others) (Nock & Prinstein, 2004; 2005).



Ample empirical support has been garnered for this four-function model of NSSI. In a seminal study supporting the overarching model through confirmatory factor analysis (Nock & Prinstein, 2004), motives relating to automatic reinforcement were endorsed more often than those related to social reinforcement, with automatic-negative reinforcement the most common overall. More than half (53%) of self-injurers reported that they engaged in NSSI to “stop bad feelings,” which is a clear illustration of automatic-negative reinforcement. Another widely-endorsed example of automatic-negative reinforcement was “to relieve feeling numb or empty” (endorsed by 31%). In the automatic-positive reinforcement arm, motives included “to feel something, even if it was pain” (endorsed by 34%), “to punish yourself” (32%), and to “feel relaxed” (24%). In the social-negative reinforcement category, the most prevalent motive was “to avoid doing something unpleasant you don’t want to do” (endorsed by 13%). Other functions of NSSI that provided social-negative reinforcement were “to avoid punishment or paying the consequences” (12%), “to avoid being with other people” (9%), and “to avoid school, work, or other activities” (6%). In the social-positive reinforcement category, top motives included “to give yourself something to do when alone” (endorsed by 24%), “to get control of a situation” (15%), “to try to get a reaction from someone, even if it’s negative” (15%), “to receive more attention from your parents or friends” (14%), “to let others know how desperate you are” (14%), and “to get help” (14%).

Also notable is that certain functions of NSSI appear to be more salient in different clinical profiles of adolescents. For example, further analyses of the inpatient sample described above (Nock & Prinstein, 2004) suggested that automatic-negative

reinforcement was significantly associated with hopelessness and a history of suicidality, while automatic-positive reinforcement was associated with depression and PTSD, suggesting that feelings of emptiness, detachment and anhedonia may lead some teens to self-injure in order to feel *something* to fill the void (Nock & Prinstein, 2005). Relatedly, in a study of young adolescent girls, internal distress (depressive symptoms) was associated with engaging in NSSI for emotion-regulation functions, whereas interpersonal distress (peer victimization) was associated with engaging in NSSI for social reinforcement (Hilt, Cha, and Nolen-Hoeksema, 2008). Adolescents' motivation for NSSI may also differ based on gender, with one school-based study indicating that adolescent boys are significantly more likely to report self-injuring due to boredom, to join a group, because it seemed fun, and to avoid doing something, whereas girls were significantly more likely to cite feeling very lonely and depressed, and "feeling like I needed to hurt myself" (Laye-Gindhu & Schonert-Reichl, 2005). Functions of NSSI may also differ depending on the severity of self-injury, given findings in a community sample that adolescents who engaged in moderate or severe NSSI endorsed automatic and social functions with equal frequency, while those who engaged in minor NSSI endorsed automatic reasons more often (Lloyd-Richardson et al., 2007). The authors posit that the balance between automatic and social functions for severe NSSI, which contrasts with prior findings, may be because their community sample consisted of teens who were less socially isolated than Nock and Prinstein's (2004, 2005) inpatient samples. Still, in a study that examines real-time reports, via ecological momentary assessment, from community teens and young adults, participants endorsed engaging in NSSI for automatic

or *intrapersonal* reasons 85 to 90% of the time, and for social or *interpersonal* reasons only 15 to 20% of the time (Nock et al., 2009). Moreover, in a review of 18 studies of the function of NSSI, Klonsky (2007) found that affect regulation emerged most often as a function for the behavior, though there was also strong evidence for the role of self-punishment. Overall, these contrasts speak to the different motivations for NSSI, and highlight the importance of understanding specific social and emotional deficits that underlie the behavior.

Numerous other theories also map onto and provide support for the functional model of NSSI, and are outlined below.

### **Automatic negative reinforcement**

Reviews of NSSI research corroborate that the most commonly endorsed motive for NSSI is affect regulation (Klonsky, 2007), and in particular automatic negative reinforcement. Across studies, there is evidence that negative affect precedes NSSI and that this affect is reduced after NSSI (e.g., Arney, Crowther & Miller, 2011; Klonsky, 2007; Laye-Gindhu & Schonert-Reichl, 2005). In particular, adolescents in an experience-sampling study engaged in NSSI most often when feeling self-hatred, anger toward self or others, rejected, or numb/nothing (Nock et al., 2009). A body of laboratory studies that measured negative affective arousal before and after NSSI-proxy tasks also supports the automatic negative reinforcement function of self-injury (see summary in Franklin, et al. 2010).

Several theories aim to explain the specific mechanisms through which NSSI helps a person escape, dampen or banish their emotional pain or tension. Though the theories

differ, the mechanisms they propose are similar (Chapman, Gratz & Brown, 2006; Selby, Franklin, Carson-Wong, & Rizvi, 2013). These theories include the experiential avoidance model (EAM; Chapman et al., 2006), the emotional cascade model (ECM; Selby, Anestis & Joiner, 2008), the opponent process model (Franklin et al., 2010; Gordon et al., 2010; Solomon, 1980), and the pain offset relief model (Franklin et al., 2013). Each theory illustrates how NSSI can become increasingly entrenched in an individual who lacks other coping skills.

**Experiential avoidance model (EAM).** The EAM model of NSSI (Chapman et al., 2006) focuses on the negative reinforcement that self-injury provides in offering an escape from unwanted emotional experiences. Experiential avoidance is defined as “the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, images, behavioral predispositions) and takes steps to alter the form or frequency of these experiences or the contexts that occasion them, even when these forms of avoidance cause behavioral harm” (Hayes, et al. 2004, p. 554). Experiential avoidance is considered a broader term than ‘emotional’ or ‘cognitive’ avoidance since it involves efforts to escape, avoid or modify a wide range of internal experiences (Howe-Martin et al., 2012). In this model, NSSI is situated among a broader class of maladaptive experiential avoidance behaviors, such as substance use or disordered eating, that indeed are often co-morbid with NSSI (Chapman et al., 2006; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). The EAM describes a vicious cycle that exacerbates a person’s reliance on NSSI as a form of emotion regulation (Chapman et al., 2006). First, a person encounters a

stimulus that elicits an aversive emotional response (e.g., shame, anger, sadness, frustration). In individuals for whom these emotions are very intense and who lack effective distress tolerance or emotion regulation skills, the urge to avoid this seeming emotional torment becomes increasingly strong. The person then engages in NSSI and experiences temporary relief as he or she escapes or reduces the intensity of the unwanted emotional arousal. This is negatively reinforcing, and over time, NSSI becomes a conditioned, near-reflexive response.

**Emotional cascade model (ECM).** The ECM seeks to clarify the pathway from emotional dysregulation to behavioral dysregulation (Selby, Anestis & Joiner, 2008). This model posits that individuals who ruminate on their negative affect tend to experience an intensification of that affect and eventually engage in dysregulated behavior (e.g., NSSI, substance use, binge-eating) to disrupt this cascade of emotion (Selby et al., 2008; Selby et al., 2013). Though rumination and catastrophizing are attempts to regulate emotions, they backfire; instead of calming negative affect, they intensify it. An individual who lacks other emotion regulation skills, and for whom less intense distraction methods (e.g., a hot or cold shower, watching TV) prove insufficient, may then engage in a distracting behavior that evokes stronger sensations – such as self-injury – to halt the emotional cascade (Bresin & Gordon, 2013a). Selby and colleagues highlight this cycle’s self-defeating nature: “In essence, the way we regulate our emotions may actually cause us to lose control of them, and of our behavior” (Selby et al., 2008, p. 594).

Support for the ECM exists for several examples of behavioral dysregulation, including substance use, binge-eating, and NSSI (Selby et al. 2008; Selby et al. 2013; Tuna & Bozo, 2014). For example, rumination is associated with increased higher frequency of these behaviors, even after controlling for broader psychological distress and a deficit of adaptive emotion regulation strategies (Selby et al., 2008). Moreover, more intense rumination predicts greater levels of behavioral dysregulation a month later (Selby et al., 2008).

**Opponent process theory.** Some studies suggest that the emotion regulation effects of NSSI become more reinforcing with repeated self-injury over time (e.g., Franklin et al., 2010; Gordon et al., 2010). This finding is in line with the opponent process theory of acquired motivation (Solomon, 1980), which posits that as a person has increased exposure to a provocative stimulus (i.e., engages in repeated NSSI), the primary process (the physical pain and fear of self-injury) becomes weaker and the opponent process (the emotional relief) becomes stronger (Franklin et al., 2010). In essence, this theory posits that individuals who engage in repeated NSSI develop a tolerance for the physical pain and fear that might otherwise deter self-injury, while simultaneously receiving increased emotion-regulation benefits.

In partial support of opponent process theory, one study found that individuals with a greater number of past episodes of NSSI reported feeling more soothed, relieved, and calm after their most recent episode of self-injury (Gordon et al., 2010). Unexpectedly, individuals with a greater history of past NSSI also reported more intense physical pain during their most recent episode. In other words, the primary process (physical pain) did

not necessarily decrease, but the opponent process (emotional relief) nevertheless became more reinforcing, and thus more appealing, even in the face of physical pain (Gordon et al., 2010). The authors posit that individuals may be willing to endure the pain of NSSI in order to also experience emotional relief.

**Pain offset relief model.** More recently, some of the researchers who proposed the opponent process model of NSSI have questioned its fit. A laboratory experiment yielded data that better supports a pain offset relief model, which proposes that when the *physical* pain of self-injury begins to abate, emotional pain subsides too (Franklin et al., 2013). Interestingly, pain offset relief appeared nearly universal in study participants and was not significantly associated with an individual's history of NSSI frequency. This challenges opponent process theory, which posits that self-injury provides heightened relief over the course of repeated NSSI episodes, and instead suggests that the escalation from a single episode of NSSI to a pattern of ongoing self-injury and even suicide attempts may be driven mainly by desensitization (Franklin et al., 2013). This research group notes, however, that even if repeated NSSI does not increase the affective benefits of self-injury, it may still weaken some of the barriers that most people instinctively face (Franklin, Lee, Puzia, & Prinstein, 2014). For example, in a college sample, individuals with a history of NSSI showed reduced aversion to self-cutting stimuli in comparison to a non-self-injuring control group (Franklin et al., 2014).

Regardless of the mechanism through which it develops, self-injurers consistently demonstrate increased pain tolerance, thus removing a factor that, for others, would deter the behavior (e.g., Franklin, Aaron, Arthur, Shorkey, & Prinstein, 2012; Hamza, &

Willoughby, 2015; Nock et al., 2009). Interestingly, self-injurers may perceive the level of physical pain at the same subjective intensity as non-self-injurers do, but self-injurers are better able to *tolerate* those pain levels (Weinberg & Klonsky, 2012). They may also experience the behavior as more rewarding. In one laboratory study, individuals with an NSSI history, versus those without, reported significantly greater reductions in negative arousal after experiencing self-inflicted pain (an electrical shock), even at the same subjective pain level (Weinberg & Klonsky, 2012).

This increased pain tolerance may arise because individuals who generally struggle to regulate their emotions seem to perceive more benefit and thus be more willing to bear the physical pain of NSSI, per a growing body of laboratory studies (Hamza & Willoughby, 2015). For example, higher trait levels of emotion dysregulation are associated with increased pain tolerance, regardless of a person's NSSI history (Franklin et al., 2012). Relatedly, individuals higher in emotional reactivity showed larger decreases in negative affect after experiencing a painful stimulus, compared to individuals with lower emotional reactivity (Bresin, Gordon, Bender, Gordon, & Joiner, 2010). This may be explained in part by a more restricted range of affect in less emotionally reactive individuals (i.e., their negative affect cannot fall as far), but still suggests that emotionally dysregulated individuals find physical pain more rewarding and thus are more willing to endure it. For those who begin using self-injury as an emotion-regulation tool, their increased pain tolerance may facilitate repeated engagement in NSSI.



Given the association between increased pain tolerance and NSSI, some have conceptualized NSSI as an addictive behavior. Supporting this, in a hospitalized sample of adolescents, those who engaged in repeated NSSI described qualities consistent with a dependence or addiction model, such as tolerance (frequency and/or intensity of NSSI had increased to achieve the same effect) and withdrawal (tension level reoccurred if NSSI was discontinued). These adolescents also reported continued NSSI despite the recognition that it was harmful, and endorsed items describing NSSI as time-consuming and relationship-interfering (Nixon et al., 2002). This speaks to a self-perpetuating cycle of NSSI in which a person becomes increasingly dependent on NSSI – and potentially less comfortable or adept using other coping tools –with continued self-injury.

Notably, however, a study of adolescents’ cravings for substances and for NSSI (Victor, Glenn & Klonsky, 2012) suggested that “cravings” for NSSI may be more limited and context-dependent than cravings for substances. In a psychiatric adolescent sample, cravings for NSSI occurred almost entirely in the context of negative emotions, while cravings for substances occurred in a variety of contexts. This finding held even when analyses were limited to adolescents who engaged in both substance use and self-injury. This suggests that NSSI, while indeed part of a self-perpetuating cycle, is largely maintained by negative reinforcement (i.e., relief from negative emotions), rather than positive reinforcement (i.e., feeling good). The authors posit that this supports an emotion regulation model of NSSI, rather than a more traditional addiction model.

**Automatic positive reinforcement.** Though it is less-often studied, intrapersonal positive reinforcement can also play a role in the initiation and maintenance of NSSI

(e.g., Bentley et al., 2014). Individuals may self-injure for a sense of control or excitement (Nixon, Cloutier, & Aggarwal, 2002), or for “feeling generation,” i.e., an attempt to up-regulate emotions or feel any emotion at all, in contrast to emotional numbness (Nixon et al., 2002; Turner, Chapman, Layden, 2012). Some researchers have questioned whether positive automatic reinforcement truly exists in NSSI, or whether the “relief” that self-injurers report is simply an element of negative reinforcement. In a recent laboratory study, however, pain offset relief was shown to simultaneously – but independently – increase positive affect and diminish negative affect (Franklin et al., 2013). A related positively-reinforcing maintaining factor for some self-injurers may be physical addiction to the opiate rush that occurs when they harm their bodies (Walsh, 2006). After frequent NSSI, a person can develop a tolerance for the pleasurable outpouring of endogenous opioids (endorphins), and then experience cyclical withdrawal and feel a need to self-injure further (Grossman & Siever, 2001). In a review of several literatures, Bresin and Gordon (2013b) propose that: (1) individuals who engage in NSSI have lower baseline levels of endogenous opioids, (2) NSSI releases endogenous opioids, and (3) these opioids help regulate affect. The ensuing relief can result in a self-perpetuating cycle.

### **Interpersonal functions of NSSI**

Despite the converging evidence for affect regulation as a primary function of NSSI, Nock (2008) cautions against dismissing the social functions, as the behavior is maintained by social reinforcement in at least a sizable minority of cases. He takes care to disavow the common perception that self-injury is “manipulative” in a purposeful way.

Rather, he argues, NSSI is a “high intensity social signal used when less intense communication strategies fail” (Nock, 2008, p. 159). A person may resort to self-injury as a communication tool after feeling unheard with other methods (speaking, yelling, crying).

Nock’s proposed social reinforcement model has three key routes. First, NSSI acts as a signal of distress – a “cry for help” – that elicits caretaking from others (Nock, 2008). This caretaking (or attention) is one form of positive social reinforcement. Second, NSSI provides positive social reinforcement by strengthening affiliation with others who self-injure. This is especially rewarding for adolescents who have felt socially isolated or misunderstood. Third, self-injury can provide negative social reinforcement by warding off potential threats. Specifically, self-injuring adolescents may broadcast a signal of strength that deters would-be bullies from targeting them.

Importantly, interpersonal and intrapersonal factors may interact to influence the occurrence and recurrence of NSSI (Muehlenkamp, Brausch, Quigley & Whitlock, 2013). Someone with interpersonal skills deficits and/or a high sensitivity to interpersonal conflict may be especially likely to experience distress in the face of loneliness, perceived rejection, or other social strife. This could, in turn, lead to emotional dysregulation, which – for someone who has difficulty regulating or expressing emotions– may spur self-injury as a cry for help.

### **Theoretical links between Emotional Intelligence and Self-Injury**

As is evident, abundant empirical and theoretical support exists for the four-function model of NSSI, particularly for automatic-negative reinforcement. The four constructs in

Bar-On's model of EI (intrapersonal, interpersonal, stress management, adaptability) correspond well with each of these four functions.

First, per multiple theories of NSSI's role in regulating negative affect, individuals with poor intrapersonal EI (i.e., emotional awareness and expression) and/or stress management skills (i.e., emotion regulation) may engage in NSSI to reduce or escape from unwanted emotional experiences. For example, consistent with the experiential avoidance model of NSSI (Chapman, Gratz & Brown, 2006), the emotional cascade model (Selby et al., 2008), and the pain offset relief model (Franklin et al., 2013), individuals with poor intrapersonal EI skills, who lack other ways of understanding or regulating internal experiences, may engage in NSSI to reduce or escape from unwanted emotions, reduce emotional pain, or disrupt a cascade of emotion.

The automatic positive reinforcement role of NSSI – the power of self-injury to generate rewarding sensations or emotions – also seems relevant to intrapersonal and/or stress management EI. Individuals with poor intrapersonal EI may experience many emotions as muted, diffuse, or even absent (i.e., emotional numbness) and may turn to NSSI to up-regulate or generate feelings (e.g., Turner et al., 2012). The pain offset relief model (Franklin et al., 2013) also suggests that individuals with low intrapersonal EI turn to NSSI to induce positive affect.

The social reinforcement functions of NSSI (Nock, 2008; Nock & Prinstein, 2004; 2005) are relevant to both intrapersonal and interpersonal facets of emotional intelligence. First, the intrapersonal domain of EI, as defined by Bar-On (1997), includes someone's self-perceived ability to express emotions to others (e.g., "I have trouble

telling others about my feelings.”) Thus someone with deficits in this area may feel unheard, and may turn to NSSI as a way to broadcast sadness, anger, loneliness, or other emotions (Nock, 2008).

Of course, social reinforcement theories of NSSI are also relevant to interpersonal EI (i.e., relating emotionally to others). Individuals with low interpersonal EI have difficulty forming social connections, and may thus feel drawn to NSSI for its creation of a social bond that felt otherwise out-of-reach (social positive reinforcement). Moreover, the attention or concern elicited by NSSI (social positive reinforcement) may feel more tangible and rewarding to someone with low interpersonal EI, for whom this experience is a relative rarity, versus someone with high interpersonal EI. That said, it is also possible that teens who derive social reinforcement from NSSI are in fact keenly aware of how others will respond to the behavior, and in fact have *high* interpersonal EI. (This will be explored in the empirical links section.)

The social reinforcement function of self-injury is also intertwined with adaptability, i.e., problem-solving self-efficacy, another facet of EI. Individuals with deficits in this domain perceive themselves as feeble or inflexible problem-solvers (e.g., disagree with the statement, “I can easily use different ways of solving problems,” Bar-On, 1997), and may see NSSI as the only way to elicit attention or make friends (social positive reinforcement) or protect themselves from peer victimization (social negative reinforcement) (Nock, 2008). Once NSSI reveals itself as a way to meet these goals, someone with low adaptability may return to this strategy repeatedly, rather than attempting a new one.

### **Empirical Links Between Emotional Intelligence and NSSI**

Beyond theoretical links, a fair amount of cross-sectional research provides empirical support for the association between components of EI and NSSI in adolescents and young adults. Few of these studies have directly explored EI, but have instead explored related traits and coping skills. Moreover, few of these studies have explored the longitudinal course of NSSI and EI-related constructs. Still, the existing literature provides a foundation for further study of the role of emotional intelligence in the development and maintenance of NSSI.

#### **Intrapersonal emotional intelligence**

First, with regard to the intrapersonal domain of EI, NSSI is frequently associated with discomfort and struggle in understanding and expressing one's own emotions. Alexithymia, or difficulty identifying and describing emotions (Borrill, Flynn, Fox, & Roger, 2009), is central to Bar-On's (1997) conception of intrapersonal EI and is a common trait of individuals who self-injure; in fact, one study suggested that a lack of emotional clarity is the largest challenge facing adolescents who self-injure (Bocquee et al., 2012). Similarly in an adult sample, lack of emotional clarity explained unique variance in a group of self-injurers who cited "feeling-generation" reasons for NSSI (Turner et al., 2012). As further evidence of the role of alexithymia in NSSI, women who self-injure have been found to use fewer self-referential emotional words (i.e., had more limited emotional expression) than women in a mental health control group or a physical health control group (Woods, 2012). Relatedly, in another study, self-injurers showed a deficit in verbal fluency compared to a control group, with a more pronounced deficit

following a negative mood induction (Photos, 2011). This weakened verbal fluency, especially during times of heightened affective distress, may be a barrier to self-injuring individuals' efforts to label their emotions. Another study found that individuals' difficulty identifying feelings (though not difficulty *describing* feelings) was among the strongest predictors of self-injury, matched only by rumination (Borrill et al., 2009). It should be noted, however, that this study included self-injury with both suicidal and non-suicidal intent.

Another aspect of emotional awareness is emotional differentiation, or the ability to make nuanced distinctions between similarly valenced emotions. Emotional differentiation of negative affect has been found to be lower on a daily basis in individuals who self-injure (Bresin, 2014) and to protect against NSSI in individuals with BPD who are prone to high levels of rumination (Zaki, Coifman, Rafaeli, Berenson, & Downey, 2013). Specifically, in an experience-sampling study, adults with BPD who had high daily levels of rumination, but also exhibited more finely-tuned emotion differentiation skills, reported lower frequencies of NSSI urges and behaviors. In other words, emotion differentiation – the opposite of alexithymia in many ways – may be a buffer against the impact of rumination on NSSI. The authors posit that the act of labeling a negative emotion in specific terms, rather than grouping all unpleasant emotions together, may help someone distance from the emotional intensity and perhaps slow or halt the emotional cascade and eventual NSSI that could otherwise be fueled by rumination (Zaki et al., 2013).

Emotional avoidance is another aspect of low intrapersonal EI that is consistently associated with NSSI (Guerreiro et al., 2013). Across many studies, adolescents and young adults who engage in NSSI report coping with aversive emotions by avoiding or suppressing them (e.g., in adolescents: Bocquee, 2012; Evans, Hawton & Rodham, 2005; Howe-Martin, Murrell & Guarnaccia, 2012; Williams & Hasking, 2010; in young adults: Anderson & Crowther, 2012; Andover, Pepper & Gibb, 2007; Borrill et al., 2009; Haines & Williams, 1997; Hasking, Momeni, Swannell, Chia, 2008). For example, in a school-based study, adolescent girls who engaged in NSSI demonstrated higher levels of thought suppression, alexithymia, and “unwanted inner experiences” (Howe-Martin et al., 2012). Moreover, the levels of experiential avoidance increased as the frequency of NSSI increased. Notably, these findings were not present in analyses that only included male students, suggesting potential differences in the function of self-injury across genders (Howe-Martin et al., 2012). In another study, college women with current or past NSSI reported greater emotional avoidance than those with no NSSI history (Anderson & Crowther, 2012). Incarcerated women who tried not to think unpleasant thoughts (i.e., suppressed them) reported a higher frequency of NSSI than those who did not use this strategy (Chapman, Specht, & Cellucci, 2005). Further, emotional acceptance – essentially the reverse of avoidance – has been associated with lower likelihood of NSSI (e.g., Anderson & Crowther, 2012), and indeed, acceptance of unwanted emotions is a focus of many interventions targeting NSSI (e.g., Gratz & Gunderson, 2006; Gratz, Levy & Tull, 2012; Linehan, 1993).



Interestingly, a handful of studies provide evidence for an adaptive function of emotional avoidance in the context of NSSI. For example, one research team found a lack of association between avoidant coping and NSSI (Cawood & Huprich, 2011) and suggested this may be because “bottling up” emotions (i.e., avoiding them) defends against the emotional intensity that often precedes NSSI. In another study, women with BPD who were instructed to accept their emotions in response to a sadness-inducing film clip reported *higher* urges to self-injure and to self-punish than did woman who were instructed to suppress their emotions (Svaldi, Dorn, Matthies, Philipsen, 2012), suggesting that expressive suppression can at times be an effective distraction strategy. Even researchers who developed the EAM (Chapman, Rosenthal, & Leung, 2009) found some support for this contradictory notion. They conducted an experience-sampling study in which individuals high in BPD traits reported lower urges to engage in impulsive behaviors (including self-injury) on days on which they were instructed to suppress their emotions, relative to days on which they were instructed to observe their emotions. The reverse was true in individuals with low levels of BPD traits. These data stand in contrast to a body of evidence suggesting that emotional avoidance or suppression increases the risk of NSSI, and suggest instead that the ability to effectively distract from unwanted emotions can at times be adaptive. Distraction, however, provides a rather temporary fix –without addressing underlying causes of distress – and may prove insufficient in the face of especially intense emotions (Bresin & Gordon, 2013a). For someone who relies primarily (or solely) on distraction to cope with emotions, self-injury may feel like an appealing next step after lower-intensity strategies fail.

## **Stress management**

The stress management domain of EI overlaps somewhat with the intrapersonal domain, but can be considered a broader construct, since it encompasses a person's overall aptitude to manage stress or other difficult emotions. Given this overlap, many of the empirical findings described above (i.e., those about alexithymia or avoidant coping) are relevant here too. Stepping back to examine stress management more broadly, the literature consistently supports a link between NSSI and poor emotion regulation skills (e.g., Adrian, Zeman, Erdley, Lisa & Sim, 2011; Gratz & Roemer, 2008; Jenkins & Schmitz, 2012). Self-injurers tend to have higher emotional reactivity –experiencing more frequent, intense and lasting emotional reactions (Gratz & Roemer, 2004; 2008) – and struggle to manage those reactions.

Studies supporting the ECM point to the association between NSSI and fluctuating waves of escalating emotions (e.g., Selby et al., 2013; Tuna & Bozo, 2014). In a recent experience-sampling study (Selby et al., 2013), the interaction over two weeks between *instability* in rumination and *instability* of negative affect (i.e., “cascades” of these phenomena) significantly predicted NSSI, with the strongest effects for the interaction between instability in sadness and in rumination about the past. The individuals most at risk for NSSI are those who feel a lack of control over the levels of rumination and sadness they experience on a moment-to-moment basis.

There is evidence that individuals with borderline personality disorder (BPD), who often engage in NSSI and wrestle with emotion regulation difficulties, have lower trait EI, and that this stems largely from deficits in the stress-management domain (Gardner &

Qualter, 2009; Leible & Snell, 2004; Petrides, Perez-Gonzalez & Furnham, 2007; Sinclair & Feigenbaum, 2012). For example, global trait EI showed a strong negative correlation with self-reported severity of BPD symptoms in an adult sample, and showed a positive correlation with emotion regulation and mindfulness skills (Sinclair & Feigenbaum, 2012). Poor emotion management and emotional understanding, in particular, have been associated with a range of BPD symptoms (Gardner & Qualter, 2009). Though BPD and NSSI are not synonymous, self-injury does often occur in the context of BPD, and thus the association between low EI and BPD symptom severity suggests that EI deficits, especially those relating to emotion regulation, are key to understanding NSSI.

Empirical research with adolescents echoes findings in the broader NSSI literature, suggesting that struggles with emotion regulation are a primary problem in adolescents who self-injure. For example, emotion dysregulation has been found to mediate the influence of family- and peer-related interpersonal problems on adolescents' risk of engaging in NSSI (Adrian et al., 2011). Adolescents' use of emotion-focused coping, as opposed to problem-focused coping, has been found to mediate the path from psychopathology to NSSI in adolescents (McMahon et al., 2013). Specifically, higher levels of psychopathology were associated with higher levels of emotion-focused coping, which in turn were associated with a higher risk for self-harm (McMahon et al., 2013). Similarly, in an inpatient adolescent sample, self-reports of limited emotion regulation abilities accounted for a significant portion of NSSI variance, even after controlling for other relevant variables (Perez, Venta, Garnaat, & Sharp, 2012).

NSSI serves, then, as a powerful yet ultimately maladaptive means of regulating perceived volatile, overwhelming, and uncontrollable emotions. There is also evidence that NSSI helps regulate a range of affective-cognitive processes beyond that of dampening aversive emotions. A laboratory study found that a painful stimulus (an NSSI proxy) helped college students regulate their emotional *valence* (i.e., to “feel better” as they shifted from negative emotions to positive emotions) in addition to emotional *intensity* (Franklin et al., 2010). The NSSI proxy also aided cognitive processing (i.e., helped participants think more clearly or rationally about a stressor).

### **Interpersonal emotional intelligence**

Interpersonal EI is a more loosely defined construct in Bar-On’s model. It encompasses caring about and relating to other people, as well as understanding others’ emotions. In this sense, interpersonal EI includes an aptitude for empathy (Kim et al., 2012) and for broader social skills. Given the broadness of this construct, the empirical ties to NSSI are less cohesive than those for intrapersonal EI, but are still notable.

Adolescents who self-injure appear to struggle to relate emotionally to others. They rate themselves as having worse social skills (Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010) and report lower self-efficacy in social problem-solving (e.g., Nock & Mendes, 2008). Moreover, erratic or unfulfilling relationships are also associated with NSSI, both cross-sectionally (e.g., Claes et al., 2010) and prospectively (Yates, Tracy & Luthar, 2008; You, Leung & Fu, 2012).

A sense of interpersonal isolation or rejection – which could stem from low interpersonal EI – is also consistently associated with NSSI. For example, adolescents

and young adults who self-injure report higher levels of attachment-related anxiety and lower levels of perceived family and peer social support (Heath, Ross, Toste, Charlebois, & Nedecheva, 2009; Tatnell, Kelada, Hasking, & Martin, 2013). Moreover, they report having fewer people from whom they feel comfortable seeking advice (Evans et al., 2005; Muehlenkamp et al., 2013). Some also cite a desire for peer acceptance as a motive for NSSI (Muehlenkamp et al., 2013), which suggests a lack of other perceived ways of connecting to peers (i.e., low interpersonal EI). Interestingly, college students cited interpersonal reasons for NSSI more often as reasons to *initiate* NSSI, whereas emotion regulation reasons were more closely associated with repeated NSSI (Muehlenkamp et al., 2013).

Interpersonal functions of NSSI are likely to have the strongest pull for adolescents whose other means of emotional expression are more limited. Hospitalized adolescents endorsing higher levels of internalized anger (i.e., anger not expressed externally) were more likely to report engaging in NSSI to “express frustration” or to “express anger/revenge,” in comparison to their peers with lower levels of internalized anger (Nixon et al., 2002). NSSI may seem like an appealing way to express anger for adolescents who struggle to express intense emotions more adaptively. Relatedly, adolescent girls who report higher interpersonal distress, as measured by levels of peer victimization, are more likely to report engaging in NSSI for social functions (Hilt et al., 2008). Moreover, self-reported quality of peer communication moderated the relationship between peer victimization and NSSI, such that girls were more likely to engage in NSSI if they reported poorer peer communication (Hilt et al., 2008).

Interestingly, in one study of self-injuring women, social functions of NSSI were negatively associated with expressive suppression (Turner et al., 2012), suggesting that individuals who derive social reinforcement from NSSI are not reticent in expressing their emotions. Still, comfort in expressing emotions is not synonymous with *effective* emotional expression. Indeed, this study also found that interpersonal influence functions of NSSI were positively associated with domineering/controlling and intrusive/needy personality styles, and that interpersonal communication functions were positively associated with vindictive or self-centered interpersonal styles (Turner et al., 2012).

Despite this converging evidence for low interpersonal EI in relation to NSSI, it also seems plausible that individuals who self-injure for social functions – many of whom are acutely tuned into others' reactions to their NSSI – might in fact be skilled at reading others' emotions (an aspect of Bar-On's Interpersonal EI scale). Empirical research, however, does not appear to have explored this question. An investigation of whether self-injuring adolescents are interpersonally savvy in this manner would enhance our understanding of the social correlates of NSSI.

Poor interpersonal EI may also exist alongside other types of EI deficits, each interacting with the other and co-contributing to a person's motives for self-injury. Someone who experiences more interpersonal distress and also lacks the ability to self-regulate is likely to be at the highest risk for using maladaptive coping skills such as NSSI (Muehlenkamp et al., 2013). For example, low social support has been shown to interact with emotional dysregulation to predict NSSI in a female adolescent inpatient sample (Adrian et al., 2011).

## **Adaptability**

Lastly, the adaptability domain of EI captures flexibility and problem-solving self-efficacy, i.e., perceived confidence in responding to change and solving problems. Less empirical research links this aspect of EI to NSSI, but several studies do support the association. In one study, adolescent self-injurers, compared to non-self-injurers, showed specific impairments in social problem-solving abilities. When asked to generate solutions to socially challenging situations, self-injurious adolescents did not show deficits in the quantity or quality of the solutions they generated, but were more likely to select maladaptive responses from their list, and reported lower self-efficacy in their ability to implement adaptive solutions (Nock & Mendes, 2008). This suggests that self-injurious adolescents can think of effective solutions, given ample time. Their problem-solving deficits may be specific to *confidence* in problem-solving and aptitude in *choosing* optimal solutions when distressed, rather than actually generating options (Nock & Mendes, 2008). Relatedly, self-injurers in a young adult male inmate sample reported lower perceived control over solving their problems (Haines & Williams, 1997). Further, deficits in “optional thinking ability,” or the ability to generate alternate solutions to interpersonal problems, were found to predict repeat incidents of NSSI in a sample of individuals who presented to a hospital emergency room (McAuliffe, Corcoran, Hickey, & McLeavy, 2008). Overall, youth who self-harm may perceive that NSSI is the most accessible or satisfying solution to their problems.

Avoidant coping – discussed earlier in relation to intrapersonal EI – falls under the umbrella of emotion-focused coping (i.e., a tendency to cope by reacting to acute

emotions), which stands in contrast to problem-focused coping. This difficulty accessing problem-focused coping skills is relevant to the adaptability facet of EI. NSSI is associated with a lack of problem-focused coping, or efforts to directly address the underlying cause of distress, for example through seeking social support (e.g., Andover, Pepper & Gibb, 2007; Evans et al., 2005; Nock & Mendes, 2008; Wester & Trepal, 2008). Given the reinforcing properties of NSSI, it is often effective at solving the short-term problem of aversive emotions, but ineffective at resolving longer-term problems. In fact, NSSI rarely addresses long-term problems at all. Someone who becomes increasingly reliant on the short-term fix of NSSI may begin to believe that longer-term solutions are out-of-reach, and that self-injury is a way to exert control in the face of broader helplessness. Corroborating this, one study showed that repeated NSSI (versus one-time NSSI) was most strongly associated with “passive-avoidant” problem-solving, which involves avoiding or resigning oneself to a problem (e.g., “trying to avoid difficult situations as much as possible”) and feeling helpless, pessimistic and overwhelmed by it, rather than changing one’s perception or emotional reaction to it (“being totally preoccupied with problems”) (McAuliffe et al., 2006). High scores in “active handling” problem-solving were, meanwhile, associated with lower risk of repeated NSSI. In sum, research suggests that individuals who self-injure are often less adept at resolving problems and have lower confidence in their ability to do so.

### **A need for longitudinal research**

As is evident, substantial research suggests that all facets of Bar-On’s model of EI are associated with NSSI. Most studies, however, have been cross-sectional (Guerreiro et al.,



2013). It is therefore unclear whether NSSI is an outcome, a cause, or merely a correlate of poor EI. Teens may initially turn to self-injury because they lack the EI skills to regulate distress in other ways. Engaging in self-injury may, however, also contribute to *future* poor coping, as its reinforcing nature prevents adolescents from learning more effective ways to navigate their emotional worlds. Alternatively, the effects may be reciprocal, with reliance on NSSI exacerbating poor EI, and vice versa. Numerous researchers have called for longitudinal studies on the ties between NSSI and many EI-related coping skills to clarify the direction of these effects (e.g., Brown et al, 2007; Evans et al, 2005; Guerreiro et al. 2013; Guerry & Prinstein, 2010; Hasking et al., 2010; Hilt, Cha & Nolen-Hoeksema, 2008; Nock & Mendes, 2008).

Perhaps heeding this call, a small but growing number of longitudinal studies have begun to explore the association between other psychosocial factors as they relate to NSSI over the course of time, with illuminating results. For example, researchers have explored the role of peer and family relationships (Glenn & Klonsky, 2011; Hankin & Abela, 2011; Hilt, Nock, Lloyd-Richardson & Prinstein, 2008; Prinstein et al., 2010; Yates, Tracy & Luthar, 2008; You, Leung & Fu, 2012), bullying (Fisher, 2012), depressive emotions and thought patterns (Guerry & Prinstein, 2010; Hankin & Abela, 2011; Marshall, Tilton-Weaver & Stattin, 2013), negative emotions and temperament (Chapman, Derbridge, Cooney, Hong & Linehan, 2009), and maternal depression (Hankin & Abela, 2011), with results suggesting some longitudinal associations between these variables and NSSI. In one study, however, the only variables to prospectively predict NSSI in young adults over the course of one year were participants' past

engagement in NSSI, their forecast of future NSSI, and BPD features (Glenn & Klonsky, 2011), leading the authors to suggest that many of the cross-sectional correlates of NSSI may not hold substantial predictive power. In adolescents, NSSI history improved prediction of future NSSI beyond participants' behavioral forecasts, while the reverse was not true (Janis & Nock, 2008).

Only a handful of these longitudinal studies directly capture variables related to EI. As described above, repeated NSSI over the course of a year has been associated with higher use of passive-avoidant problem-solving (McAuliffe et al., 2006), which taps into the adaptability component of EI. One study in a community sample of Australian adolescents explored the role of emotional suppression, which is an aspect of intrapersonal EI (Andrews et al., 2013). In this study, those who continued to use NSSI over the course of one year demonstrated higher levels of emotional suppression and lower levels of cognitive reappraisal, in comparison to those who stopped self-injuring. This echoes and extends cross-sectional research on experiential avoidance in NSSI (e.g., Howe-Martin et al., 2012), suggesting that teens who tend to push away aversive emotions are more likely to continue using NSSI to cope. Moreover, teens who have difficulty reframing a situation in a way that sets the stage for problem-solving (i.e., who have low adaptability) may also fail to find alternatives to NSSI. In another study of the same Australian adolescent sample (Tatnell et al., 2013), self-esteem, self-efficacy and cognitive reappraisal mediated the relationship between attachment anxiety and NSSI onset. Notably, emotion regulation was not a significant mediator. In contrast, in a four-year longitudinal study in college students, affective dysregulation, among other factors,

independently predicted past-year NSSI (Wilcox et al., 2012). Though these longitudinal studies provide an initial lens into the role of EI-related factors in the trajectory of NSSI, they do not explain the ongoing interaction over time. Further longitudinal research, in which relevant predictors and NSSI are each measured at several time points, can help clarify these relationships. Such research would be especially illuminating in clinical samples of adolescents, given their elevated risk for NSSI.

### **Social Context: Child maltreatment and Parental Psychopathology**

Notably, the relationship between EI and NSSI develops within a social context. The parenting environment is especially important in influencing the development of adolescents' socioemotional and behavioral functioning. Both child maltreatment and parental depression may contribute to the relationship, as they both play roles in the social-emotional development of an adolescent.

#### **Child maltreatment**

Child maltreatment, which includes sexual and physical abuse and neglect, is a key interpersonal stressor with documented associations with NSSI (Lang & Sharma-Patel, 2011). This association extends to frequency (and not just presence) of maltreatment and NSSI. In one study, Italian adolescents with more frequent NSSI reported higher levels of sexual and physical abuse and neglect (Di Pierro, Sarno, Perego, Gallucci, & Madeddu, 2012). Across the literature, retrospective data suggest that child maltreatment is associated with self-injurious behavior, above and beyond the influence of other risk factors.

Childhood sexual abuse, in particular, has been examined frequently in relation to NSSI, though results are inconsistent (Lang & Sharma-Patel, 2011). One study suggests that while sexual abuse, but not physical or psychological abuse, is independently associated with NSSI, the co-occurrence of sexual and non-sexual abuse has the strongest association (Briere & Gil, 1998). A longitudinal study of adolescents and young adults (up to age 26) suggested that childhood sexual abuse predicted recurrent self-injury, whereas physical abuse predicted intermittent self-injury (Yates, Carlson, & Egeland, 2008). There is some evidence that sexual abuse incurs a direct risk on the likelihood of self-harm behaviors, above and beyond the contribution of depression (Gladstone et al., 2004). Still, a meta-analysis by Klonsky and Moyer (2008) did not support a direct causal link between sexual abuse and self-injury. These authors note that conclusions about causality are limited by the dearth of longitudinal studies.

Though fewer studies have explored the link between childhood physical abuse and NSSI, retrospective data in adults generally suggest an association (e.g., Brodsky, Cloitre, & Dulit, 1995; Matsumoto et al., 2004; van der Kolk, Perry & Herman, 1991; Weiderman, Sansone, & Sansone, 1999). Research on the role of childhood emotional abuse and neglect is more mixed, though again there is some evidence that it relates independently to NSSI (e.g., Gratz, Conrad & Roemer, 2002; Glassman, Weierich, Hooley, Deliberto & Nock, 2007). In a study of inpatient adults with BPD, emotional neglect was the strongest predictor of self-injury (Dubo, Zanarini, Lewis, & Williams, 1997). In another adult BPD sample, emotional neglect was the most powerful predictor of continued self-harm at follow-up (van der Kolk et al., 1991).

Overall, the observed relationships between abuse and NSSI are mixed (Muehlenkamp, Kerr, Bradley, Larsen 2010). Moreover, the precise pathway linking child maltreatment to the development of NSSI is unclear. Some authors have posited that mediational models may be apt, and in particular that emotion regulation may be a mediator in the abuse-NSSI pathway, given ties from emotion regulation to both abuse and NSSI (Muehlenkamp et al., 2010).

Indeed, Yates (2004; 2009) has proposed a developmental psychopathology model that frames NSSI as an adaptation to childhood trauma. Specifically, this model posits that child maltreatment disrupts the adaptive development of self-regulatory skills, and that self-injury therefore develops as a compensatory regulatory strategy. Yates (2004) outlined five interacting levels of competence that are thwarted by the experience of abuse. First, at the *motivational* level, a competent child learns to rely on others and is motivated to seek social connections, while an abused child is less likely to trust and want to connect to others. Second, *attitudinal* competence, which shapes self-image and self-esteem, develops as a child views him/herself as worthy of care; abuse mars this view. Third, a child develops *instrumental* competence by learning to elicit support; this process is disrupted for a child whose efforts are ignored or punished. Fourth, a child with *emotional* competence learns to flexibly manage emotional arousal. This process, too, is strained for a child whose emotional needs are often invalidated. Fifth, *relational* competence, i.e., social reciprocity and empathy, is hindered by maltreatment.

Yates (2009) further described three primary pathways that are shaped by early caretaking exchanges: regulatory, representational (interpersonal), and reactive. In

reviewing the literature, Lang and Sharma-Patel (2011) posited that the regulatory pathway is the most critical, given that affect regulation is the most common function of NSSI. They write, “Child maltreatment may [...] grant youth high affect regulation and interpersonal needs, and simultaneously undermine development of healthy skills for satisfying those needs” (Lang & Sharma-Patel, 2011, p. 29).

Consistent with this theoretical model, EI is an under-studied construct that may capture many of the coping deficits that affect the abuse-NSSI pathway. There is some evidence for relevant mediators such as alexithymia (e.g., Paivio & McCullough, 2004; Swannell et al. 2012), dissociation (Gratz et al. 2002; Rallis, Deming, Glenn, & Nock, 2012; Rodriguez-Srednicki, 2011; Swannell et al., 2012; Yates & Carlson et al., 2008), self-criticism (Glassman et al., 2007), and self-blame (Swannell et al., 2012). One study found that the mediating role of emptiness/dissociation is unique to those who self-injure for automatic-positive reinforcement (Rallis et al., 2012). Affective dysfunction has been shown to moderate the relationship between emotional abuse and features of borderline personality disorder (including self-injury) in young teens (Gratz, Latzman, Tull, Reynolds & Lejuez, 2011). Similarly in a clinical adult sample, self-injurers who also reported a history of child abuse showed the greatest impairment in three types of “self capacities” – affect tolerance, self-worth, and connectedness (Deiter, Nicholls, & Pearlman, 2000). One research group (Muehlenkamp et al., 2010) explored the potential for unique pathways from different abuse types to NSSI, and found that self-injuring college students reported poorer emotion regulation, compared to non-self-injurers, if they had a history of physical abuse or of both physical and sexual abuse, but not of

sexual abuse alone. Only one study has explicitly explored EI in the pathway from child maltreatment to suicide-related outcomes, with evidence that EI moderates the relationship, acting as a protective factor (i.e., moderator) (Cha & Nock, 2009). Notably, this study explored suicidal thoughts and attempts, which is distinct from NSSI.

In each case, the authors hypothesize that child maltreatment impedes the emotional socialization process, consistent with theoretical models of trauma-induced deficits in adaptive development (Yates 2004, 2009; Lang & Sharma-Patel, 2011). For example, Glassman and colleagues (2007) posit that emotional abuse could lead to a tendency to internalize self-directed criticism and, in turn, engage in NSSI as a form of self-punishment in the face of stressful events. Maltreated children have been shown to have a poor understanding of negative affect (e.g., Shipman, Zeman, Penza, & Champion, 2000), though this deficit in EI has not yet been empirically linked to NSSI.

Notably, nearly all of this research is cross-sectional, limiting causal inferences (Klonsky & Moyer, 2008). An exception is a study by Yates, Carlson, and colleagues (2008), which found that dissociation was the only significant mediator between child maltreatment and recurrent self-injurious behavior in adolescents. Further longitudinal research can help clarify gaps in the EI profile of adolescents who have experienced maltreatment, especially in relation to the trajectory of NSSI over time.

### **Parental psychopathology**

Similar to those with a maltreatment history, adolescents whose parents struggle with mental illness, and with depression in particular, may be more vulnerable to developing lower EI and in turn resorting to maladaptive coping strategies such as NSSI. Parental

psychopathology is a well-established risk factor for a range of adolescent mental health problems (e.g., Biederman et al., 2001; Cummings, Keller & Davies, 2005; Goodman & Gotlib, 1999; Hammen & Brennan, 2003; Lewinsohn, Olino & Klein, 2005). Parental depression, especially, increases adolescents' vulnerability to both internalizing and externalizing disorders (Goodman et al., 2011), contributing to earlier onset of mood disorders (Weissman et al., 1987) and wide-ranging impairment in adolescence (Weissman, Warner, Wickramaratne, Moreau & Olfson, 1997). Children of depressed parents are also at increased risk for suicidal behavior (King, Kerr, Passarelli, Foster & Merchant, 2010), particularly if a parent completed or attempted suicide (Christiansen, Goldney, Beautrais, & Agerbo, 2011). Though part of this association is genetic, parenting behaviors also play a role (e.g., Eley et al., 2004).

A handful of studies have explored the relation between parents' and children's mental health with NSSI as a specific outcome, though the associations are inconsistent. For example, maternal depression prospectively predicted adolescent NSSI in some studies (Hankin & Abela, 2011; Wilcox et al., 2012), but not in others (Deliberto & Nock, 2008; Esposito-Smythers et al., 2010). A family history of impulsivity-related disorders may pose a particular risk for the development of NSSI, as suggested by a study in which adolescents who engaged in NSSI had a higher family history of substance abuse, violence and suicidal ideation (Deliberto & Nock, 2008). This association may stem partly from the genetic transmission of impulsivity and self-regulatory capacity (Eisenberg Spinrad, Eggum, 2010), but may also arise because parents with impaired impulse-control skills are less able to impart adaptive emotion regulation tactics to their



children (Deliberto & Nock, 2008). Relatedly, genetically predisposed teens are most likely to self-injure if their family environment is high in negativity and conflict (Crowell et al., 2008).

Overall, parents in frequent psychological distress may be less able to offer emotional support or to teach effective ways of understanding, expressing or managing emotions, thus hindering the development of EI in their offspring. Adolescents with stunted EI may then, as described earlier, be more likely to turn to NSSI to cope with distress. There is evidence that emotion-related parenting behaviors, such as responses to children's emotions (Eisenberg, Fabes, & Murphy, 1996; Eisenberg et al., 2005), parents' own emotional expression (Valiente et al., 2006), and direct emotional instruction or discussion (Gottman, Katz, & Hooven, 1996) play a role in the development of children's approach to managing emotions (for reviews on the socialization of emotion regulation, see Eisenberg et al., 2010; Morris, Silk, Steinberg, Myers & Robinson 2007). Each of these processes may be impaired in parent-child dyads containing a depressed parent.

First, depression can interfere with a parent's ability to respond attentively and warmly to a child's emotional needs. Sensitive, warm, and supportive parental responses to children's emotions are associated with stronger self-regulatory capacities in children and adolescents (Eisenberg et al., 2010); in turn, deficits in this responsiveness are associated with regulatory deficits in children. Parents' reactions to their children's affect provide valuable information about the meaning and appropriateness of emotions. Parents with depression, who are less warm and consistent in these reactions, may send confusing or damaging messages. Depressed mothers display different patterns of interactions with

their children (Goodman & Gotlib, 1999). For example, they display more anxious, sad and irritable affect (e.g., Foster, Garber, & Durlak, 2008; Radke-Yarrow, Nottelman, Belmont, Welsh, 1993); are more punitive, controlling and retaliatory (e.g., Cummings et al., 2005); and are less responsive to their children's emotional presentation and less likely to match their children's affect (e.g., Field, Healy, Goldstein, & Guthertz, 1990). Parental depression is also associated with less secure parent-child attachment (e.g., Teti, Gelfand, Messenger, & Isabella, 1995), which, in turn, is associated with disruptions in emotion-regulation abilities in offspring (Brenning, Soenens, Braet, & Bosmans, 2012; Cassidy, 1994; Kobac & Sceery, 1988) and with social skills and relational competence in adolescents (Contreras, Kerns, Weimer, Gentzler, & Tomich, 2000; Engels, Finkenauer, Meeus, & Dekovic, 2001).

Second, depressed parents may experience deficits in their own emotion regulation skills (Gross & Muñoz, 1995), thus affecting their emotional expression and limiting their ability to model, teach or reinforce adaptive strategies. There is evidence that from a young age, children look to their parents for information on how to think, feel, and respond to a situation; this process is called social referencing (Saarni, Mumme, & Campos, 1998). Parents who display a wider range of emotions and emotion-regulation approaches impart information about the appropriateness of these reactions in different settings (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997). Depressed parents, meanwhile, may model or teach more restricted and less effective emotional responses, thus limiting their children's own repertoire of emotional intelligence strategies.

Empirical research supports the disruption of emotion-regulation socialization in offspring of depressed parents. Children of depressed mothers, and especially daughters, exhibit a more passive style of regulating emotions than do children of non-depressed mothers (Garber, Braafladt, & Zeman, 1991; Silk, Shaw, Skuban, Oland & Kovacs, 2006). For example, depressed mothers and their children generated fewer and less effective (per independent raters) strategies for regulating affect when presented with hypothetical scenarios (Garber et al., 19991). In an observational study of children ages 4-7, the child's gender interacted with the mother's depressive symptomology, such that daughters of depressed mothers were more likely to use passive waiting strategies and less likely to use active distraction strategies during a distressing task (waiting to receive a cookie or toy that was within sight) (Silk, Shaw, Skuban, et al., 2006). In a related study, this research group (Silk, Shaw, Forbes, Lane & Kovacs, 2006) found that emotion regulation moderated the relationship between maternal depression and young children's internalizing symptoms. This seems relevant to the development of NSSI, which often occurs in the context of internalizing symptoms. No research, however, has investigated the role of social-emotional intelligence as it relates to parental depression and NSSI in particular.

Though they did not explore parental depression per se, Wedig and Nock (2007) explored the pathway to NSSI from a behavior that may surface in depressed parents: expressed emotion (EE). In this community adolescent sample, EE – a communication style characterized by criticism/hostility and emotional over-involvement – was associated with adolescent NSSI (among other self-injurious behaviors), with the

relationship explained entirely by the role of parental criticism (Wedig & Nock, 2007). Self-criticism moderated this relationship, such that the influence of parental criticism was especially powerful in predicting NSSI in adolescents who had a self-critical cognitive style (Wedig & Nock, 2007). This suggests that harsh parenting behaviors exert the strongest influence on the development of NSSI in adolescents who are harshest with themselves. Since adolescents' social-emotional intelligence may affect their levels of self-criticism in the face of overwhelming emotions, this study suggests a possible mediating role of EI in the pathway from parenting behaviors to NSSI.

Most research on the role of parental depression in the development of offspring's emotion regulation has focused on young children, rather than adolescents, leaving questions about how this process changes as children grow older (Morris et al, 2007). In comparison to younger children, whose parents might directly intervene in moments of emotional distress, adolescents are more independent in regulating and managing their own emotions (Morris et al., 2007). Moreover, adolescents are more likely to look to peers as guides (e.g., Zeman & Shipman, 1997). Still, adolescents are likely to continue to refer to parental cues and internalized messages from earlier childhood (Morris et al., 2007). Given the lack of research on the development of social-emotional intelligence in adolescence, especially as it relates to parental mental health and to NSSI, research on the potential mediating role of EI in the pathway from parental psychopathology to adolescent NSSI would be valuable.

### **A need for research**

Emotional intelligence is a construct that may capture several intra- and interpersonal coping skills that are relevant to NSSI. The broader literature on coping and NSSI supports a pattern of avoidant coping and suggests that NSSI may help someone escape or regulate unwanted emotions. Most studies of NSSI and coping have been cross-sectional, and have involved a majority of female and Caucasian participants. Longitudinal research with more diverse samples could help clarify the directionality of EI deficits and presence and frequency of NSSI over time.

Moreover, given the social context in which NSSI develops, research on EI as it relates to family-related risk factors for NSSI could be illuminating. EI may be lower in adolescents whose social learning has been compromised as a result of child maltreatment or parental psychopathology. These adolescents with lower EI may, in turn, be more likely to use NSSI to cope with emotional distress, particularly that fostered by an invalidating environment, given the broader literature on NSSI that supports a pattern of maladaptive avoidant coping. Research is needed to explore the potential mediating role of EI in the longitudinal pathway from family-related risk factors to NSSI.

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## **BIOGRAPHY**

Alexandra Perloe received her Bachelor of Arts from Brandeis University in 2006, with a major in psychology and minor in Spanish Language and Literature. She was employed as a newspaper reporter in Fitchburg, Massachusetts, for one year, as a psychology research assistant at Massachusetts General Hospital for one year, and as a clinical educator in the adolescent acute residential treatment program at McLean Hospital in Belmont, Massachusetts, for two years. She earned her Master of Arts in clinical psychology from George Mason University in 2012.