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Childhood maltreatment, mental health, and responses to psychosocial stress in young adults: the role of emotion regulation strategies

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CHILDHOOD MALTREATMENT, MENTAL HEALTH, AND RESPONSES TO PSYCHOSOCIAL STRESS IN YOUNG ADULTS: THE ROLE OF EMOTION REGULATION STRATEGIES

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CHILDHOOD MALTREATMENT, MENTAL HEALTH, AND RESPONSES TO PSYCHOSOCIAL STRESS IN YOUNG ADULTS: THE ROLE OF EMOTION REGULATION STRATEGIES

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ABSTRACT

Childhood maltreatment predicts mental health problems and stress responses. To design better intervention/prevention programs, it is important to explore mechanisms that may mediate those relationships. Some evidence indicates that emotion regulation strategies (suppression and reappraisal) may play this role. Using self-report, observational, and biological measures and stress manipulation in female and male college students (Study 1: *N*=267; Study 2: U.S.= 264; Korean=211; Study 3: *N*=211), I tested the following hypotheses: Study (1) habitual suppression and reappraisal strategies will mediate the relation between childhood maltreatment and perceived stress; Study (2) parental emotional neglect will be positively associated with habitual suppression and internalizing problems, and negatively associated with habitual reappraisal, in both U.S. and Korean participants; Study (3) childhood maltreatment will be associated with heightened physio-emotional responses to the Trier Social Stress Test, mediated by spontaneous suppression and reappraisal.

In Study 1, partially supporting my hypotheses, habitual suppression and reappraisal mediated the relationship between self-reported maternal/paternal emotional neglect and perceived stress, though in females only; habitual suppression also mediated the relationship between maternal psychological maltreatment and perceived stress in females. In Study 2, structural equation modeling revealed that, as hypothesized, in both countries parental emotional neglect was positively associated with internalizing problems and negatively associated with habitual reappraisal; habitual reappraisal was negatively associated and habitual suppression was positively associated with internalizing problems. The positive association between parental emotional neglect and suppression was significant only in U.S. participants. In Study 3, partially supporting hypotheses, childhood maltreatment was associated with lower spontaneous reappraisal, higher negative affect at stress-test baseline, and higher behavioral expression during recovery; spontaneous suppression and reappraisal were associated with reduced emotional responsivity. Contrary to hypothesis, no mediating roles for spontaneous suppression and reappraisal were found.

Together, results showed that habitual use of some emotion regulation strategies can mediate the relation between childhood maltreatment and later perceived stress (at least in females) and internalizing problems; habitual suppression mediates the association between parental emotional neglect and internalizing problems in U.S. young adults; and childhood maltreatment is related to emotional and behavioral responses to stress and effectiveness of spontaneous reappraisal strategy use during stress.

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BACKGROUND

The U.S. Department of Health and Human Services (Children's Bureau, 2013) reported that in 2012 there were 686,000 child maltreatment victims (9.2 per 1,000 children), according to the National Data Archive on Child Abuse and Neglect (NDACAN). Of those child victims of maltreatment, almost half of them (44%) were white, 21.8% were Hispanic, and 21% were African American; in 36.6% of the cases, the mother was the perpetrator, in 18.7%, the father was the perpetrator. According to the Children's Bureau report in 2013, girls are most often victims of abuse (9.5 per 1000) in the U.S. Among those children reported for childhood maltreatment, 78.3% experienced neglect, 18.3 % experienced physical abuse, 8.5% experienced psychological maltreatment, and 19.9% experienced other types of maltreatment (some children reported having more than one type of abuse). Unfortunately, as of 2016, the data showed that the rate of child maltreatment changed little over the preceding ten-year period (Child Trends, 2016). These data signal the urgent need for more research on childhood maltreatment epidemiology and the importance of a commitment from psychologists to pursue research that can inform intervention/prevention programs and policy-makers concerned with the effects of childhood maltreatment.

Within the field of childhood maltreatment, a differentiation is often made between parental emotional neglect and parental abuse (physical, psychological, and sexual). Parental emotional neglect is defined as parental practices "not meeting the child's development or emotional needs, including inadequate nurturance or affection" (Korbin & Krugman, 2014, p.30-31). Parental physical maltreatment is generally defined

as “the presence of a non-accidental injury resulting from acts of commission by an adult” or “acts of commission that involve either demonstrable harm or endangerment to the child” (NCCAN, 1988). Parental psychological maltreatment is conceptualized as “intentionally eliciting feelings of guilt, shame or fear to serve the emotional needs of the perpetrator; persuading children to perform inappropriate acts; denigrating or destroying things they value; or placing them in harmful situations, such as witnessing interpersonal violence” (Teicher et al., 2016, p.652). Past research has shown that childhood maltreatment during developmentally sensitive periods has many deleterious outcomes such as depression (e.g., Khan, et al., 2015), suicidality (e.g., Briere, Madni, & Godbout, 2016), psychiatric disorder (e.g., Keyes et al., 2012), physical health problems (e.g., Widom, Czaja, Kozakowski, & Chauhan, 2018), and increased susceptibility to posttraumatic stress disorder (PTSD) (e.g., Gilbert et al., 2009).

Researchers have proposed different theories and tested many factors to explore the mechanisms that explain the associations between childhood maltreatment and negative developmental outcomes in adults. Some studies revealed that childhood maltreatment may cause reduced hippocampal volumes (e.g., Dannolowski et al., 2012) or alter trajectories of brain development in ways that affect sensory systems, emotion regulation, and reward anticipations (Teicher et al., 2016). Longitudinal studies of gene-environment interactions revealed that child adversity interacts with genotypes in predicting mental health problems (e.g., Caspi et al., 2003). Data from developing countries also revealed negative consequences of childhood maltreatment for later mental health (e.g., Fry, McCoy, & Swales, 2012). For example, studies with Asian adult

samples found associations among childhood maltreatment, health-risk behaviors, and chronic diseases (e.g., Ramiro, Madrid, & Brown, 2010), personality disorders and aggression (e.g., Liu et al., 2011), and interpersonal problems and depression (e.g., Lee & Kim, 2011).

Motivation for the Current Research

Although many studies have found that childhood maltreatment predicts later mental health problems, most of them treated childhood maltreatment as a wholistic, undifferentiated variable; relatively few studies examined multiple types of childhood maltreatment from mothers and fathers separately and the potentially varying associations of those different types with developmental outcomes. Increasingly, however, researchers are finding that the effects of maltreatment on developmental outcomes vary by types of maltreatment and gender of both perpetrators and victims (e.g., Ashy et al., 2017).

In Western samples, there is evidence that, compared to other forms of childhood maltreatment such as physical abuse, parental emotional neglect is associated with more cognitive deficits (De Bellis, Hooper, Spratt, & Woolley, 2009), dysfunctional attachment styles (Gauthier, Stollack, Messe, & Arnoff, 1996), internalizing problems (Hildyard et al., 2002), and personality disorders (e.g., Tyrka, Wyche, Kelly, Price, & Carpenter, 2009). Thus, based on the high prevalence of emotional neglect and evidence of its negative effects on developmental outcomes, one of the studies for this dissertation focused specifically on parental emotional neglect as a predictor of perceived stress, and the other two studies included emotional neglect along with the more traditionally-studied types of maltreatment (psychological and physical maltreatment) in relation to

later mental health symptoms and stress responses to acute stress separately. Moreover, most of the previous studies focused on the long-term effects of childhood maltreatment on selected mental health problems, but few examined systematically the extent to which different types of maltreatment are directly associated with stress responses, including physiological responses, emotional responses, and behavioral expressions (observer-rated), during psychosocial stress tests. The third study of this dissertation filled this gap.

Second, there is a growing literature identifying mediators that can help explain the path from childhood maltreatment experience to mental health problems and stress responses. Among the psychological processes that might serve as potential mediators are emotion regulation strategies. Emotion regulation, as defined by Gross (2004, p.282) is "the process by which we influence which emotions we have, when we have them, and how we experience and express them." According to Gross's process model of emotion regulation, emotion can be regulated at five different points: selection of the situation, modification of the situation, deployment of attention, change of cognition, and modulation of the situation (Gross, 1998). ER strategies fall into two categories based on when they occur during the emotion-generative process: antecedent-focused emotion regulation and response-focused emotion regulation. Gross proposed that the antecedent-focused regulation strategies, such as reframing the situation, act early in the emotion generative process. They aim at changing a situation cognitively and appear to be adaptive (e.g., Gross & Thompson, 2007; Schutte, Manes, & Malouff, 2009). Response-focused regulation strategies, such as concealing or suppressing feelings, modify emotion responses after they have been triggered. They aim at inhibiting ongoing emotion and

have been viewed as maladaptive (e.g., Gross et al., 2007). Building on the work of Gross et al., 2007 and others, the current study examined the extent to which emotion regulation strategies mediate between different types of childhood maltreatment and mental health problems, including perceived stress, internalizing problems, and responses to acute stress. Moreover, although some studies have examined the association between childhood maltreatment and mental health, no studies have conducted gender-specific analyses of mediators in the relationship between maternal/paternal maltreatment and perceived stress in female and male adults separately.

It has been suggested that spontaneous ER strategies, which are conceptualized as self-motivated and automatic, are influenced by individuals' personal experience, including relationships with parents during childhood (e.g., Mauss et al., 2007; O'Mahen, Karl, Moberly, & Fedock, 2015). Although there are studies revealing associations between emotion regulation strategies and mental health (e.g., Hagan, Roubinov, Mistler, & Luecken, 2014), no studies have systematically tested the mediating effects of ER strategies between different types of childhood maltreatment and mental health problems. Currently, in regard to research examining the effects of ER strategies on stress responses, some studies examined the habitual use of ER strategies and their associations with responses to acute stress (Gross & John, 2003). This type of study involves collecting participants' reports concerning their regularly-used emotion regulation strategies and then instructing the participants to participate in emotion eliciting tasks, such as watching sad, disgusting, or happy movies or pictures; the associations between the habitual ER strategies and stress responses are examined within that context. Other

studies experimentally manipulated the ER strategies participants used during emotion eliciting tasks (with different groups of participants primed to use different types of ER strategy) and then compared the effects of this manipulation across different groups (Werner et al., 2011). However, little is known about the effects of *spontaneous* ER strategies on well-being following social stress; more specifically, few researchers have examined the kinds of strategy participants use to regulate their emotions during a psychosocial social stress test when they have not been given any instructions regarding the strategy to be used. That is, after manipulating stress, only a few previous researchers have asked participants to recall and report the extent to which they used self-motivated suppression and reappraisal strategies during the stress test. Asking about self-generated strategies is different from asking participants about the ER strategies they typically use because the assessment is anchored in a socially stressful context. Asking about self-generated strategies is also different from instructing participants to use particular ER strategies. Thus, to gain a greater understanding of the role of spontaneous emotion regulation strategies in moderating the effects if child maltreatment, in this study, we examined the potential mediating role of spontaneous ER strategies between different types of childhood maltreatment and stress responses during a psychosocial stress test.

In addition to testing for a mediating role of habitual and spontaneous ER strategies, I also examined the mediating role of trait resilience, which has been conceptualized and operationalized as a personality characteristic involving equanimity, perseverance, self-reliance, meaningfulness, and a sense of personal uniqueness (Wagnild & Young, 1993). Although resilience has been shown to be a protective factor against a

number of negative outcomes (Arslan, 2016; Bonanno, 2008; Collishaw et al., 2007), it has not been examined as a potential mediator between childhood maltreatment and later perceived stress with gender-specific analyses.

Third, although child abuse has long been recognized as a pervasive social problem all over the world, a lot of the current conclusions about associations between childhood maltreatment and outcomes are based on Western samples, with relatively little attention to these relationships in Eastern countries. Due to cultural differences in parenting styles, it is possible that some of the associations found in Western samples would be different in Eastern samples (Gabarino, 1996; Lansford et al., 2005; Park, 2010; Tang, 2006). For example, in some Eastern countries, such as China, South Korea, and Japan, talking about personal feelings for parents is viewed as superfluous (Chen et al., 1998). Also compared to European American parents, Asian parents have shown more restraint in vocal expression and less emotional expression (Soto, Levenson, & Ebling, 2005), and are more likely to adopt an authoritarian parenting style, such as using power-assertive, prohibitive, and punitive strategies (Chen, Dong, & Zhou, 1997). This tradition might lead to higher public acceptance of violence against children in Asian countries. For example, some studies with Korean samples indicated that a potential negative effect of childhood abuse on children's development was reduced by relative acceptance of violence (e.g., Lansford et al., 2005; Lansford et al., 2004; Mulvaney & Meber, 2010; Vittrupt & Holden, 2010).

Nevertheless, the existence of different traditions in parenting styles does not mean that the long-term effects of childhood maltreatment on mental health and stress

responses are different across cultures. In fact, some studies have suggested that culture might moderate the strength of associations between parental behaviors and child development rather than producing an entirely different pattern of association (e.g., Chen et al., 2011). On the other hand, as many Eastern societies are becoming more and more westernized, it is possible that the associations between childhood maltreatment and mental health outcomes are getting more similar. However, few studies have included samples from both Eastern and Western countries, and few have made direct comparisons of the extent to which associations between childhood maltreatment and mental health outcomes and the mediating role of emotion regulation strategies between them differ by country.

Finally, many studies of childhood maltreatment have focused on early childhood. However, young adulthood is also a particularly valuable time for investigating outcomes of childhood maltreatment because of findings that this is a period in which the consequences of early childhood adversity, including abuse, may be particularly impactful on psychological problems and stress vulnerability (e.g., Benjet, Borges, & Medina-Mora, 2010; Clark, Caldwell, Power, & Stansfeld, 2010; Herrenkhl, Hong, Kilka, Herrenkohl, & Russo, 2013; Mersky & Topitzes, 2010). Thus, all three studies for this dissertation recruited young samples (both females and males).

Overview of the Current Research

This dissertation consists of three studies examining the associations among different types of childhood maltreatment and mental health symptoms, stress responses to acute stress, and mediators such as habitual use of suppression and reappraisal,

resilience, and spontaneous use of suppression and reappraisal during a psychosocial stress test. In Study 1, with a sample of 183 females and 84 males (college students), I examined gender-specific associations between three types of self-reported childhood maltreatment from both mothers and fathers and perceived stress, as well as the mediating role of habitual use of suppression and reappraisal strategies and resilience, and the moderating role of emotion regulation self-efficacy. In Study 2, I tested the contribution of one specific type of childhood maltreatment – parental emotional neglect during childhood – to later internalizing problems (specifically, trait social anxiety and alexithymia), and the extent to which these associations were mediated by habitual use of suppression and reappraisal. With a cross-cultural college student sample from both the U.S. (*N*=264) and South Korea (*N*=211), this study also examined whether the relationship of emotion regulation with parental emotional neglect and internalizing problems differed between Western and Asian young adults. In Study 3, with a sample of U.S. college students (*N*=211), I examined the associations between different types of childhood maltreatment and dynamic stress responses (including heart rate, emotional responses, and behavioral responses) to the Trier Social Stress Test (TSST) as well as the potential mediating roles of self-reported spontaneous suppression and reappraisal during the TSST in those relationships.

CHILDHOOD MALTREATMENT AND PERCEIVED STRESS IN YOUNG ADULTS: THE ROLE OF EMOTION REGULATION STRATEGIES, SELF-EFFICACY, AND TRAIT RESILIENCE

Past research has shown that childhood maltreatment may result in greater sensitivity to stress and higher perceived stress in adulthood (e.g., Hager & Runtz, 2012; Hyman, Paliwal, & Sinha, 2007) and efforts are underway to identify underlying mechanisms in that relationship. There is some evidence that habitual use of emotion regulation strategies, including suppression (aims at inhibiting ongoing emotion) and reappraisal (aims at changing a situation cognitively) are associated, either positively (in the case of suppression) or negatively (in the case of reappraisal), with later psychopathology (see reviews by Aldao, Nolen-Hoeksema, & Schweizer, 2010; Hu, Zhang, Wang, Mistry, Ran, & Wang, 2014); however, there appears to have been little or no research exploring the potential indirect effect of childhood maltreatment (from both mothers and fathers separately) on perceived stress via suppression and reappraisal in females and males separately.

Research has also shown that the effect of habitual use of emotion regulation strategies on psychopathology is partially dependent on individuals' emotion regulation self-efficacy – that is, on how effective individuals believe they can be in implementing emotion regulating strategies (Goldin, Manber-Ball, Werner, Heimberg, & Gross, 2009; Goldin et al., 2012). Thus, tests of the indirect effect of childhood maltreatment on perceived stress in young adults via emotion regulation strategies might be enhanced by

including tests of the potential interaction effect of emotion regulation self-efficacy and strategies on perceived stress.

Past research has also indicated that trait resilience (a personality trait that contains a cluster of personality characteristics such as personal competence and acceptance of self and life) can be a protective factor in relation to later psychopathology (e.g., Collishaw et al., 2007; Edward, 2005; Graham-Bermann, Howell, & Girz, 2009; Hjemdal, Friborg, Stiles, Rosenvinge, & Martinussen, 2006). For example, some studies showed that resilience mediated the relationship between parental psychological maltreatment and emotional problems in adolescents and also counteracted the tendency of individuals with a maltreatment history to suffer from later depression (Arslan, 2016; Seok et al., 2012; Wingo et al., 2010). Using a gender-specific analytic approach in a retrospective study of college students, Ashy, Gutowski, Samkavitz, and Malley-Morrison (2017) found that both maternal psychological maltreatment and paternal physical maltreatment were predictive of total psychiatric symptomatology in adulthood, with shame mediating the relationship in women and guilt mediating it in men, limbic system symptoms mediating the relationship in both genders. However, few studies have examined the extent to which later vulnerability to perceived stress following childhood maltreatment may be mediated by trait resilience in distinct male and female models. The current study aims at filling this gap.

Childhood Maltreatment and Perceived Stress

Several studies have shown that individuals with a history of childhood maltreatment tend to show a decreased ability to modulate and tolerate aversive

emotional states (e.g., see review by Cicchetti & Toth, 2005), and higher levels of perceived stress (Hyman et al., 2007; Hager et al, 2012). There is also evidence that childhood experience of harsh parenting, early adversity, and childhood maltreatment (such as emotional and physical maltreatment) may affect stress coping styles and alter neurological responses to stress (Bugental, 2004; Heim & Nemeroff, 2001; Thabet, Tischler, & Vostanis, 2004). For example, Hager et al. (2012) found that physical and psychological maltreatment were associated with perceived stress in adults. Cook, Chaplin, Sinha, Tebes and Mayes (2012) found that adolescents who experienced less childhood maltreatment reported less perceived stress and fewer problems at school than those who experienced more childhood maltreatment. In a retrospective, cross-sectional study, Vranceanu, Hobfoll, and Johnson (2007) found that scores on a measure combining multiple forms of childhood maltreatment were positively associated with increased life stress in adult women. However, it appears that no study has examined the extent to which different forms of childhood maltreatment, including psychological and physical maltreatment and emotional neglect from mothers and fathers separately, contribute to later perceived stress.

Emotion Regulation Strategies and Self-Efficacy

Past research showed significant associations between emotion regulation strategies and psychopathology (see reviews by Aldao et al., 2010, and Hu et al., 2014). For example, reappraisal was found to be positively correlated with favorable health outcomes, such as life satisfaction and positive affect (Hu et al., 2014) and negatively associated with psychopathologies, such as alexithymia (e.g., Chen, Xu, Jing, & Chan,

2011; Swart, Kortekaas, & Aleman, 2009). Suppression has been found to be associated with several internalizing symptoms such as anxiety and depression (e.g., Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Llewellyn, Dolcos, Lordan, Rudolph, & Dolcos, 2013; O'Mahen, Karl, Moberly, & Fedock, 2015), and maladaptive behaviors, such as substance abuse (e.g., Fucito, Juliano, & Toll, 2010). In general, reappraisal is viewed as an adaptive emotion regulation strategy while suppression is viewed as a maladaptive strategy.

There is some evidence that experiencing certain forms of parental psychological and physical maltreatment or neglect during childhood can undermine children's development of effective emotion regulation skills and promote ineffective emotion regulation strategies with a long-term influence on mental health (Briere & Jordan, 2009; Hagan et al., 2017; Jennissen, Holl, Mai, Wolff, & Barnow, 2016; Spasojević & Alloy, 2002; Shields & Cicchetti, 2001; Stevens et al., 2013). For example, Buckholdt, Parra, and Jobe-shields (2014) found that adolescents' self-reported perceptions of parent invalidation of emotions through punishment or neglect was associated with emotion dysregulation. O'Mahen et al. (2015) found that childhood emotional neglect was associated with maladaptive emotion regulation strategies, such as behavioral avoidance and rumination. However, to our knowledge, no studies have examined the mediating role of suppression and reappraisal between multiple types of childhood maltreatment and perceived stress.

Previous studies have also shown that emotion regulation self-efficacy beliefs – that is, beliefs that one can successfully implement suppression and reappraisal strategies

when desiring to regulate one's emotions (Goldin et al., 2009; Goldin et al., 2012) – are associated with fewer negative emotional outcomes and psychopathological symptoms (e.g., Thomasson & Psouni, 2010). For example, by manipulating beliefs about the likelihood of success in implementing emotion regulation strategies, Bigman, Mauss, Gross, and Tamir (2016) found that participants who were led to expect that implementing emotion regulation would be successful were more effective in regulating their emotional reactions to a negative stimulus than participants in the control condition. Similarly, researchers found that college students who reported higher self-efficacy in emotion regulation showed lower levels of depression, fewer negative emotions, and higher psychological well-being than counterparts lower in self-efficacy (Tamir, John, Srivastava, & Gross, 2007; Goldin et al., 2012). Based on this finding, it seems likely that the effectiveness of emotion regulation strategies used to cope with perceived stress might be affected by beliefs in self-efficacy in relation to emotion regulation. Thus, in the current study, we examined the associations among emotion regulation self-efficacy and other variables and whether the indirect effect of childhood maltreatment on perceived stress through emotion regulation strategy was moderated by emotion regulation self-efficacy (Figure 1).

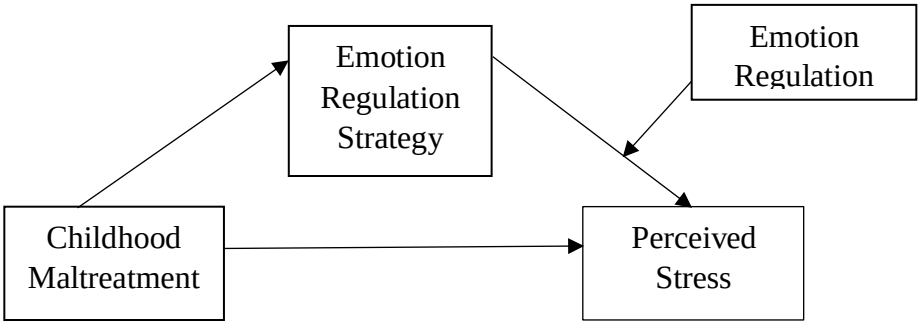

Figure 1. Conceptual model

The Role of Trait Resilience

Although childhood maltreatment can exert a deleterious effect on mental health, outcomes may vary in relation to the developing individual's resilience. Generally defined, resilience refers to "individual characteristics (e.g., positive self-esteem and self-control) and external/environmental factors (e.g., family and educational support) that allow individual to adapt successfully to stressful situations" (Ashy et al., 2017, p.6). In this study, we specifically focused on trait resilience, which has been conceptualized and operationalized as a personality characteristic involving equanimity, perseverance, self-reliance, meaningfulness, and a sense of personal uniqueness (Wagnild &Young, 1993). Individuals with higher resilience have been found to function well in adverse situations, have better mental health, and show fewer emotional and behavioral problems compared to individuals with lower resilience (Arslan, 2016; Bonanno, 2008; Collishaw et al., 2007; Goldstein, Faulkner, & Wekerle, 2013). Previous research also showed that resilience is negatively correlated with symptoms of stress, anxiety, obsessive-compulsiveness, and depression (Anyan & Hjemdal, 2016; Hjemdal, Vogel, Solem, Hagen, & Stiles, 2011; Youssef et al., 2017). In adults subjected to experimentally – induced pain, those who reported higher resilience showed less pain and stress, supporting a protective effect of resilience (Friborg et al., 2006).

Most relevant to the current study is evidence that adolescents who reported experiencing maltreatment exhibited lower levels of resilience and more anti-social behaviors than their non-maltreated counterparts (Bonanno, 2008; Collishaw et al., 2007). A study with Turkish adolescents found that resilience mediated the relationship between

parental psychological maltreatment and emotional and behavioral problems in adults (Arslan, 2016).

Among the cited studies that examined potential mediators of relationships between child maltreatment variables and negative mental health outcomes (Arslan, 2016; Jennissen & Seok, et al., 2012; Stevens, et al., 2013; Wingo, et al., 2010), the Stevens et al (2013) sample was female only, and Jennissen et al. (2016), Wingo et al. (2010), and Hjemdal et al. (2006) ran their analyses controlling for gender. The other investigators report on their mediation analyses in their full samples, without running analyses separately by gender or controlling for gender. Consequently, to our knowledge, no previous study has explored the mediation role of trait resilience between different types of childhood maltreatment from fathers and mothers and perceived stress in young women and men separately.

The value of gender-specific correlational analyses has been advanced by investigators interested in a wide range of issues such as risk factors for depression in old age (Glaesmer, Riedel-Heller, Braehler, Spangenberg, & Luppa, 2011); trait anxiety in relation to a cardiac defense response to a sudden loud noise (López et al., 2016); and the mental health of sexual minority adults who have or have not revealed their sexual identities (Pachankis, Cochran, & Mays, 2015). Several longitudinal studies examining the effects of early child adversity on negative developmental outcomes have also emphasized the importance of gender-specific analyses in which patterns of association in predictors and outcomes are calculated separately by gender (e.g., Topitzes, Mersky, & Reynolds, 2012; Weiser et al., 2009;). Moreover, it has been argued that the gender-

specific nature of associations between childhood maltreatment and developmental outcomes has treatment implications that are served well by examining patterns of correlation separately by gender (e.g., Bright & Jonson-Reid, 2008; Hyman, Garcia, & Sinha, 2006). Based on these arguments, all analyses in the current study were run separately by gender.

The Current Study

Based on the literature reviewed, the current study was designed to examine potential gender-specific patterns in 1) the mediating effect of emotion regulation strategies (suppression and reappraisal) in the relationship between different forms of childhood maltreatment (paternal and maternal psychological and physical maltreatment and emotional neglect) and later perceived stress; 2) the moderating effect of emotion regulation self-efficacy in the mediation model in which we tested the mediating role of emotion regulation between maltreatment and perceived stress (Figure 1); and 3) the mediating effect of trait resilience between childhood maltreatment and perceived stress.

Method

Participants

This study was part of a larger project conducted in a major northeastern university; it was approved by the university Institutional Review Board (IRB).

The sample consisted of 267 young adults (Females=183, *M* age=19.76, *SD*=2.30; Males=84, *M* age=19.81, *SD*=2.26). The ethnicity was 43.0% White, 31.7% Asian American, 8.7% Hispanic, 7.5% African American, and 9.1% other ethnicities. The majority of participants (91.6%) were from middle class families. Participants were all

college students who were recruited through either SONA (a system for recruiting introductory psychology students into research) or an advertisement on the university's Quickie Job Board. Students recruited through SONA received course credit; those recruited through Quickie Job were compensated with $25 gift card. In accordance with the recruitment notice, all participants were native English speakers.

Measures

Childhood Maltreatment. The Parent-Child Conflict Tactics Scales (CTSPC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) was used to measure maternal and paternal psychological and physical aggression. Participants were instructed to recall the worst year of their childhood and rate the frequencies with which their mother and father exhibited specific behaviors, ranging from 0 ("This never happened") to 6 ("More than 20 times in the worst year"). Subscales included: 1) psychological maltreatment (e.g., "My mother swore or cursed at me") (paternal: Cronbach's α = .78; maternal: Cronbach's α = .78); 2) physical maltreatment (e.g., "My mother hit me on the bottom with something like a belt") (paternal: Cronbach's α = .85; maternal: Cronbach's α = .88). Responses were recoded as annual frequency and summed to create total maternal and paternal psychological and physical maltreatment scores.

Parental Emotional Neglect. A subscale of the Parental Bonding Instrument (PBI; Parker, Tupling, & Brown, 1979) was used to measure parental emotional neglect. In this study, we summed the 12 items from the parental care subscales and reverse coded the scores to represent the extent to which participants indicated maternal and paternal emotional neglect in childhood. Cronbach's α was .86 for each emotional neglect scale.

Emotion Regulation Strategies. The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was used to measure habitual use of emotion regulation strategies, including suppression and reappraisal. Four items measure suppression (e.g., "I keep my emotions to myself"). Six items measure reappraisal (e.g., "When I want to feel more positive emotions (such as joy or amusement), I change what I'm thinking about"). Cronbach's α was .79 for suppression and .86 for reappraisal.

Emotion Regulation Self-efficacy. A scale derived from the emotion regulation questionnaire (ERQ -SE) was used to measure perceived self-efficacy of emotion regulation strategy use (Goldin et al., 2012). Items [e.g., "When I really want to, I am very capable of changing the way I'm thinking about a situation when I want to feel more positive emotion (such as joy or amusement)"] were rated on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). Ratings were summed for a total self-efficacy score. Cronbach's α was .87.

Trait Resilience. The 10-item resilience scale (Neill & Dias, 2001; Wagnild & Young, 1993), including subscales for personal competence (e.g., "I usually manage one way or another") and acceptance of self and life (e.g., "I am friends with myself"), was used to measure trait resilience. This measure has shown good reliability and validity in other studies (e.g., Ashy et al., 2017; Ahern, Kiehl, Lou Sole, & Byers, 2006). Cronbach's α was .87 for personal competence and .71 for acceptance of self and life.

Perceived Stress. The 10-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1994) was used to measure the degree to which, in the last month, respondents perceived aspects of their life as uncontrollable and overloading (e.g., "In the

last month, how often have you been upset because of something that happened unexpectedly"). Items were rated on a 4-point scale from 0 (never) to 4 (very often). Cronbach's α was .87.

Analyses

All data were entered and analyzed in SPSS (version 24). First, we did preliminary analyses to examine the possibility of gender and ethnicity differences on variables of interest. Next, we conducted Pearson correlations to test the associations among childhood maltreatment, emotion regulation strategies, and perceived stress. To test the potential mediating roles of the two major emotion regulation strategies (suppression and reappraisal) and trait resilience in the relationship between childhood maltreatment and perceived stress, we conducted a series of mediation analyses following the recommendation of Preacher and Hayes (2004), using bootstrapping procedures to compute 95% bias-corrected confidence intervals around the indirect effect (e.g., the path through the mediator). The indirect effect was tested using a bootstrap estimation approach with 5000 samples and was considered significant if the confidence interval (CI) did not contain 0. Finally, we tested the moderated mediation models exploring whether either suppression or reappraisal mediated between the different types of childhood maltreatment and perceived stress and the extent to which emotion regulation self-efficacy moderated the relationship between emotion regulation strategy and perceived stress. In other words, we examined whether the indirect effect of childhood maltreatment on perceived stress through emotion regulation strategy was moderated by emotion regulation self-efficacy.

Results

Preliminary Analyses

Log transformations were conducted on paternal psychological aggression, maternal physical aggression, and paternal physical aggression to normalize those variables. In all analyses, pairwise deletion was conducted to deal with missing values on any of the measures. Table 1 shows the descriptive statistics for all variables. Preliminary analyses of the potential contribution of demographic characteristics to the variables of interest revealed that females reported lower suppression, $t(196) = -2.43$, $p = .02$, and trait resilience, $t(263) = -2.12$, $p = .04$, and higher perceived stress, $t(262) = 3.96$, $p < .001$, than males. Level of perceived stress did not vary significantly as a function of ethnicity.

Table 1. **Descriptive Statistics for Variables of Interest**

Variables	Total (*N*=267)			Females (*N*=183)			Males (*N*=84)		
	M	*SD*	*Range*	*M*	*SD*	*Range*	*M*	*SD*	*Range*
Maternal Psychological Aggression	25.42	26.98	0-125	25.98	27.86	0-125	24.25	25.12	0-101
Paternal Psychological Aggression	16.19	21.38	0-125	15.94	21.28	0-125	16.73	21.71	0-102
Paternal Psychological Aggression *(Log Transformed)*	0.99	0.54	0-2.1	0.96	0.55	0-2.1	1.05	0.53	0-2.01
Maternal Physical Aggression	12.09	29.76	0-200	11.38	28.15	0-200	13.64	33.13	0-198
Maternal Physical Aggression *(Log Transformed)*	0.87	0.62	0-2.3	0.86	0.62	0-2.3	0.89	0.64	0-2.3
Paternal Physical Aggression	5.87	16.81	0-200	4.51	11.09	0-78	8.80	24.92	0-200
Paternal Physical Aggression *(Log Transformed)*	0.76	0.54	0-2.3	0.70	0.50	0-1.89	0.89	0.59	0-2.3
Maternal Emotional Neglect	20.18	7.45	12-45	20.51	7.81	12-45	19.45	6.55	12-40
Paternal Emotional Neglect	23.77	8.55	12-48	23.87	8.85	12-48	23.53	7.89	12-41
Suppression	14.68	5.34	4-28	14.19	5.61	4-26	15.76	4.55	5-28
Reappraisal	28.89	6.93	6-42	28.87	7.10	6-42	28.93	6.61	10-42
Emotion Regulation Self-Efficacy	48.07	10.82	13-70	47.42	10.82	13-70	49.48	10.74	29-70

Trait Resilience	54.70	10.44	20-70	53.78	10.67	20-70	56.68	9.72	29-70
Perceived Stress	18.86	6.29	4-35	19.87	6.12	6-35	16.65	6.13	4-33

Associations among Childhood Maltreatment and Other Variables

Correlation analyses were conducted to examine the associations among childhood maltreatment, reappraisal, suppression, emotion regulation self-efficacy, and perceived stress in females and males separately. In females (see Table 2), the results indicated that maternal (but not paternal) psychological and physical maltreatment, and both maternal and paternal emotional neglect were significantly positively correlated with suppression; both maternal and paternal emotional neglect were significantly negatively correlated with reappraisal; and maternal (but not paternal) emotional neglect was also significantly negatively correlated with emotion regulation self-efficacy. In addition, both maternal (but not paternal) psychological maltreatment and emotional neglect were significantly positively correlated with perceived stress.

Table 2. **Correlations among Childhood Maltreatment, Emotion Regulation Strategies, Emotion Regulation Self-Efficacy, Trait Resilience, and Perceived Stress in Females.**

Variables	1	2	3	4	5	6	7	8	9	10	11
1.Maternal Psychological Maltreatment	--										
2.Maternal Physical Maltreatment *(log transformed)*	.60***	--									
3.Maternal Emotional Neglect	.40***	.38***	--								
4.Paternal Psychological Maltreatment *(log transformed)*	.48***	.31**	.12	--							
5.Paternal Physical Maltreatment *(log transformed)*	.23*	.42**	.13	.44***	--						
6.Paternal Emotional Neglect	.15*	.29**	.47***	.28***	.22	--					
7.Suppression	.19*	.21*	.34**	.04	.01	.24**	--				
8.Reappraisal	-.06	-.17	-.20**	-.03	.04	-.28***	-.03	--			

9.Emotion Regulation Self-efficacy	-.15	-.12	-.15*	-.02	.12	-.07	.17*	.49***	--		
10.Trait Resilience	-.26**	-.27**	-.47***	-.15	-.05	-.31***	-.37***	.51***	.41***	--	
11.Perceived Stress	.20**	.03	.27***	.01	-.13	.14	.28***	-.42***	-.42***	-.63***	--

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

In males (see Table 3), we did not find any statistically significant correlations among the maltreatment, emotion regulation, and perceived stress variables.

Table 3. **Correlations among Childhood Maltreatment, Emotion Regulation Strategies, Emotion Regulation Self-Efficacy, Trait Resilience, and Perceived Stress in Males.**

Variables	1	2	3	4	5	6	7	8	9	10	11
1.Maternal Psychological Maltreatment	--										
2.Maternal Physical Maltreatment *(log transformed)*	.44**	--									
3.Maternal Emotional Neglect	.37**	.38*	--								
4.Paternal Psychological Maltreatment *(log transformed)*	.60***	.38*	.12	--							
5.Paternal Physical Maltreatment *(log transformed)*	.41*	.75***	.23	.49**	--						
6.Paternal Emotional Neglect	.13	.16	.31**	.16	.11	--					
7.Suppression	.16	.15	.16	.17	.13	.04	--				
8.Reappraisal	.07	-.04	.10	.04	-.20	-.09	-.01	--			
9.Emotion Regulation Self-efficacy	.14	.09	.04	.06	-.07	-.04	.30**	.36**	--		
10.Trait Resilience	.23*	.11	-.05	.11	-.00	-.19	-.09	.42***	.43***	--	
11.Perceived Stress	-.15	.09	.09	-.01	.02	-.04	-.05	-.08	-.30**	-.58***	--

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

In regard to relationships among childhood maltreatment, trait resilience, and perceived stress scores, the results again revealed gender-specific patterns of association. In females (Table 2), trait resilience was significantly negatively correlated with all three types of maternal maltreatment as well as with paternal emotional neglect and perceived stress. In males (Table 3), trait resilience was significantly positively correlated with

maternal psychological maltreatment and significantly negatively correlated with perceived stress.

The Mediating Role of Emotion Regulation Strategies

Table 4 shows all significant mediation models. The results indicated that in females, both suppression and reappraisal significantly mediated: 1) the relationship between maternal emotional neglect and perceived stress; and 2) the relationship between paternal emotional neglect and perceived stress. In addition, suppression also mediated the relationship between maternal psychological maltreatment and perceived stress in females. Neither of the emotion regulation variables mediated the relationship between any of the child maltreatment variables and perceived stress in males. We also tested the moderation effect of emotion regulation self-efficacy in the mediation analyses; however, no significant moderated mediation models were found.

Table 4. **Indirect Effects of Maltreatment Types on Perceived Stress via Suppression, Reappraisal, and Trait Resilience (5,000 Bootstrap Samples) in Females.**

IV	MV	Effect of IV on MV (a)	Effect of MV on DV (b)	Direct Effect (c')	Indirect Effect (a*b)
Maternal EN	Suppression	0.25***	0.23***	0.15*	0.06 CI[0.02, 0.12]
Paternal EN	Suppression	0.15**	0.29**	0.05	0.04 CI[0.01, 0.10]
Maternal PSY	Suppression	0.04*	0.28***	0.03*	0.01 CI[0.00, 0.02]
Maternal EN	Reappraisal	-0.18**	-0.34***	0.15**	0.06 CI[0.02, 0.12]
Paternal EN	Reappraisal	-0.23***	-0.38***	0.01	0.09 CI[0.04, 0.15]
Maternal PSY	Resilience	-0.10***	-0.36***	0.10	0.04 CI[0.02, 0.06]
Paternal PSY	Resilience	-0.10*	-0.37***	-0.02	0.03 CI[0.00, 0.01]
Maternal EN	Resilience	-0.63***	-0.37***	-0.02	0.23 CI[0.16, 0.32]
Paternal EN	Resilience	-0.38***	-0.38***	-0.05	0.14 CI[0.07, 0.24]
Maternal PHY	Resilience	-0.10**	-0.37***	-0.01	0.03 CI[0.01, 0.06]

Note: EN = Emotional Neglect; PSY = Psychological Maltreatment; PHY = Physical Maltreatment; IV=Independent Variable; MV=Mediating Variable; DV=Dependent Variable; both a and b were unstandardized coefficients. Statistics are provided only for the statistically significant mediation effects.
*p<.05 **p<.01 ***p<.001

The Mediating Role of Trait Resilience

Finally, we examined the mediating role of trait resilience between different types of childhood maltreatment and perceived stress. In females, trait resilience mediated the relationships between 1) both maternal and paternal psychological maltreatment and perceived stress; 2) both maternal and paternal emotional neglect and perceived stress; and 3) maternal physical maltreatment and perceived stress. No significant mediation models were found in males.

Discussion

Childhood maltreatment is a serious and prevalent problem with a long-term impact on later psychological functioning. The current study examined the mediating role of two emotion regulation strategies – suppression and reappraisal – and the mediating role of trait resilience in the relationships between different types of childhood maltreatment, including psychological maltreatment, physical maltreatment, and emotional neglect from mothers and fathers separately, and perceived stress. We also tested whether any indirect effect of childhood maltreatment on perceived stress through suppression or reappraisal is moderated by emotion regulation self-efficacy and the extent to which there were gender-specific patterns of association among variables.

Childhood Maltreatment and Perceived Stress

One of the most important findings of this study is that the relationships between childhood maltreatment and perceived stress in this college student sample varied by type of parental maltreatment and were statistically significant only in the females. The correlation analyses showed that maternal psychological maltreatment and both maternal and paternal emotional neglect were significantly positively associated with perceived stress in females, but not in males. Thus, our data add to the findings from previous studies that examined associations among child maltreatment and perceived stress in one gender only (e.g., Hager et al., 2012) or did not examine patterns of associations in females and males separately (e.g., Hyman et al., 2007). Previous research has indicated that the relationship between psychopathology and history of childhood maltreatment tends to be stronger for women than for men (MacMillan et al., 2001; Gershoff, 2002), which perhaps helps explain the lack of significant associations between childhood maltreatment variables and perceived stress in our male sample.

Another explanation for the absence of significant correlations between child maltreatment and perceived stress in males is that the ill effects of parental maltreatment may be influenced by sex role socialization. The measure of perceived stress is in some ways a measure of *internalized* responses to stress—feelings of distress, anxiety, and lack of confidence in coping ability. There is some evidence that in response to stresses, including family violence, females are more likely than males to display internalizing symptoms (Kurchaska, 2017), as well as some evidence that males are more likely than females to display externalizing symptoms such as behavior problems and heightened aggressiveness (Kurchaska, 2017; Oshri, Rogusch, Burnette & Cicchetti, 2011; Shields &

Cicchetti, 1998). For example, in the Los Angeles Epidemiologic Catchment Area (ECA) study, women with a childhood history of maltreatment had higher levels of psychiatric disorders than women without a maltreatment history, while men with a childhood history of maltreatment had higher rates of substance abuse (Stein, Golding, Siegel, Burnam, & Sorenson, 1988).

It is also interesting that maternal psychological maltreatment and maternal emotional neglect were the forms of maltreatment that were directly associated with perceived stress in females. It is possible that because sex role socialization is associated with a strong relationship-orientation in females, young women are particularly vulnerable to failures in the parenting relationship domain and to perceive social interactions as stressful. Moreover, in a study examining the effect of interparental hostility (e.g., displaying verbal hostility towards spouse or complaining about spouse in front of child) on developmental outcomes, Verlaan and Schwartzman (2002) found that exposure to maternal-perpetrated interparental hostility was significantly positively correlated with children's externalizing behavior problems but paternal interparental hostility was not – again suggesting that the violation of cultural roles of maternal nurturance may leave children particularly at risk.

Mediation/Moderation Results for Emotion Regulation Strategies and Self-Efficacy

First, the mediating analyses showed that in females, maternal emotional neglect exerted a significant direct effect on perceived stress above and beyond individual suppression and reappraisal skills; the direct effect of maternal psychological maltreatment on perceived stress was also above and beyond suppression skills in

females. These results suggest that young women who experienced maternal psychological maltreatment and emotional neglect may not only be more vulnerable to chronic stress, but also less able to make effective use of a reappraisal strategy and more reliant on maladaptive suppression when dealing with daily stress.

It is also interesting that although there were no significant correlations between any type of *paternal* maltreatment and perceived stress, paternal emotional neglect exerted a significant *indirect* effect on perceived stress via both suppression and reappraisal in females; thus, there is indirect evidence that paternal maltreatment may also play a negative role regarding the emotion regulation strategies women need to deal effectively with daily stress.

Some insights regarding the impacts of parental emotional neglect and psychological maltreatment on emotion regulation strategies may be found in western attachment theory, which posits that children living in neglectful and abusive environments often learn not to trust their parents' responsivity to their emotions; under such attachment-threatening circumstances, children may learn to keep their feelings to themselves when they experience negative emotions (e.g., Criss et al., 2015; Morris, Silk, Steinberg, Myers, & Robinson, 2007; Mikulincer, Shaver, & Pereg, 2003). Experiences promoting insecure attachment may also provide fewer opportunities to learn how to cope with stress, and a tendency to adopt maladaptive strategies such as suppression, which have a long-term deleterious impact on emotion functioning (Briere et al., 2009; O'Mahen et al., 2015; Spasojević et al., 2002).

There was no evidence in the male sample that any form of childhood maltreatment had an indirect effect on perceived stress via emotion regulation processes, which is not surprising given the lack of significant correlations among these variables in the males. Previous relevant research has indicated that men show less emotional awareness, complexity, and differentiation than women in describing their own and others' emotional experience, which perhaps limits their sensitivity to the nuances of emotion regulation self-report items (Barrett, Lane, Sechrest, & Schwartz, 2000). Moreover, based on an extensive review of the literature regarding emotion regulation and gender, Nolen-Hoeksema (2012) concluded that adaptive strategies such as reappraisal appear to have a compensatory effect for those women who tend to use higher levels of maladaptive strategies, but do not have similar compensatory effects for men tending to use maladaptive strategies. She also suggests, and we concur, that there are serious gaps in the relevant literature concerning how men regulate their emotions, and that priority should be given to research investigating the extent to which emotion regulation plays a role in forms of psychopathology more common in men than in women. To assess this possibility, future studies might also benefit from the development of more diverse ways of tapping men's emotion regulation capacities and experiences.

In contrast to many of the correlational analyses indicating gender-specific (largely female) patterns of correlations, emotion regulation self-efficacy was significantly positively correlated with both suppression and reappraisal, and significantly negatively correlated with perceived stress in both males and females. Thus, how well individuals see themselves as able to use strategies is important in reducing perceived

stress in both females and males. However, the indirect effect of childhood maltreatment on perceived stress through emotion regulation strategy was not moderated by emotion regulation self-efficacy in either gender. It seems that both emotion regulation strategies and emotion regulation self-efficacy contribute independently to perceived stress, but in our study any potential interaction effect between them was not strong enough to be detected.

The Mediating Role of Trait Resilience

Finally, regarding the mediating role of trait resilience between different types of maternal and paternal maltreatment and perceived stress, results from the female sample were consistent with previous studies examining total parental (maternal plus paternal) maltreatment or comparing maltreated with non-maltreated participants (Arslan, 2016; Flores, Cicchetti, & Rogosch, 2005; Wingo et al., 2010), and finding that trait resilience was negatively associated with later perceived stress. In males, although trait resilience was significantly negatively associated with perceived stress and maternal psychological maltreatment, no significant indirect effect of maltreatment on perceived stress via trait resilience was found. Thus, although the mediating effect of trait resilience was not significant in males, there was evidence that trait resilience was associated with lower levels of perceived stress in daily life and might thereby be effective in preventing perceived stress in males as well as females. Further research into these associations seems important.

Limitations

Like all self-report studies with a cross-sectional design, our study has limitations. There is not always a close correspondence between self-reports of behavior and actual behavior, and reports on childhood experiences are subject to distorting influences. We have already mentioned the possibility that males may not be as accurate and precise as females when describing their emotional experiences and awareness. On the other hand, we administered measures that have been widely used in several different countries with different cultural groups and that have well-established reliability and validity information. A longitudinal design would have provided stronger information concerning cause-effect relationships; however, identifying and analyzing available longitudinal datasets with measures of child maltreatment outcomes, emotion regulation, and trait resilience would provide a good opportunity to learn more about causal sequences among these variables.

CHILDHOOD EMOTIONAL NEGLECT, EMOTION REGULATION STRATEGIES, AND INTERNALIZING PROBLEMS IN U.S. AND SOUTH KOREAN ADULTS

Childhood adversity, such as parental emotional neglect, has been shown to contribute to the development of psychopathology across time (e.g., Hildyard & Wolfe, 2002; Hong et al., 2018). Parental emotional neglect, the most prevalent maltreatment type, has been associated with various negative developmental outcomes, such as internalizing problems, across Western (e.g., Hagan et al., 2014) and Eastern samples (e.g., Han, Choi, & June, 2016). There is evidence that emotion regulation strategies such as reappraisal (for example, reconceptualizing a stressful situation to make it less aversive) are an adaptive response to adverse events and may protect individuals from behavioral and psychological problems; by contrast, strategies such as suppression (for example, inhibiting emotional responses) are considered maladaptive, and are associated with psychological symptoms (e.g., Aldao, Nolen-Hoeksema, & Schweizer, 2010). Further, it is well documented that parenting behaviors, particularly emotion-related parenting, shape the development of emotion regulation strategies, and that emotion regulation may serve as an underlying mechanism in the relation between parenting practices and psychopathology among children and adolescents (e.g., Cui, Morris, Criss, Houltberg, & Silk, 2014; Morris, Silk, Steinberg, Myers, & Robinson, 2007).

Recent research has explored the role of emotion regulation strategies in explaining the long-term influence of early childhood maltreatment on later internationalizing problems (e.g., O'Mahen, Karl, Moberly, & Fedock, 2015). However,

research examining the mediation effects of emotion regulation strategies in the associations between retrospective reports of parental emotional neglect and current internalizing problems among participants in Eastern countries is limited. Therefore, the current study focused specifically on the potential contribution of parental emotional neglect during childhood to later social anxiety and alexithymia via reappraisal and suppression among young adults from both a Western (United States) and Eastern (Korea) country. The extent to which these associations differ across U.S. and Korean nonclinical samples was of particular interest, as some regulation strategies, such as expressive suppression, may have different meanings and functions in different cultures.

Childhood Emotional Neglect and Internalizing Problems

Although emotional neglect routinely co-occurs with other forms of childhood maltreatments, such as sexual and physical maltreatment (e.g., Herrenkohl & Herrenkohl, 2009), researchers have proposed that emotional neglect is the essential factor underlying long-term negative impacts of childhood maltreatment (Shaffer, Yates, & Egeland, 2009). For example, emotional neglect has been linked to internalizing problems such as anxiety and depression (e.g., Colvert et al., 2008), externalizing problems such as violence (e.g., Chapple, Tyler, & Bersani, 2005), and psychiatric disorders (e.g., Young, Lennie, & Minnis, 2011).

Social anxiety and alexithymia are among the internalizing problems studied in relation to childhood emotional neglect. For example, a retrospective study of U.S. college students showed that students with higher levels of parental emotional neglect during childhood were more vulnerable to psychological distress such as anxiety (Wright,

Crawford, & Del Castillo, 2009). There is also evidence in Western samples (e.g., Yates, Gregor, & Haviland, 2012) that childhood emotional neglect is associated with maladaptive forms of affective processing such as alexithymia (difficulty in fantasizing, recognizing, identifying, verbalizing, and analyzing emotions). Studies with Asian samples also have found significant associations between childhood emotional neglect and mental health outcomes such as depression and anxiety (e.g., Wang, Wang, & Liu, 2016), suggesting that parental emotional neglect may have detrimental effects across cultures. However, there appears to be no study investigating the associations between childhood emotional neglect and alexithymia in Asian young adults.

Emotion Regulation, Culture, and Internalizing Problems

Both suppression and reappraisal have been found to be associated with a variety of negative and positive mental health outcomes (e.g., Aldao et al., 2010; Hu et al., 2014). Past research has also revealed associations between emotion regulation strategies and alexithymia in participants with western backgrounds (e.g., Laloyaux et al., 2015). For example, Laloyaux et al. (2015) found that suppression was positively associated with alexithymia, particularly difficulty in verbalizing emotions, in a French college student sample.

Literature suggests that cultural values and practices play an important role in relationships between habitual use of suppression and psychological problems (e.g., Soto, Perez, Kim, Lee, & Minnick, 2011). Western cultures tend to value independence and self-assertion and encourage free and open emotional expression. By contrast, Asian cultures, which tend to value interdependence and relationship harmony, generally

emphasize controlling and suppressing emotions (e.g., Matsumoto, 1990). Contrary to western samples, findings regarding the relationship between suppression and mental health are somewhat mixed for Asian or Asian-heritage populations. In general, some earlier studies with Asian or Asian-heritage populations found no relationship between suppression and mental health problems (e.g., Soto et al., 2011), while more recent studies found positive associations between suppression and mental health problems, including internalizing problems (e.g., Gong, Li, Zhang, & Rost, 2016), behavior problems (Lu, Tao, Hou, Zhang, & Ren, 2016), and alexithymia (e.g., Chen et al., 2011). Based on a meta-analysis of both western and eastern samples, Hu et al. (2014) concluded that reappraisal was negatively associated with mental health problems (including anxiety and negative affect; effect size r = -.20) and suppression was positively related to mental health problems in both eastern and western samples, although the associations between suppression and mental health problems were stronger in Western samples (r = .19) than in Eastern samples (r = .06).

It is possible that modernization and frequent contact with western cultures has led to cultural value changes, with the ways in which Koreans express and regulate emotions becoming increasingly similar to Western patterns, thereby making suppression a less adaptive strategy for Koreans than it was in previous generations. In this study, given that the Korean sample was from a large urban city – a population that is likely to be influenced by western culture – we hypothesized that suppression would contribute to internalizing problems in both Korean and U.S. samples.

Parental Emotional Neglect and Emotion Regulation

Although there is clear evidence that emotional neglect is associated with later symptomatology, the mechanisms through which emotional neglect contributes to internalizing problems are less clear. Morris and colleagues (2007) proposed a mediational model linking parenting, emotion regulation, and developmental outcomes. Specifically, they suggested that positive parenting or positive family emotional climate facilitates the development of emotion regulation abilities (such as regulating anger, sadness, fear, and positive affect under different social contexts), while negative parenting impairs the development of adaptive emotion regulation strategies in children and adolescents, which in turn links to negative outcomes. Empirical studies guided by this framework have found supportive evidence for the model (e.g., Cui et al., 2014; Cui, Morris, Harrist, Larzelere, & Criss, 2015). Other research with U.S. samples has found associations between negative parenting, such as dismissing, mocking, and explicitly disapproving children's expression of emotion, and later use of maladaptive emotion regulation strategies (e.g., Buckholdt et al., 2014). From the perspective of attachment theory, children might tend to adopt maladaptive emotion regulation strategies, such as suppression, to cope with negative emotions if they do not trust that their parents are able to respond appropriately to their emotions (e.g., Mikulincer, Shaver, & Pereg, 2003).

Efforts to determine whether emotion regulation strategies serve as an underlying mechanism for the association of parental emotional neglect with internalizing problems have been rare. Although Balan, Dobrean, Roman, and Balazsi (2017) did not examine parental emotional neglect, they found that suppression mediated the relationship

between negative parenting practices such as poor monitoring and corporal punishment and internalizing problems in adolescents. O'Mahen et al. (2015) found that behavioral avoidance and rumination mediated the relationship between childhood emotional neglect and depression in a clinical, community-based female sample. It is possible that individuals who experience parental emotional neglect may have few opportunities for emotional interactions with their parents, resulting in poor emotion regulation ability and deficits in social skills (e.g., Kim & Cicchetti, 2004). These studies provide initial evidence that emotion regulation strategies may mediate relations between childhood maltreatment and mental health problems, but further research is needed to define the scope of this association –including the extent to which it applies to different types of internalizing problems, and across eastern and western cultures.

The Role of Sex

The strategies people use to regulate emotions and the impact of emotion regulation strategies on mental health have been found to vary by sex in U.S. samples (e.g., Nolen-Hoeksema, 2012). Gross et al (2003) found that males used suppression significantly more often than females but did not differ from them significantly in use of reappraisal. It is possible that expressing emotions is generally viewed as feminine (Brody, 2000) so that men are socialized to inhibit emotional expression during childhood and adolescence (e.g., Way, 2013). There is also evidence that parenting works differently for females and males, as females may be more sensitive to parenting practices, particularly mothering (e.g., Cui et al., 2015), and the impact of childhood maltreatment on mental health outcomes may differ by sex (e.g., Cullerton-Sen et al.,

2008). Thus, it is important to examine further the role of sex in regard to the potential influences of emotion regulation and childhood emotional neglect.

The Current Study

To address research gaps in the literature, the current study was designed to examine the contribution of parental emotional neglect to young adult internalizing problems via emotion regulation strategies. The hypothesized models (Figure 1 & 2) were tested using structural equation modeling to examine the extent to which parental emotional neglect was directly linked to internalizing problems and indirectly associated with internalizing problems via emotion regulation strategies. Given cultural differences in emotion regulation, we explored whether any direct and indirect links between emotional neglect and internalizing problems differ across Eastern and Western cultures, using a U.S. and a South Korean sample. Specifically, we hypothesized that 1) parental emotional neglect would be positively linked to social anxiety and alexithymia in both the US and Korea samples; 2) reappraisal would be negatively related to and suppression would be positively related to social anxiety and alexithymia in both samples; 3) parental emotion neglect would be negatively related to cognitive reappraisal and positively related to suppression in both samples. Although no specific hypotheses were made, potential moderating effects of sex in the associations were explored, based on the evidence from previous studies (e.g., Nolen-Hoeksema, 2012).

Method

Participants

The study procedures and materials have been approved by the U.S. university Institutional Review Board. The U.S. sample consisted of 264 young adults (182 women M_{age}=19.70, *SD*=2.19; 82 men, M_{age}=19.56, *SD*=1.61; ethnicity: 42.7% White; 32.1% Asian American; 8.8% Hispanic; 7.3% African American; and 9.2% other ethnicities); they were recruited from introductory psychological classes at a large urban university in northeastern U.S. or from the university's online job board. Participants received either course credit or a $25 gift card. The South Korean sample included 211 participants (121 women, M_{age}=20.52, *SD*=1.99; 90 men, M_{age}=22.87, *SD*=2.37), recruited from a university in Seoul; they received coupons (amount equivalent to $25) for completing the survey packet. The vast majority of U.S. participants (91.2%) and Korean participants (93.8%) reported that they were from middle class families (39.8% upper middle class; 34.1% middle class; 11.0% lower middle class). Participants were native English or Korean speakers and the surveys were administered in their native languages. For the Korean sample, all measures were first translated into Korean by Korean graduate students who are native Korean speakers and then checked by bilingual students who speak both Korean and English fluently.

Measures

Parental Emotional Neglect. We reverse coded the 12-item Parental Care subscale of the Parental Bonding Instrument (PBI; Parker, Tupling & Brown, 1979) to measure young adults' perceptions of maternal and paternal neglect during childhood.

Participants were asked to rate the degree to which each parent behaved in ways that were like (ranging from totally like to totally unlike) the behaviors described in each statement. Sample items (before reverse coding) are "Spoke to me in a warm and friendly voice," "Appear to understand my problems and worries." Items were rated on 4-point scales from 0 (*very unlike*) to 3 (*very like*), and reverse coded such that higher scores indicated greater neglect. Ratings were summed for a total parental emotional neglect score. The scale has shown good test-retest reliability and validity (Parker, 1988). Cronbach's α was .93 for U.S. and .89 for Korean participants in the current study.

Emotion Regulation. Gross and John's 10-item Emotion Regulation Questionnaire (ERQ; Gross et al., 2003) was used to assess the use of emotion regulation strategies. The items were rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The questionnaire has two subscales: 1) Suppression, including 4 items; e.g., "I keep my emotions to myself"; "When I am feeling positive emotions, I am careful not to express them"; and 2) Reappraisal, including 6 items; e.g., "When I want to feel more positive emotions (such as joy or amusement), I change what I'm thinking about"; "I control my emotions by changing the way I think about the situation I'm in." Subscale items were summed to create total scores for suppression and reappraisal. Cronbach's α for suppression was .82 for the U.S. and .70 for the Korean sample. Cronbach's α for reappraisal was .85 for the U.S. and .90 for the Korean sample.

Social Anxiety. The Liebowitz Social Anxiety Scale (LSAS-SR; Fresco et al., 2001; Liebowitz, 1987) was used to measure participants' trait social anxiety levels. Participants were asked to report their anxiety and fear level when they were in 24

specific social situations during the previous week. The measure includes 13 performance situations, e.g., "Acting, performance, or giving a talk in front of an audience," and 11 social interaction situations, e.g., "Resisting a high-pressure salesperson." Participants were asked to rate each item for fear and anxiety experienced from 0 (*none*) to 3 (*severe*). The scale has shown good reliability and validity (e.g., Baker et al., 2002). Ratings of fear and avoidance were summed to form a total social anxiety score. Cronbach's α was .92 for U.S. and .92 for Korean participants.

Alexithymia. The 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) consists of three subscales: difficulties in identifying feelings, difficulties in describing feelings, and externally oriented thinking. Each item was rated on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Item 3 ("I have physical sensations that even doctors don't understand") was dropped to improve reliability; Cronbach's α for the final scale was .81 in the Korean and .84 in the U.S sample. Total alexithymia scores (without item 3) were calculated.

Analytic Strategy

To test our hypotheses, the following analyses were conducted. First, for each measure, multi-group confirmatory factor analysis (CFA) was conducted in Mplus version 8 (Muthén & Muthén, 1998-2015) to examine whether the measure consistently tapped the central construct in participants from both the U.S. and Korea (measurement equivalence; Knight & Hill, 1998). Second, structural equation models (SEMs) were conducted to examine the effects of parental emotional neglect on social anxiety and alexithymia via each emotion regulation strategy (suppression or reappraisal) separately

(Figure 1 & 2). A multi-group approach was used to test whether the paths in the models differed by country or sex. We first constrained pathway coefficients to be equal across U.S. versus Korean or across female versus male participants, thus employing a fully constrained baseline model. Then, we released equal constraint on pathways one by one to improve model fit if necessary. Model fit was examined using the following criteria: the chi-square test (χ^2), the root mean square error of approximation (RMSEA <.06), the comparative fit index (CFI>.90), and standardized root mean squared residual (SRMR<.08; Hu & Bentler, 1999). For indirect effects estimation, bootstrapping of 1000 times was used to calculate the standard errors and the 95% biased-corrected confidence intervals for coefficients (MacKinnon, 2008).

Results

Correlations among Main Variables

Means and standard deviations of all variables are presented in Table 5 for U.S. and Korean participants separately. Independent sample *t*-tests revealed only two group differences in the comparisons by sex and country. Specifically, males reported using significantly higher levels of suppression than females, $t(470)=-2.26$, $p=0.02$, and U.S. participants reported higher social anxiety than Korean participants, $t(465)=5.91$, $p<0.001$. Bivariate correlations among all variables were presented in Table 1 separately for U.S. and Korean samples.

Table 5. **Parental Emotional Neglect, Emotion Regulation Strategies, Social Anxiety, and Alexithymia in U.S. (N=264) and Korean participants (N=211): Correlations and Descriptive Statistics**

Variables	*1*	*2*	*3*	*4*	*5*	*M*	*SD*	*Range*
U.S.								
1. Age	-							
2. Parental Emotional Neglect	.09	-				39.78	12.22	24-93
3. Suppression	-.01	.28***	-			14.72	5.33	4-28
4. Reappraisal	.06	-.21**	-.02	-		28.88	6.96	6-42
5. Social Anxiety	-.11	.24**	.32***	-.20**	-	24.20	12.43	0-110
6. Alexithymia	-.12	.25***	.51***	-.22***	.46***	46.07	11.13	21-71
South Korean	*1*	*2*	*3*	*4*	*5*	*M*	*SD*	*Range*
1. Age	-							
2. Parental Emotional Neglect	.21**	-				38.87	12.05	25-80
3. Suppression	-.01	.00	-			15.14	4.50	4-26
4. Reappraisal	-.08	-.23**	-.22**	-		27.93	7.21	6-42
5. Social Anxiety	-.11	.23***	.15*	-.11	-	17.30	12.65	0-101
6. Alexithymia	-.12	.41***	.19**	-.27***	.55***	45.07	12.45	22-71

Note. $^{*}p<.05$. $^{**}p<.01$. $^{***}p<.001$.

Measurement Invariance

Measurement equivalence was examined for each measure across U.S. and Korean samples. First, to determine whether the construct assessed in each measure was understood similarly across U.S. and Korean participants, we tested configural invariance by requiring the same factor structure across groups (Cheung & Rensvold, 2002). Then, metric invariance was tested to determine whether the factor loadings of each measure were essentially the same across groups. Finally, intercept invariance of each measure was tested to determine whether item intercepts were the same across groups. To do so, we set factor loadings, variances, covariances, and item intercepts to be equal across groups (full constraint model). Then equal constraint was released to improve model fit if necessary, resulting in a partial constraint model. Items that were responsible for the factorial variance were found and equal constraints were lifted from the full constraint model to form a partial constraint model (Byrne, Shavelson, & Muthén, 1989).

The results showed full metric invariance for reappraisal, $\chi^2(24) = 33.59$, $p = .09$, CFI = .99, RMSEA = .04, SRMR = .05; social anxiety, $\chi^2(460) = 635.78$, $p < .01$, CFI = .97, RMSEA = .04, SRMR = .06; and alexithymia, $\chi^2(269) = 378.02$, $p = .01$, CFI = .96, RMSEA = .04, SRMR = .08, suggesting that factor loadings, variances, and covariances invariance exists for these measures. For parental emotional neglect, factor loading for the item "(parent) was affectionate to me" differed between the two samples. This equal constraint was released, and the final model fit the data well, $\chi^2(88) = 138.61$, $p < .01$, CFI = .99, RMSEA = .05, SRMR = .05. For the suppression item "when I am feeling negative emotions, I make sure not to express them" factor loadings differed as

well. The final model fit the data well after releasing the equal constraint for this item, $\chi^2(6) = 1.99$, $p = .92$, CFI = 1.00, RMSEA = .00, SRMR = .02. For intercept invariance, reappraisal showed full intercept invariance; intercept invariance was not fully met for parental emotional neglect, suppression, alexithymia, and social anxiety.

Indirect Effect of Parental Emotional Neglect via Suppression

Structural models were tested to examine both the direct and indirect effect of parental emotional neglect on internalizing problems via suppression. First, pathway coefficients were fully constrained to be equal across participants from the two countries in multi-group analyses. Results suggest that the fully constrained model fit the data moderately. Modification indices suggest that equal constraint of the path from parental emotional neglect to suppression should be released, $\Delta\chi^2(1) = 6.17$, $p = .01$ and the path from suppression to alexithymia should also be released, $\Delta\chi^2(1) = 5.03$, $p = .03$. The final model fit the data well, $\chi^2(3051) = 3834.8$, $p < .001$; RMSEA = .03, CFI = .94, SRMR = 0.07. Results showed that, parental emotional neglect was significantly associated with social anxiety, and alexithymia in participants from both countries, but was significantly associated with suppression only in the U.S. sample, not in the Korean sample (Figure 1). Suppression was significantly associated with social anxiety in both samples. The associations between suppression and alexithymia was stronger among U.S. participants compared to Korean participants. We used the same multi-group procedure to examine whether the associations differed between females and males. The results showed no sex differences in any pathways.

After bootstrapping, the indirect effects of parental emotional neglect on social anxiety, indirect effect (IE) = 0.02, CI [0.01, 0.04], and alexithymia, IE = 0.09, CI [0.04, 0.14] via suppression were significant in the U.S. sample. Also, as expected, there were no significant indirect effects of parental emotional neglect on either social anxiety, IE = 0.01, CI [-0.01, 0.02] or alexithymia, IE = 0.01, CI [-0.01, 0.03] in the Korean sample.

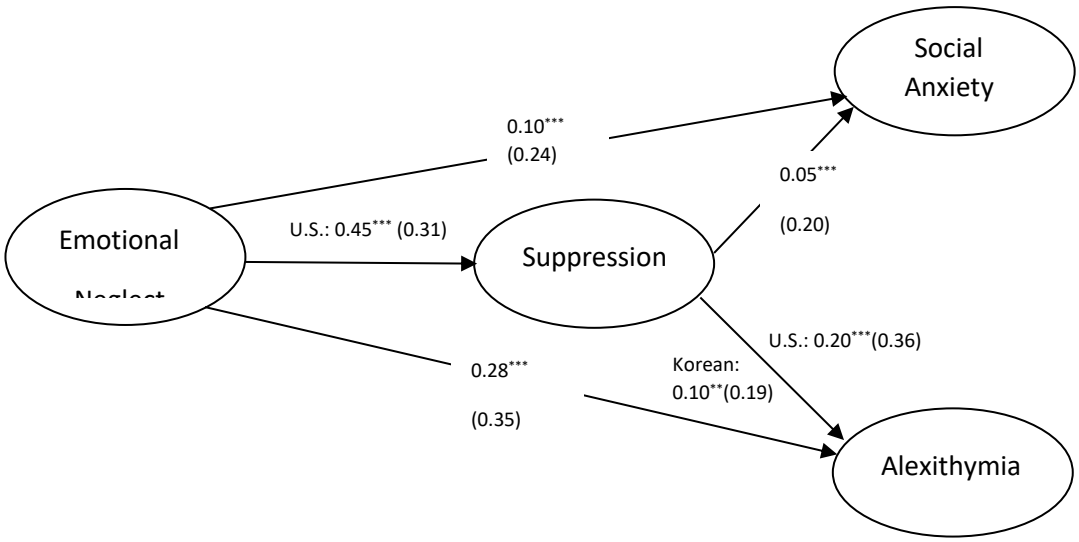

Figure 2. Structural equation model examining direct and indirect effects of parental emotional neglect on social anxiety and alexithymia via suppression among U.S. and Korean young adults.
Note. Standardized coefficients are in parentheses and unstandardized coefficients are outside parentheses.
$^{*}p<.05$. $^{**}p<.01$. $^{***}p<.001$.

Indirect Effect via Reappraisal

We used the same approach to test the indirect effect of parental emotional neglect on social anxiety and alexithymia via reappraisal. With all path equal constraints, the final model (Figure 3), χ^2 (3303) = 4168.25, $p<.001$; RMSEA=0.03, CFI=0.94, SRMR=0.07, showed good model fit. No significant country differences were found for

any pathways in this set of analyses. The final model suggests that parental emotional neglect was negatively associated with reappraisal, and positively associated with social anxiety and alexithymia. Reappraisal were negatively linked to both social anxiety and alexithymia. To test sex differences, two-group analyses were conducted, and the results showed no sex differences either. The indirect effect of parental emotional neglect on alexithymia was significant, IE=0.03, CI [0.01, 0.05], but the indirect effect on social anxiety lost significance, IE=0.01, CI [-0.001, 0.02].

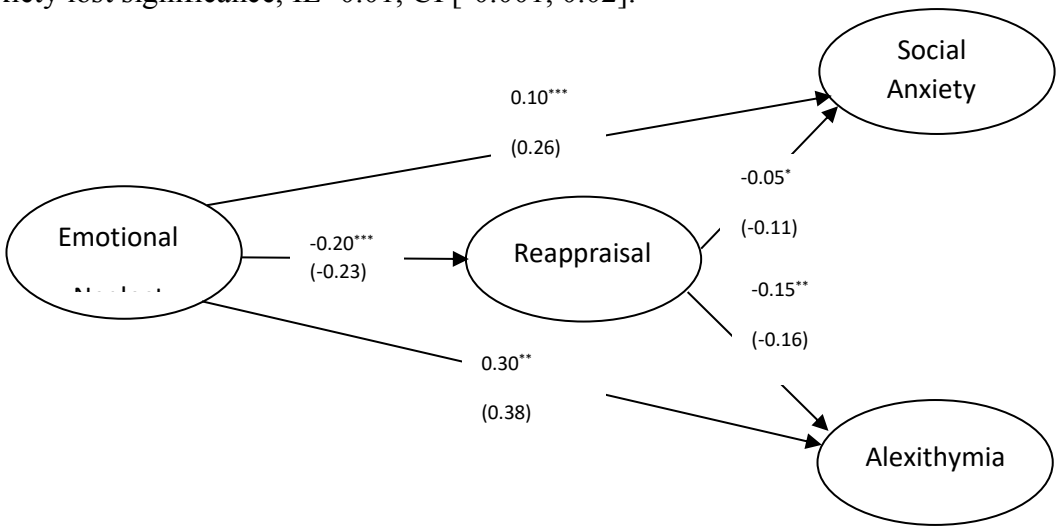

Figure 3. Structural equation model examining direct and indirect effects of parental emotional neglect on social anxiety and alexithymia via reappraisal among U.S. and Korean young adults.
Note. Standardized coefficients are in parentheses and unstandardized coefficients are outside parentheses.
$^{*}p<.05$. $^{**}p<.01$. $^{***}p<.001$.

Discussion

As a common form of child abuse, parental emotional neglect is generally under-recognized. Evidence from follow up studies have shown that parental emotional neglect is a cause of substantial harm to the child's mental health, often extending into adult life (Hong et al., 2018). However, cross-cultural research examining the underlying

mechanisms between parental emotional neglect and internalizing problems in adults from the perspective of emotion regulation strategies is quite limited. To address gaps in the literature, we used structural equation modeling to determine both the direct and indirect effect of parental emotional neglect on social anxiety and alexithymia via suppression and reappraisal in U.S. and South Korean young adult samples. We also addressed the possibility of sex differences in associations among parental emotional neglect, emotion regulation strategies, and internalizing problems.

Consistent with our first hypothesis, our SEM analyses revealed that parental emotional neglect was significantly positively associated with internalizing problems in young adults from both the United States and Korea. Consistent with the second hypothesis, analyses revealed that in both samples, reappraisal was negatively associated with both internalizing problems while suppression was positively associated with both internalizing problems. That is, the countries did not differ in regard to the link between reappraisal and suppression emotion regulation strategies and internalizing problems. Finally, our third hypothesis was partially supported. SEM analyses showed that parental emotional neglect was significantly associated with reappraisal in both countries; however, the relationship between parental emotional neglect and suppression was statistically significant among U.S. but not Korean young adults.

Deleterious effects of parental emotional neglect

As noted, consistent with our first hypothesis, we found that parental emotional neglect exerted a significant direct effect on both social anxiety and alexithymia in both the U.S. and South Korea samples. This direct effect on both internalizing problems was

above and beyond individual emotion regulation strategies. Such findings were in line with previous studies in U.S. samples (e.g., Colvert et al., 2008; Gauthier et al., 1996; Wright et al., 2009; Yate et al., 2012) and added to the literature on the role of parental emotional neglect in Eastern cultures. Our findings also provided evidence that the deleterious effect of emotional neglect on social anxiety and alexithymia can be generalized to populations from different cultures, extending previous findings that individuals who experience parental emotional neglect during childhood are at risk for development of psychopathology (e.g., Teicher et al., 2004) and lower social-emotional competence (e.g., Jones, Eisenberg, & Fabes, 2002).

This study contributed to the growing evidence that parental emotional neglect during childhood may operate across cultures to limit children's opportunities to recognize and learn about their own emotional states and express their feelings, leading them to be vulnerable to intrapersonal distress, such as alexithymia (Yates et al., 2012). In addition, individuals exposed to parental emotional neglect might not get instructions from their parents about how to respond in a socially appropriate and adaptive manner in stressful or social situations. Neither do they have opportunities to observe and learn about emotion regulation from parents, resulting in poor social skills and more interpersonal distress, such as social anxiety (e.g., Wright et al., 2009).

Emotion regulation and internalizing problems

The associations between emotion regulation strategies and internalizing problems are well documented in previous research (e.g., Aldao et al., 2010; Chen et al., 2011; Laloyaux et al., 2015). Consistent with our second hypothesis, analyses showed

that suppression was a significant correlate of social anxiety and alexithymia in the U.S. sample. In line with recent literature (e.g., Juang et al., 2016), we also found the significant positive association between suppression and both internalizing problems in the Korean sample. It is possible that, for individuals growing up in both countries, relying on suppression to manage emotions may result in difficulties in transitioning out of negative emotions as well as to disrupted communication (e.g., Lougheed & Hollenstein, 2012), leading to internalizing problems such as social anxiety and alexithymia.

In addition to delineating the frequency with which particular strategies are used in daily life, it is important to understand whether individuals are able to rely on strategies in appropriate social contexts to reach their emotion regulation goals. As English et al. (2017) pointed out, suppression is particularly tied to social features of context. As modernization and globalization are always ongoing, suppression may no longer be an adaptive strategy in Asian cultures when it comes to regulating behaviors and emotions. Even in cultures that value suppression, over-reliance on this strategy may lead to greater vulnerability to internalizing problems.

In our study, reappraisal was negatively associated with alexithymia and social anxiety, and the associations were consistent across countries, which was consistent with our second hypothesis. It is possible that, in both U.S. and Korean samples, reappraisal is effective in reducing both intrapersonal distress (alexithymia) and interpersonal distress (social anxiety). These findings suggest that reappraisal may be a universally adaptive

and beneficial emotion regulation strategy protecting individuals from developing internalizing problems (e.g., Chen et al., 2011; Hu et al., 2014; Laloyaux et al., 2015).

Linking parental emotional neglect and emotion regulation strategies

In partial support of our third hypothesis, the relation between parental emotional neglect and reappraisal was significant in both samples, and the relationship between parental emotional neglect and suppression was significant only in the U.S. sample. Higher levels of parental emotional neglect predicted more emotion suppressing behavior and less use of reappraisal strategy among U.S. participants, which was consistent with previous studies indicating that negative parenting is associated with maladaptive emotion regulation strategies (e.g., Buckholdt et al., 2014; Morris et al., 2007; O'Mahen et al., 2015).

In their review article, Morris et al. (2007) proposed a tripartite model of familial influence on the development of emotion regulation. They posited that individuals' emotion regulation ability was developed through observational learning from their parents and emotion-related parenting practices, and was largely affected by emotional climate of the family. According to their model, parents who constantly neglect their children' emotional needs and show inadequate affection or nurturance are probably not aware of their children' emotion in a lot of situations and are unable to seize opportunities to coach their children in regard to managing emotions. Attachment theory also proposes that social interactions during childhood play a central role in shaping emotion regulation patterns (Shaver & Mikulincer, 2007). Parent-child attachment, regarded as a reflection of family emotional climate, has been found to predict later

emotion regulation (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). When individuals have experienced emotional neglect during childhood, they might not trust others to respond appropriately to their emotions and might be more likely to keep their emotions to themselves rather than sharing them with others when they grow up (English, Lee, John, & Gross, 2016). Our findings were consistent with the literature suggesting that parental emotional neglect may impair the development of adaptive emotion regulation strategies and lead to maladaptive strategies.

Of particular interest is the finding that although parental emotional neglect was associated with lower levels of reappraisal, the adaptive emotion regulation strategy, in both samples, it was not associated with suppression, considered a maladaptive strategy in previous research with Western samples, in the South Korean sample. It is possible that factors other than parental emotional neglect contribute to the use of suppression in South Korean young adults. People living in Asian cultures, which are thought to value suppression more than Western cultures do, may adapt suppression as a strategy based on general cultural values (Bulter et al., 2007), independent of level of parental warmth in their particular childhood family environment. It is also possible that some South Korean children may gradually adjust their use of suppression during adolescence and young adulthood, such that any effects of parental emotional neglect on suppression are overridden by other factors associated with the development of suppression as an emotion regulation strategy. More research is warranted to further examine the mechanisms and processes contributing to the development of suppression.

Strengths and Limitations

This is the first study, to our knowledge, to examine the role of emotion regulation strategies – suppression and reappraisal – in the relationships between childhood emotional neglect by parents and later internalizing problems in both Western and Asian young adults. It is a strength of this study that participants were recruited from two different countries, instead of relying on Asian Americans who might be influenced by their acculturation level. In addition, we measured the emotion regulation strategies from multiple dimensions (suppression and reappraisal). Although the current study may contribute to a greater understanding regarding potential cultural-specific associations among parental emotional neglect, emotion regulation strategies, and internalizing problems, it has some limitations. First, this cross-sectional study used a retrospective measure of childhood experience of parental emotional neglect along with measures of current emotion regulation and psychological symptoms. Future studies would benefit from longitudinal designs. Second, all the measures were self-reports. Although self-reported measures can tap into valuable internal information, it is possible that the accuracy of participants' perceptions of childhood emotional neglect by their parents has been compromised. In addition, our indicators of internalizing problems were limited to social anxiety and alexithymia. Future studies might consider adopting a multi-method approach for assessing internalizing problems, or incorporating measures such as behavior observation, interviews, and reports from other informants. Finally, young adults recruited for this study were urban university students and were relatively privileged. It is a strength that the samples were similar in these ways because the

observed differences can be more clearly attributed to culture differences. However, the conclusions are not necessarily generalizable to other demographic groups (e.g., lower income classes).

CHILDHOOD MALTREATMENT AND DYNAMIC STRESS RESPONSES: ASSOCIATION WITH SPONTANEOUS EMOTION REGULATION STRATEGIES

Research has shown that childhood maltreatment is associated with psychological symptoms (Edwards, Holden, Felitti, & Anda, 2003) and behavioral problems (Bryd & Manuck, 2014), and exerts a negative effect on neural development linked to psychiatric disorders (Teicher et al., 2003). Childhood maltreatment has also been found to be associated with heightened reactivity patterns to acute stress (e.g., Carpenter, Shattuck, Tyrka, Geracioti, & Price, 2011; Elzinga, Roelofs, Tollenaar, Bakvis, Pelt, & Spinhoven, 2008; Guo, Mrug, & Knight, 2017; Lewis & Ramsay, 2005), which are important indicators of mental health. However, there has been scant attention to potential dynamic changes in physiological and emotional responses to acute stress in the aftermath of different types of childhood maltreatment. In addition, previous studies generally did not observe stress responses in a context that closely replicated a real-life stress situation.

The current study addressed these gaps, adopting a time-course approach to stress responses and using multi-level modeling to capture dynamic changes (temporal change across time) in physiological and emotional reactions to a psychosocial stress test involving real life elements; the focus was on how different types of childhood maltreatment, including parental emotional neglect, psychological, and physical maltreatment, relate to dynamic changes in heart rate and behavioral responses (i.e., avoidant eye contact and anxiety expression) in the context of a modified version of the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993). The TSST

protocol provides an experimental manipulation that is similar to a real-life stress situation and elicits heightened physiological, emotional, and behavioral responses in both children and adults (e.g., Allen, Kennedy, Cryan, Dinan, & Clarke, 2014; Guo et al., 2017; Gunner & Fisher, 2006; Lupien, McEwen, Gunner, & Heim, 2009)

Exploring mechanisms that may explain the relationship between childhood maltreatment and physiological and emotional responses to acute stress is an important step towards expanding the knowledge base regarding child maltreatment and later symptoms and using that knowledge to design better intervention/prevention programs. Studies have investigated whether either habitual or instructed use of emotion regulation strategies (e.g., expressive suppression and cognitive reappraisal) attenuate heightened psychological and physiological responses to stress tasks (e.g., Lam, Dickerson, Zoccola, Zaldivar, 2009; Werner et al., 2011). Some researchers have particularly explored the associations between spontaneous emotion regulation (ER) strategies (i.e., automatic responses without external instructions as to how to regulate emotion) and physiological (e.g., heart rate), emotional, and behavioral responses under various stress conditions (e.g., Egloff, Schmukle, Burns, & Schwerdtfeger, 2006; Ehring, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010; Szasz, Coman, Curtiss, Carpenter, & Hofmann, 2018; Volokhov & Demaree, 2010). However, to my knowledge, no studies have investigated the extent to which spontaneous ER strategies (self-generated suppression and reappraisal) play a role in dynamic and behavioral responses to the TSST and whether suppression and reappraisal mediate between various forms of childhood maltreatment and dynamic stress responses to the TSST. Information about these relationships may

help identify additional points of intervention or prevention for individuals who have been maltreated in childhood and are at risk for maladaptive responses to stress. Also of interest is the possibility of gender differences in these associations.

Childhood Maltreatment and Responses to Acute Stress

Dysfunctional family environments, such as those characterized by childhood maltreatment, have been found to provide a developmental basis for later negative outcomes, such as psychopathology (e.g., MacMillan et al., 2001), maladaptive forms of affective processing reflected in neurological anomalies (e.g., Lim, Radua, & Rubia, 2014; Teicher et al., 2003), and stress coping styles (e.g., Cicchetti et al., 2005; Kim & Cicchetti, 2010). Research has also shown associations between childhood maltreatment experience and later responses to acute stress. For example, as compared to individuals not reporting maltreatment during childhood, people with a history of maltreatment report experiencing significantly more stress and significantly more anxiety in response to a laboratory stress manipulation (e.g., Carpenter et al., 2011). Several studies also found that maltreated children exhibited higher emotional arousal in response to interpersonal conflict than non-maltreated children (Cummings, Hennessy, Rabideau, & Cicchetti, 1994; Klimes-Dougan & Kistner, 1990; Maughan & Cicchetti, 2002).

From the perspective of evolution, the stress response system develops in order to help individuals adapt to their environments (Boyce & Ellis, 2005). Childhood maltreatment may disrupt this process in ways that affect how individuals regulate their responses to acute stress. However, studies examining the association between childhood maltreatment and stress responses reflecting real-life emotionally-charged social

experience (e.g., Butler, Wilhelm, & Gross, 2006) are few. One promising procedure for eliciting stress in a social situation is the TSST, a psychosocial stress test that asks participants to perform a public speech and a mental arithmetic calculation in front of three impassive and non-reactive research assistants (Kirschbaum et al., 1993). This test combines elements of subjective uncontrollability and a high level of social-evaluation threat in regard to being exposed to potential negative judgments by others (Kudielka, Hellhammer, Kirschbaum, Harmon-Jones, & Winkielman, 2007; Campbell & Ehlert, 2012; Ehring et al., 2010; Ordaz & Luna, 2012); it has been found to be one of the most effective methods for the experimental induction of psychosocial stress in laboratory settings (Kirschbaum et al., 1993). Compared to tasks using emotional pictures and film clips to elicit strong emotions, the TSST involves actual social interaction and has higher ecological validity as it better mimics real-life situations.

In addition to using the TSST for an experimental stress manipulation, the current study adopted a time course approach by modeling intra-individual temporal stress responses, including heart rate, self-report negative affect, and anxiety changes throughout the phases of the manipulation. More and more research has started to use this approach to assessing stress responses across the stress task rather than computing reactivity scores by taking simple or residualized change scores from a baseline measure (e.g., Butler et al., 2006; Cui et al., 2015). The novel combination of the TSST manipulation and time course modeling of intra-individual temporal stress responses provided a unique opportunity to examine the extent to which individuals varying in

histories of maltreatment undergo a consistent pattern of physiological, emotional, and observable behavioral changes during and after a social stress experience.

Spontaneous Emotion Regulation Strategies to Psychosocial Stress

There is a growing literature identifying protective factors and mediators that can help people cope with stress and inform intervention and prevention programs. One factor that might contribute to the intense fear associated with social anxiety is maladaptive patterns of emotion regulation – specifically, difficulties engaging in emotion regulation strategies to down-regulate negative emotions (Goldin et al., 2009).

A number of experimental studies have focused on manipulating the use of suppression and reappraisal during stress tasks to assess people's psychological and physiological responses to stress (e.g., Goldin & Gross, 2010; Lam et al., 2009; Werner et al., 2011). For example, Hofmann, Heering, Sawyer, and Asnaani (2009) instructed participants to use either reappraisal, acceptance, or suppression strategies during a public speech task and found that reappraisal was more effective in reducing subjective anxiety than attempting to suppress or accept it. Gross and Levenson (1997) found that participants who were instructed to suppress their emotion while watching a sad film clip, as compared to participants told to clear their minds and watch the film freely, showed heightened sympathetic nervous system activity.

Although experimental studies of directed emotion regulation are useful, it is also important to study spontaneous ER strategies use – i.e., self-selected approaches with no instructions regarding how to regulate emotion – in psychosocial stress tasks. Mauss et al. (2007) argued that individuals' spontaneous ER strategies use was engendered by

sociocultural norms, implicit hedonic goals, and regulatory strategies learned during childhood; moreover, these strategies serve to regulate emotions without exerting deliberate efforts. In the context of psychosocial stress, how individuals spontaneously respond with certain ER strategies might reflect their own personal stress coping styles and ER ability. Thus, to assess spontaneous ER, instead of giving instructions concerning which strategy participants should use, some researchers (e.g., Egloff et al., 2006; Volokhov et al., 2010) have asked participants after the stress events to recall and report the extent to which they used self-motivated suppression and reappraisal during those stress tasks.

There is evidence that instructed use of ER strategies is associated with individual physiological responses to stress, such as heart rate (e.g., Dan-Glauser & Gross, 2011; Mauss, Cook, Cheng, & Gross, 2007). However, although a few studies examined the association between spontaneous ER strategies and heart rate responses to acute stress (e.g., Egloff et al., 2006; de Veld et al, Riksen-Walraven, & de Weerth, 2012; Volokhov et al., 2010), none of them computed the dynamic pattern of heart rate responses. When computing averages of the physiological variables for each period of a stress test, Egloff et al. (2006) found that greater spontaneous suppression, but not reappraisal, was associated with an increase in the activation of the sympathetic nervous system during public speech tasks; however, Egloff et al's study did not compute stress responses in a dynamic way. Given the dearth of research on the potential of spontaneous ER strategies to help alleviate physiological and psycho-behavioral symptoms in the context of social stress, the current study adopted a time course approach to capture temporal change

across a stress manipulation. It also built on the limited previous research to explore further the associations between spontaneous ER and heart rate baseline, and heart rate linear and quadratic changes across the psychosocial stress test.

In regard to associations between spontaneous ER strategies and emotional responses to stress tasks, one study found that during a public speech task, both spontaneous suppression and spontaneous reappraisal strategy use, as reported by the participants, was associated with lower negative affect (Egloff et al., 2006). However, after inducing participants' sad mood using a film clip, Ehring et al. (2010) found that spontaneous suppression during film watching was ineffective in reducing negative emotions. One possible explanation for this difference in findings concerning the relationship between spontaneous suppression and negative emotions is the difference in laboratory stimuli used to induce emotion. It is possible that under conditions of high stress such as a public speech, spontaneous ER strategies are more effective in reducing negative or anxious feelings than tasks using sad film clips or pictures to specifically provoke dysphoric emotions (e.g., Dixon-Gordon, Aldao, & De Los Reyes, 2015; Szasz et al., 2018). Therefore, the second purpose of the current study was to adopt a time course approach to capturing both the linear and quadratic changes in emotional responses, including negative affect and subjective anxiety, and investigate the extent to which self-motivated suppression or reappraisal are linked to changes in emotional responses across the TSST. Since the TSST is a highly stressful psychosocial test, we hypothesized that both spontaneous strategies would be associated with reductions in

negative feelings during the TSST, but only spontaneous reappraisal would be associated with reductions in heart rate and behavioral expressions of anxiety.

Past research has shown that negative affect-oriented parenting practices, such as dismissing, denigrating, mocking, and explicitly disapproving of any emotional expression by children, have been linked to ineffective ER strategies (e.g., avoidance, rumination) in the children (Buckholdt et al., 2014; Eisenberg, Fabes, & Murphy, 1996). A few studies have found ER strategies to mediate between childhood maltreatment and psychopathology (e.g., O'Mahen et al., 2015). Morris and colleagues (2007) proposed a mediational model positing that positive parenting facilitates the development of children's ER abilities, while negative family emotional climate impairs the development of adaptive ER strategies, which in turn links to negative developmental outcomes. However, efforts to determine the association between childhood maltreatment and spontaneous ER use under psychosocial stress and whether spontaneous ER strategies serve as an underlying mechanism for the association between childhood maltreatment and responses to psychosocial stress have been rare. Thus, the third purpose of this study was to fill this gap.

Behavioral Reactivity to Psychosocial Stress

Much of the available research on behavioral reactivity to stress has focused on children. For example, Ursache et al. (2014) coded 7-month-old infants' negative behavioral reactivity into low reactivity (e.g., fussing, whining, and pressed lips), medium reactivity (e.g., crying, wide squared mouth, and eyes open or partially opened), and high reactivity (e.g., screams, wails, and wide-open mouth) during a frustration

eliciting task and found it was related to cortisol reactivity and recovery. In a study involving coding 24-month-old children's negative affect during an emotion eliciting task, Fortunato et al (2008) found that expressions of negative affect were positively correlated with cortisol levels before and after a stress task. Other studies with toddlers and children have examined behaviors such as avoidance, freezing reactions, or self-soothing within a stressful situation, and the extent to which these behavioral strategies are correlated with biological markers of stress (e.g., Ursache et al., 2014; Neuenschwander et al., 2015).

Several studies have shown associations among gaze avoidance, escape behaviors, and subjective anxiety during stress tasks in adult participants with social anxiety. For example, avoidant eye contact during a public speech stress task was found to be more frequent in adults with speech phobia than in a control group (e.g., Lewin, McNeil, & Lipson, 1996; Hofmann, Gerlach, Wender, & Roth, 1997). Mansell, Clark, Ehlers, and Chen (1999) found that young adults high in social anxiety showed an attentional bias away from emotional facial expressions (positive and negative faces) during a demanding task compared to those low in social anxiety, when they were led to expect they would have to give a video-recorded speech right after a challenging task. Voncken and Bögels (2008) found that compared to well-functioning controls, patients with social anxiety disorder were rated as showing a more anxious appearance and less adequate social behavior during a conversation with an experimenter.

Studies such as these, relying on the coding of facial expressions and behavior, provide a valuable addition to research on anxiety, going beyond traditional reliance on

self-report measures. However, there appear to be few if any studies that have examined the association between behavioral reactivity and both heart rate and self-reported emotional responses during a stress manipulation and determined whether childhood maltreatment could exert both a direct effect on behavioral reactivity during a stress test and post-recovery as well as an indirect effect through spontaneous ER strategies. It was a major purpose of this study to fill that gap.

The Current Study

The current study administered a modified version of the TSST in which participants were instructed to perform a speech and an arithmetic task in front of three judges. Based on evidence regarding the effectiveness of the TSST, we hypothesized that:

1) childhood maltreatment variables would be significantly positively associated with baseline levels and heightened responses across time (linear and quadratic responses) in heart rate and emotional responses (negative affect and subjective anxiety), and would also be positively associated with anxious behavioral responses (avoidant eye contact and anxiety expression).

2) spontaneous suppression would be significantly negatively associated with heightened emotional responses, and positively associated with heart rate at baseline level and heightened response across the TSST, as well as with behavioral responses (avoidant eye contact & anxiety expression).

3) spontaneous reappraisal would be negatively associated with heart rate and emotional responses at baseline level, with heightened responses across the TSST, and

with anxious behavioral responses (avoidant eye contact and anxiety expressions) across the TSST.

4) both spontaneous ER strategies would mediate the relationship between childhood maltreatment and dynamic changes in stress responses.

Of relevance to our analyses is the fact that some previous studies have revealed gender differences in stress-related diseases (e.g., cardiovascular disease) and in responses to acute stress (e.g., Guo et al., 2017; Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004). For example, females exhibited higher heart rate response to acute stress than males (e.g., Guo et al., 2017). Thus, the current study explored the possibility of gender differences in participants' responses to the TSST.

Method

Participants

In the current study, all participants were college students recruited either through SONA (a system for recruiting introductory psychology students into research) and awarded course credits or through advertisements on the university's Quickie Job Board and compensated with a $25 gift card for completing the study. The sample consisted of 211 participants (females=135, *M* age =19.52, *SD*=1.96; males=76, *M* age=19.66, *SD*=2.31). Among these participants, 47.4% were White, 31.1% were Asian American, 6.7% were Hispanic, 6.7% were African American, and 8.1% were other ethnicities. The majority (91.9%) were from middle-class families. All reported being native English speakers.

Procedure

All procedures were approved by the university Institutional Review Board (IRB). After participants provided written consent, MindWare BioNex (Model 50-3711-01) physiological sensors were placed on their upper body to obtain heart rates and they were instructed to sit calmly and relax for 8 minutes. Next, participants were asked to engage in a modified Trier Social Stress Test (TSST; Kirschbaum et al., 1993) and then sit and relax for another 5 minutes following the test. Finally, they filled out a package of questionnaires, which took about 40 minutes. The TSST protocol consisted of a five-minute preparation period, a five-minute free speech period, and a five-minute mental arithmetic task in which they were asked to count backwards from 2083 by 13 in front of an audience of three young adults (research assistants) who were trained not to respond emotionally during the test. For the preparation phase, participants were told that the task involved their memorizing and delivering Martin Luther King's "I have a dream" speech and then doing a math problem in front of a panel of judges. They were then asked to memorize the speech alone in the room for five minutes. After the preparation period, the panel came into the room, turned on the video recorder, and asked the participant to stand in front of them to perform the speech and the math tasks. If the participant made a mistake in the speech or math, one judge would say "No, you are wrong. Please start from the beginning." As part of a larger project, all tasks were videotaped while participants' electrocardiogram (ECG) and respiration were monitored and recorded.

Measures

Parental Psychological and Physical Maltreatment. Two subscales of the Parent-Child Conflict Tactics Scale (CTSPC) were used to measure psychological and physical maltreatment by parents (father and mother separately) (Straus & Hamby, 1997; Straus et al., 1998). The psychological maltreatment subscale has five items, such as "My mother threatened to spank or hit me but did not actually do it." The physical maltreatment subscale has 13 items, including minor assault (corporal punishment), such as "My mother spanked me on the bottom with her bare hand" and severe assault, such as "My mother threw or knocked me down." For both psychological and physical maltreatment, participants were asked to think of the worst year of their childhood and choose how often, on scales ranging from 0 (this never happened) to 6 (more than 20 times in worst year) and 7 (not in worst year, but did happen at another time), their mother and their father carried out each behavior. Annual frequency scores were calculated for psychological and physical maltreatment. Maternal and paternal scores were summed to form parental psychological maltreatment and parental physical maltreatment scores. Cronbach's α was .85 for parental psychological maltreatment and .91 for parental physical maltreatment.

Parental Emotional Neglect. The Parental Bonding Instrument (PBI) was used to measure participants' maternal and paternal emotional neglect (Parker, Tupling, & Brown, 1979). The scale has been reported to have good test-retest reliability and validity (Parker, 1983, 1988). It has two subscales, including parental care and parental overprotection. For the purpose of this study, we used only the 12-item care subscale,

with some items reverse coded to measure participants' perception of maternal and paternal neglect during childhood. A sample item is "Did not help me as much as I needed." Each item was rated on a 4-point scale from 0 (very unlike) to 3 (very like). Ratings were summed up for a total parental emotional neglect score. Cronbach's α was .93.

Spontaneous Emotion Regulation Strategies. Egloff's (2006) measure, based on Gross and John's Emotion Regulation Questionnaire (Gross et al., 2003), was used to assess participants' spontaneous ER strategies during the TSST. This self-report scale includes two 3-item subscales: one for suppression and one for reappraisal. Participants reported on their spontaneous use of suppression and reappraisal immediately after the TSST math task. The suppression items are "During the situation, I controlled my emotion," "I showed my emotion," and "One could see my feelings during the situation." The latter two items were reverse coded. The reappraisal items were "I tried to see the situation as positive as possible," "I viewed the situation as a challenge," and "I thought of the situation in a way that made me stay calm." Participants rated each item on a 4-point scale ranging from 0 (not at all) to 3 (strongly). Subscale items were summed up to get a total score for suppression and a total score for reappraisal. Cronbach's α was .53 for reappraisal and .63 for suppression.

Heart Rate. Participants' heart rate was recorded throughout the TSST. For purposes of analysis, mean heart rate was calculated for the last two minutes of each of the following TSST segments: baseline, preparation, speech task, math task, and recovery.

Negative Affect. Using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), respondents reported the extent to which they were experiencing negative feelings three times during their participation in the study: 1) right before participating in the TSST; 2) right after participating in the TSST; and 3) ten minutes after the TSST. The negative affect scales of PANAS consisted of 10 items, covering a broad range of negative emotions--specifically distress, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid. Items were rated from 1 (very slight or not at all) to 5 (extremely). Ratings were summed to create total negative affect scores for each of the three time points. Cronbach's α was .79.

Subjective Anxiety. Participants were asked to rate their anxiety level from 0 (not at all) to 10 (extreme anxiety) (Hofmann et al., 1997) at the following time points: 1) right before TSST preparation (1st assessment); 2) in the middle of the TSST, between the speech task and the math task (2nd assessment); 3) immediately after the TSST (3rd assessment); 4) at the end of the recovery period, ten minutes after the TSST (4th assessment).

Behavioral Reactivity Coding. Participants' avoidant eye contact and facial anxiety expressions during the TSST were coded from the video recordings. For both sets of behaviors, two research assistants first coded a set of videos together to achieve good reliability and then coded the remaining videos independently. Periodic reliability checks between the independent coders were conducted to maintain high reliability. Fifty-one participants (24.2%) were not coded for avoidant eye contact and thirty-five participants

(16.6%) were not coded for anxiety expressions due to blurry scenes (coders were not able to detect eye gaze) or recording failures (e.g., camera out of power).

1) *Avoidant Eye Contact*: The number of times the participants looked away (did not look at panel or camera) and duration of that avoidant eye contact were coded. Two trained coders used a Datavyu program to code the frequency and duration of avoidant eye contact. Following the procedures used in Hofmann et al. (1997), the total durations and frequencies of avoidant eye contact during speech delivery and math were calculated. Intra-Class Correlation Coefficients (ICC) ranged from .84 to .99, indicating a satisfactory interrater reliability.

2) *Anxiety Expression*: Using the videotapes, coders rated each participant's anxiety level once per minute during speech delivery, math, and recovery; 5-point Likert-type scales with a range from 1 (not anxious at all) to 5 (extremely anxious) were used for each rating, based on the criteria developed and used by Egloff et al. (2006): nervous mouth movement, such as lip biting, lip licking, twitches of mouth, and pressing the lips; eye blinks, hand position and movement, such as nervous face or hair touching; and speech dysfluencies. Ratings were summed to get a total anxiety expression score for the duration of the TSST and a total anxiety expression score for the recovery period. The interrater reliability (ICC) ranged from .82 to .95, showing a satisfactory interrater reliability.

Analytical Strategy

First, descriptive and correlations analyses were conducted. Next, multilevel modeling (MLM) was adopted in the HLM7 program to examine dynamic changes in

heart rate, negative affect, and subjective anxiety from baseline, through the TSST, to recovery (linear and quadratic terms were added). Missing data were handled in the HLM7 program using full information maximum likelihood (FIML) estimation in multilevel modeling (Raudenbush, Bryk, & Cngdon, 2011).

Gender and ethnicity were added separately at level 2 of each multilevel model to determine whether the dynamic changes in heart rate, negative affect, and subjective anxiety differed by participant gender or ethnicity. Next, spontaneous suppression and reappraisal were added separately on level 2 of the MLM to examine their effect on dynamic changes in stress responses controlling for gender and ethnicity. Then, with gender and ethnicity controlled, the effect of each type of childhood maltreatment on heart rate, negative affect, and subjective anxiety were tested by adding them separately on level 2 of the MLM. Finally, the mediating effect of spontaneous suppression and reappraisal between childhood maltreatment variables and dynamic stress responses was tested by conducting latent curve model.

Example:

Level 1:

$$\text{Negative Affect} = b_0 + b_1\text{Time} + b_2\text{Time}^2 + \varepsilon$$

Level 2:

$$b_0 = \gamma_{00} + \gamma_{01}\text{Gender} + \gamma_{02}\text{Ethnicity} + \gamma_{03}\text{Suppression} + \upsilon_0$$

$$b_1 = \gamma_{10} + \gamma_{11}\text{Gender} + \gamma_{12}\text{Ethnicity} + \gamma_{13}\text{Suppression} + \upsilon_1$$

$$b_2 = \gamma_{20} + \gamma_{21}\text{Gender} + \gamma_{22}\text{Ethnicity} + \gamma_{23}\text{Suppression} + \upsilon_2$$

Results

Preliminary Analyses

Table 1 showed the means and standard deviations for all variables of interest as well as the independent sample t-test results comparing female and male scores on those variables. Male participants had significantly higher spontaneous reappraisal strategy scores during the TSST than female participants. Female participants reported significantly higher subjective anxiety during the TSST, right after the TSST, and 10 minutes after the TSST than male participants. Female participants also had higher heart rates from baseline level to recovery.

Table 6. **Descriptive Statistics and T-Tests Results for Gender in Variables of Interests**

Variables	Total (N=211) *M* (SD)	Sex Differences		
		Male (N=76) *M* (SD)	Female (N=135) *M* (SD)	t-value
Psychological Maltreatment	41.89(46.18)	40.39(45.50)	42.73(46.71)	0.35
Physical Maltreatment	18.67(45.41)	24.66(56.30)	15.30(37.79)	-1.41
Emotional Neglect	43.70(13.25)	42.82(11.65)	44.15(14.02)	0.67
Spontaneous Reappraisal	1.88 (0.71)	2.01 (0.65)	1.80 (0.73)	-2.05*
Spontaneous Suppression	1.38(0.60)	1.49 (0.69)	1.33 (0.53)	-1.76†
NEG (Baseline)	13.92 (3.98)	13.74 (4.23)	14.03 (3.84)	0.51
NEG (TSST)	18.17 (6.85)	17.03 (6.72)	18.82 (6.87)	1.83†
NEG (10 minutes after TSST)	13.33 (4.41)	13.04 (4.68)	13.50 (4.26)	0.72
Subjective Anxiety 1	2.61(1.46)	2.38(1.22)	2.74(1.57)	1.72†
Subjective Anxiety 2	5.26(2.05)	4.84(2.11)	5.50(1.99)	2.24*
Subjective Anxiety 3	4.72(2.22)	3.99(2.08)	5.14(2.20)	3.73***
Subjective Anxiety 4	2.86(1.66)	2.47(1.44)	3.07(1.74)	2.57*
Heart Rate (Baseline)	79.32(13.53)	76.17(14.52)	81.11(12.65)	2.57*
Heart Rate (Preparation)	88.43(13.78)	84.52(13.65)	90.66(13.40)	3.16**
Heart Rate (Speech)	96.85(16.83)	90.25(15.41)	100.64(16.49)	4.48***
Heart Rate (Math)	96.63(15.97)	92.19(17.32)	99.17(14.62)	3.10**
Heart Rate (Recovery)	79.31(14.87)	76.34(13.18)	80.99(15.54)	2.17*
Avoidant Eye Contact Duration	510.63(65.13)	508.56(73.71)	511.61(61.04)	0.28
Avoidant Eye Contact Frequency	45.94(30.55)	48.47(42.23)	44.76(23.31)	-0.72
Observed Anxiety (TSST)	2.96 (0.58)	2.93 (0.65)	2.97 (0.54)	-0.50
Observed Anxiety (Recovery)	1.19 (0.31)	1.23 (0.35)	1.16 (0.28)	1.43

Note. $^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 2 shows the correlations among variables of interest. Both parental psychological and physical maltreatment were positively correlated with self-reported negative affect at baseline level. Parental physical maltreatment was significantly negatively correlated with subjective anxiety and heart rate during the TSST. Spontaneous reappraisal was significantly negative correlated with parental emotional neglect, negative affect during the TSST, subjective anxiety from TSST to recovery, and heart rate during baseline and the math task. Spontaneous suppression was significantly negatively correlated with all self-reported negative affect scores, subjective anxiety scores, and heart rate during the speech task. It was also negatively correlated with observed anxiety during the TSST. Thus, the more spontaneous suppression participants reported using during the TSST, the less negative affect and subjective anxiety they reported experiencing during and after the TSST.

Table 7. **Correlations among Variables of Interests**

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.PSY	-																				
2.PHY	.60***	-																			
3.EN	.38***	.22***	-																		
4.Reappraisal	0.09	0.03	-.17*	-																	
5.Suppression	-0.04	-0.02	-0.04	0.1	-																
6.NEG 1	.21**	.17*	0.01	-0.02	-.16*	-															
7.NEG 2	0.09	0.07	0.03	-.17*	-.34***	.48***	-														
8.NEG 3	0.08	0.05	0.03	-.12†	-.26***	.59***	.77***	-													
9.SA 1	-0.02	0.01	0.05	-0.09	-.22**	.46***	.31***	.40***	-												
10.SA 2	-.13†	-.17*	0	-.15*	-.28***	.30***	.47***	.38***	.26***	-											
11.SA 3	-0.02	-0.06	0.05	-.17*	-.30***	.36***	.68***	.49***	.40***	.68***	-										
12.SA 4	-0.01	-0.08	0.04	-.20**	-.23**	.45***	.49***	.58***	.56***	.51***	.68***	-									
13.HR1	-0.12	-0.07	0.11	-.16*	-0.07	0.04	0.08	0.05	0.08	.15*	.18*	.19**	-								
14.HR2	-0.1	-0.1	0.02	-0.12	-0.12	-0.01	0.03	-0.01	0.02	.17*	.19**	.18*	.81***	-							
15.HR3	-0.06	-.16*	0.07	-0.1	-.15*	0.05	0.06	0.05	0.04	.20**	.24***	.23**	.74***	.86***	-						
16.HR4	-0.07	-.14*	0.03	-.18**	-0.11	0.08	0.09	0.1	0.06	.17*	.23**	.24**	.75***	.77***	.87***	-					
17.HR5	-0.11	-0.06	0.01	-.12†	-0.09	0.05	0.11	0.05	.13†	.18*	.20**	.22**	.78***	.71***	.66***	.69***	-				
18.AED	0.01	0.04	-0.09	.14†	-0.05	0.11	0.04	0.03	0.06	-0.02	0.07	0.11	0.03	0.01	-0.01	-0.03	0.05	-			
19.AEF	-0.07	-0.09	0.11	-0.01	-.15†	-0.07	0.03	0.08	0.02	-0.01	-0.06	-0.03	0.02	-0.04	0.01	0	-0.03	-.57***	-		
20.OA (TSST)	0.11	-0.07	0.04	-0.01	-.16*	.19*	.22**	.29***	0.04	.27***	.21**	.27***	0.01	-0.04	0.02	0.05	0	0.03	0.07	-	
21.OA (Recovery)	0.04	-0.09	0.04	0.09	-.13†	-0.08	-0.04	-0.02	0	0.08	.13†	0.03	-0.06	-0.05	-0.03	0	-0.11	0.04	-0.04	.36***	-

Note: Correlation analysis was performed with 5000 bootstrapping. PSY=Parental Psycholgoical Maltreatment; PHY=Parental Physical Maltreatment; EN=Parental Emotional Neglect; NEG 1=Negative Affect before TSST; NEG 2= Negative Affect after TSST; NEG 3=Negative Affect 10 minutes after TSST; SA1=Subjective Affect before TSST; SA2=Subjective Affect during TSST; SA3=Subjective Affect Right After TSST; SA4=Subjective Affect 10 minutes After TSST; HR1=Heart Rate during Baseline; HR2=Heart Rate during TSST Preparation; HR3=Heart Rate during Speech; HR4=Heart Rate during Math; HR5=Heart Rate during Recovery; AED=Duration of Avoidant Eye Contact during TSST; AEF= Frequency of Avoidant Eye Contact during TSST.

As a preliminary check on the effectiveness of our stress manipulation, we examined, without additional predictors, the unconditional models of heart rate, negative affect, and subjective anxiety by incorporating both linear and quadratic effects of time. The results indicated that heart rate showed a significant increase from baseline to TSST, b=18.36, p<.001, and a subsequent decrease from TSST to recovery, b=-4.38, p<.001. Both negative affect and subjective anxiety showed a significant increase from baseline to TSST (negative affect: b=8.76, p<.001; subjective anxiety: b=3.41, p<.001), and a subsequent decrease from TSST to recovery (negative affect: b=-4.52, p<.001; subjective anxiety: b=-1.13, p<.001). Thus, there were significant linear and quadratic effects of time on all three indicators of stress.

Next, we tested gender differences in dynamic stress responses. The MLM results showed that females had significantly higher baseline, b=4.45, p=.02, initial increase, b=4.30, p<.01, and greater quadratic deceleration, b=-1.08, p<.01, in heart rate (Figure 4) and had a significant higher initial increase, b=0.76, p=.04, in self-reported subjective anxiety (Figure 5) than males. We also checked the effect of ethnicity on dynamic changes in stress responses using the same method and found small ethnicity differences in negative affect and heart rate.

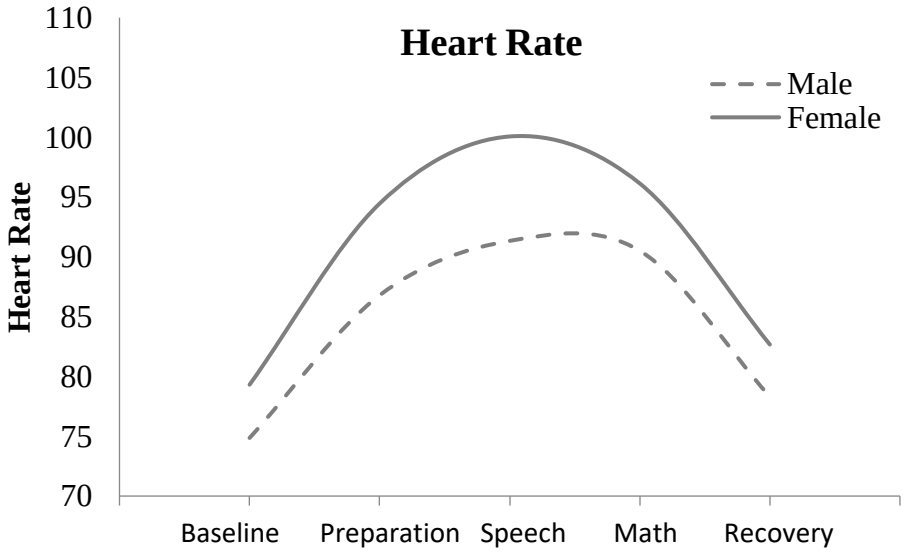

Figure 4. Gender differences in dynamic change of heart rate.

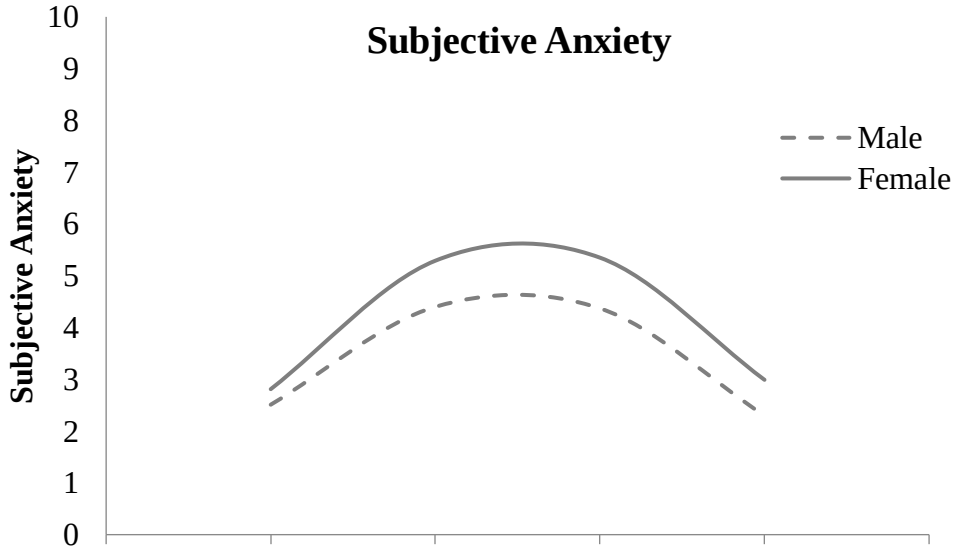

Figure 5. Gender differences in dynamic change of subjective anxiety.

Childhood Maltreatment and Dynamic Changes in Heart Rate, Negative Affect, and Subjective Anxiety

To test the first hypothesis, we examined the associations between childhood maltreatment variables and dynamic changes in heart rate, negative affect, and subjective anxiety with gender and ethnicity controlled. The results (Table 3) indicated that, in partial support of the first hypothesis, both parental psychological and physical maltreatment were significant predictors of self-reported negative affect value at baseline level; that is, the more psychological, b=0.02, p<.01, and physical maltreatment, b=0.02, p=.02, the respondents reported experiencing in childhood, the higher their negative affect during baseline. However, only parental psychological maltreatment was positively associated with observed anxiety during recovery. Contrary to expectation in Hypothesis 1, the associations between other forms of childhood maltreatment and dynamic changes in subjective anxiety or heart rate were not found.

Table 8. **Multilevel Models of the Associations Between Both Childhood Maltreatment and Spontaneous Emotion Regulation Strategies and Negative Affect Dynamic Changes (Gender and Ethnicity Controlled).**

Fixed Effect	Model 1			Model 2			Model 3			Model 4		
	Psychological Maltreatment			Physical Maltreatment			Suppression			Reappraisal		
	Coefficient	*SE*	*t*	Coefficient	*SE*	*t*	*Coefficient*	*SE*	*t*	*Coefficient*	*SE*	*t*
b_0 (NEG Baseline)												
γ_{00} (Intercept)	13.63***	0.79	17.23	13.67***	0.8	17.05	13.68**	0.74	18.52	13.51***	0.75	17.97
γ_{01} (Gender)	0.2	0.61	0.33	0.36	0.62	0.58	0.1	0.57	0.18	0.25	0.58	0.43
γ_{02} (Ethnicity)	0.19	0.38	0.5	0.1	0.39	0.25	0.1	0.35	0.29	0.14	0.35	0.41
γ_{03} (Predictor)	0.02**	0.01	2.98	0.02*	0.01	2.32	-1.03*	0.46	-2.24	-0.08	0.4	-0.19
b_1 (NEG Linear Change)												
γ_{10} (Intercept)	3.64†	2.15	1.69	3.52	2.15	1.63	4.87*	1.93	2.52	4.58*	2	2.29
γ_{11}(Gender)	2.92†	1.66	1.75	2.83†	1.67	1.69	1.89	1.5	1.25	2.23	1.55	1.44
γ_{12} (Ethnicity)	1.89†	0.03	1.84	2.00†	1.04	1.92	1.54†	0.91	1.7	1.58†	0.93	1.7
γ_{13} (Predictor)	-0.01	0.02	-0.3	-0.01	0.02	-0.53	-4.96***	1.21	-4.09	-2.29*	1.06	-2.17
b_2 (NEG Quadratic Change)												
γ_{20} (Intercept)	-1.81†	0.97†	-1.86	-1.76†	0.97	-1.81	-2.41**	0.88	-2.75	-2.27*	0.91	-2.5
γ_{21} (Gender)	-1.4	0.75	-1.86	-1.38†	0.76	-1.83	-0.92	0.68	-1.36	-1.09	0.7	-1.55
γ_{22} (Ethnicity)	-1.06*	0.46	-2.28	-1.09*	0.47	-2.32	-0.87*	0.41	-2.12	-0.90*	0.42	-2.12
γ_{23} (Predictor)	0	0.01	0.06	0	0.01	0.3	2.25***	0.55	4.09	0.99*	0.48	2.07
Random Effect	Variance Component	χ^2(*df*)	*p*	Variance Component	χ^2(*df*)	*p*	Variance Component	χ^2 (*df*)	*p*	Variance Component	χ^2(*df*)	*p*
υ_0 (NEG baseline)	11.66	657.49 (185)	<.001	11.97	669.71 (185)	<.001	10.89	672.92 -202	<.001	11.57	732.67 -202	<.001
υ_1 (NEG Linear Change)	90.18	735.71 (185)	<.001	89.35	731.74 (185)	<.001	76.19	694.24 -202	<.001	84.19	782.03 -202	<.001
υ_2 (NEG Quadratic Change)	17	648.99 (185)	<.001	17.46	646.60 (185)	<.001	14.89	617.27 -202	<.001	16.62	696.83 -202	<.001
Level 1 error, ε	4.59			4.6			4.75			4.46		

Note. † $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Spontaneous Suppression and Reappraisal, and Dynamic Changes in Heart Rate, Negative Affect, and Subjective Anxiety

To test hypothesis 2 and 3, associations between the two spontaneous strategies (suppression and reappraisal) and dynamic changes in heart rate, negative affect, and subjective anxiety with gender and ethnicity controlled were examined. The results (Table 3) indicated that, consistent with Hypothesis 2, spontaneous suppression was associated with lower baseline levels, a slower increase and a smaller subsequent quadratic rebound in negative affect (Figure 6); the same pattern of associations was also found in subjective anxiety (Figure 7) (baseline level, b=-.51, p<.01, a slower increase, b=-0.65, p=.03; a smaller subsequent rebound, b=0.21, p=.03). Also, consistent with Hypothesis 3, spontaneous reappraisal (Figure 8) was associated with a slower increase and a smaller subsequent quadratic rebound in negative affect. In other words, participants who reported greater use of suppression or reappraisal strategies had a smaller variant in negative affect responses across the TSST experiment. Regarding the associations among spontaneous ER strategies, behavioral responses and dynamic changes in heart rate, the results indicated that only spontaneous reappraisal was associated with baseline heart rate, b=-2.61, p=.046, and negatively associated with observed anxiety during the TSST and recovery, which is only partially consistent with Hypothesis 2 and 3.

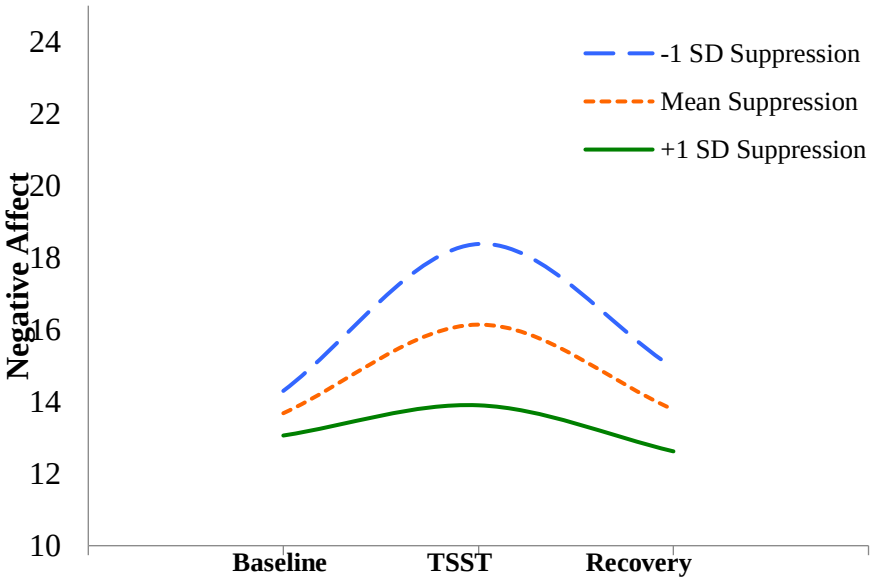

Figure 6. Associations between spontaneous suppression and dynamic response for negative affect.

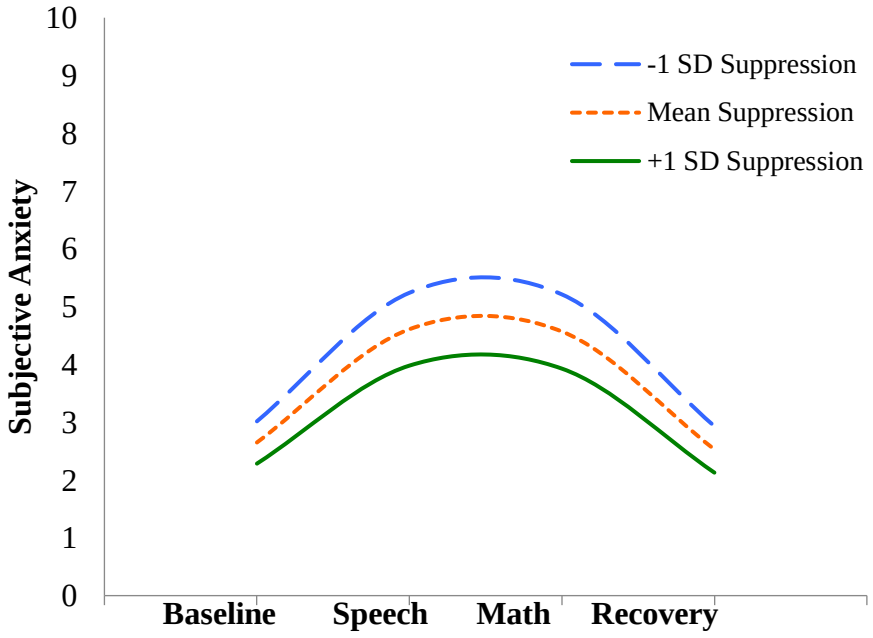

Figure 7. Associations between spontaneous suppression and dynamic change for subjective anxiety.

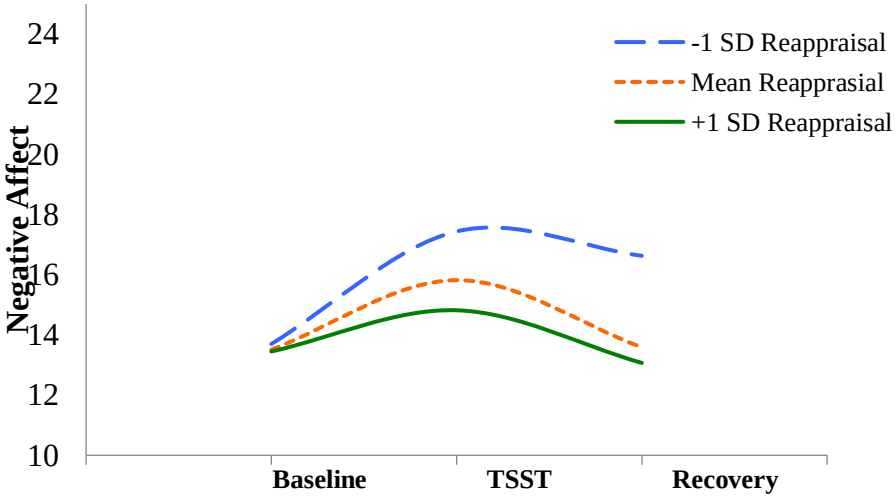

Figure 8. Associations between spontaneous reappraisal and dynamic change for negative affect.

For hypothesis 4, we predicted that spontaneous suppression or reappraisal would mediate the associations between childhood maltreatment and dynamic stress responses in heart rate, negative affect, and subjective anxiety as well as the behavioral responses. Because the correlation analysis showed that only parental emotional neglect was negatively associated with spontaneous reappraisal, we tested only the mediating effect of spontaneous reappraisal between parental emotional neglect and dynamic stress responses. No significant mediating effect of spontaneous reappraisal was found.

Discussion

Past studies have shown the deleterious effects of childhood maltreatment on later psychopathology and heightened stress responses to acute stress (e.g., Carpenter et al., 2011). Research into spontaneous ER strategies (e.g., Egloff et al., 2006; Volokhov et al.,

2010) has provided some evidence of their effects on psychological and physiological responses to a stress task. However, few studies have examined, from a developmental perspective, the associations between childhood maltreatment and later behavioral and dynamic (both linear and quadratic) physiological and emotional responses to the TSST, as well as the mediating role of spontaneous ER strategy use during the TSST in young adults. This is the first study to examine these associations.

Consistent with previous literature (e.g., Guo et al., 2017), the gender difference tests showed that females reported significantly higher subjective anxiety and displayed significantly higher heart rate than males during the TSST and recovery period. The multi-level modeling also revealed that females had greater increases in subjective anxiety and heart rate during the TSST.

Childhood Maltreatment and Stress Responses to TSST

Consistent with Hypothesis 1, parental psychological and physical maltreatment were positively associated with negative affect at baseline level. These associations may reflect hyper-reactivity in response to negative or stressful social situations in participants who experienced maltreatment during childhood. Previous research has shown that supportive parental behaviors are linked to fewer negative emotions in response to stress and better social problem-solving skills (Domitrovich & Bierman, 2001). It is possible that individuals who experienced more psychological or physical maltreatment gain fewer opportunities to learn adaptive ways to confront socially challenging situations from their parents and are more vulnerable to interpersonal distress (Wright et al., 2009).

In regard to behavioral responses, the results showed that parental physical maltreatment was also positively associated with observed anxiety expression during recovery from stress. This finding added to the literature showing that individuals who report experiencing more physical maltreatment find it harder to recover from a stress test and show a more anxious appearance during post-recovery. It is also in line with studies that found high prevalence of emotional and behavioral problems (Flisher et al., 1997; Lansford et al., 2002) and psychiatric disorders, such as posttraumatic stress disorder (PTSD), among individuals who have experienced childhood physical abuse and related interpersonal violence (e.g., Cloitre et al., 2010). No associations were found between childhood maltreatment variables and dynamic heart rate responses. It is possible that heart rate is influenced by a more complicated pattern involving both the parasympathetic (PNS) and sympathetic nervous systems (SNS) (Gross, 1998). Future studies might collect multiple indicators to reflect dynamic physiological responses to stress and their associations with childhood maltreatment.

The Role of Spontaneous Emotion Regulation Strategies

In partial support of our second hypothesis, participants with higher spontaneous suppression had lower negative affect at baseline and had a slower increase in both negative affect and subjective anxiety, and a smaller subsequent quadratic rebound, compared to those with lower spontaneous suppression. Also in line with the third hypothesis, spontaneous reappraisal was associated with a slower increase in negative affect and smaller rebound. These findings are consistent with previous research that used highly stressful psychosocial stress tests (Egloff et al., 2006), such as the TSST, but not

with those from studies using relatively less stressful tests (e.g., inducing stressful feelings by showing film clips; Ehring et al., 2010), confirming again that under highly socially stressful situations, both spontaneous suppression and reappraisal can help reduce negative feelings.

Interestingly, although spontaneous suppression was associated with a reduction in negative affect throughout the TSST, it was not associated with dynamic changes in heart rate or any behavioral responses, including avoidant eye contact and observed anxiety; by contrast, spontaneous reappraisal was associated with lower heart rate at baseline level and lower observed anxiety expression during the TSST and recovery period, which is partially consistent with the third hypothesis. This suggests that spontaneous suppression did not function to reduce heart rate or facial expressions of anxiety during the TSST. On the other hand, the findings regarding spontaneous reappraisal may indicate that people who are more inclined to use spontaneous reappraisal tend to have a steady low heart rate when confronting socially challenging situations and also exhibit less anxiety behaviors during and after stressful situations.

In order to test the mediating role of spontaneous ER strategies posited in Hypothesis 4, we first examined the relationship between childhood maltreatment and spontaneous ER strategies before examining the mediating role of spontaneous ER strategies. The results showed that parental emotional neglect was negatively associated with spontaneous reappraisal use. This is the first study that tested the association between childhood maltreatment and spontaneous ER strategies during a psychosocial stress test. The findings suggest that people who experienced more emotional neglect

during childhood may have a lower ability to use reappraisal during highly stressful social situations. It is possible that individuals exposed to parental emotional neglect may not have a lot of opportunity to develop adaptive stress coping skills from their parents or may get less guidance from them about how to manage stress in stressful social situations (Wright et al., 2009).

Other components of our fourth hypothesis were not supported; specifically, we did not find any mediating effect of spontaneous ER strategy between childhood maltreatment and dynamic stress responses. It is possible that the mediating effect was not strong enough to be detected even if these strategies were associated with certain dynamic stress responses and childhood maltreatment variables. More studies are warranted to examine other spontaneous ER strategies, such as acceptance and avoidance.

GENERAL DISCUSSION

The deleterious effect of childhood maltreatment on physical and mental health has been well documented. I have undertaken a comprehensive research project examining possible mediating roles of *habitual* emotion regulation strategies between a) different types of childhood maltreatment and perceived stress in a U.S. adult sample; and b) between parental emotional neglect and internalizing problems in adult samples from both the U.S. and South Korea; I also examined c) the potential mediating role of *spontaneous* emotion regulation strategies between childhood maltreatment and responses to acute stress in a U.S. sample. Below is a summary of each study and implications for the overall project.

Using self-report data, Study 1 examined the mediating role of habitual suppression and reappraisal and the moderating role of emotion regulation self-efficacy between childhood maltreatment (psychological and physical maltreatment, and emotional neglect) and perceived stress in college students as well as the moderating role of emotion regulation self-efficacy. It also tested the mediating role of trait resilience in the relationship between childhood maltreatment and perceived stress. Analyses were conducted to investigate gender-specific associations. Findings revealed that in females, both habitual use of suppression and reappraisal mediated the relationship between maternal/paternal emotional neglect and perceived stress, and suppression also mediated the relationship between maternal psychological maltreatment and perceived stress. Trait resilience mediated the relationships of maternal maltreatment, paternal psychological

maltreatment, and paternal emotional neglect with perceived stress in females. There were no significant mediation effects in males.

Results of this study reinforce the importance of conducting gender-specific analyses, given the evidence that patterns of associations between childhood maltreatment and mental health outcomes may differ for males versus females. These findings also suggest that interventions aiming at reducing perceived stress associated with maternal or paternal emotional neglect or maternal psychological maltreatment in women may benefit from targeting both suppression and reappraisal. For example, using workbooks and homework exercises to supplement weekly group sessions led by a trained leader, innovative intervention programs for adults who feel persistent distress from "adverse childhood experience" might focus on promoting their effective emotion regulation strategies (more cognitive reappraisal, less suppression, greater resilience) (Camerson, Carroll, & Hamilton, 2018).

Another option for interventions designed to reduce the negative effects of childhood maltreatment is the route focusing on promoting resilience, a trait and process that has been shown to be negatively related to perceived stress in males as well as females. A number of resilience-based programs developed for late adolescents and adults who have problems related to trauma and other negative experiences show some promise – for example, the WRITE ON (Writing and Reflecting on Identity to Empower Ourselves as Narrators) program for youth involved in child welfare and juvenile justice systems (and often maltreated) (Greenbaum & Javdani, 2017); the ecologically-focused effort of Differential Impact Theory recommendations for human service workers serving

children in war-zones, which urge a mutil-level approach to addressing children's sources of suffering and resilience (Wessells, 2017); and an Internet-based intervention (CORE: Cultivating our Resilience), for college students dealing with stress and anxiety (Herrero et al., 2018).

Study 2 examined the extent to which habitual use of suppression and reappraisal mediated relationships between one specific type of childhood maltreatment – parental emotional neglect--and internalizing problems (trait social anxiety and alexithymia) in Western and Asian young adults. I also tested whether the relationship of emotion regulation strategies with parental emotional neglect and internalizing problems differed between Western and Asian young adults. In both countries, structural equation models showed that parental emotional neglect exerted significant direct effects on both social anxiety and alexithymia, and a significant indirect effect on alexithymia via reappraisal. Although the association between parental emotional neglect and suppression was significant only in the U.S. sample, suppression was positively associated with both social anxiety and alexithymia in both countries. Thus, although parental emotional neglect is associated with adult internalizing symptoms in both countries, Asian values may counteract any negative contribution of parental emotional neglect to the use of suppression in Korean participants.

The results of this study are consistent with previous literature that childhood parental emotional neglect may be a universally negative parenting behavior impairing the development of adaptive emotion regulation strategies and leading to various internalizing problems. Study 1 suggested that for women who had experienced

childhood maltreatment, interventions designed to promote use of reappraisal and reduce use of suppression might prove helpful. Study 2 suggest that, given the possible cultural differences in the association between parental emotional neglect and suppression, interventions aimed at reducing suppression and promoting reappraisal in order to prevent or treat internalizing problems such as social anxiety and alexithymia might prove beneficial for U.S. individuals who had experienced parental emotional neglect during childhood. On the other hand, it may be more effective to focus only on facilitating reappraisal strategy use among South Korean populations. In both societies, reducing parental emotional neglect appears to be critical for the development of adaptive emotion regulation strategies and helping to protect against the development of internalizing psychological symptoms.

Study 3 investigated the extent to which childhood maltreatment (psychological, physical maltreatment, and emotional neglect) is associated with emotional and physiological dynamic reactivity (temporal change across time) patterns to the Trier Social Stress Test in young adults. It also examined the potential mediating role of spontaneous suppression and reappraisal between different types of childhood maltreatment and dynamic stress responses. Participants reporting experiencing higher parental psychological and physical maltreatment also reported having higher negative affect before the TSST. Psychological maltreatment was also positively associated with observed anxiety expression during the recovery period; parental emotional neglect was associated with lower spontaneous reappraisal. Both spontaneous suppression and reappraisal were associated with reduced emotional responses; spontaneous reappraisal

was also associated with lower heart rate at baseline and lower observed anxiety expression during the TSST and recovery. In addition, for gender differences, females reported higher subjective anxiety overall and displayed higher heart rates throughout the TSST and recovery period than males.

The third study contributed to the literature by demonstrating associations between childhood maltreatment and stress responses to acute stress with multiple types of response indexes, including emotional, physiological, and behavioral responses. Additionally, it showed associations between spontaneous suppression and reappraisal and stress reactivity, revealing the importance of developing adaptive strategies to deal with socially-stressful situations. Although the expected mediating roles of spontaneous suppression and reappraisal were not found, the results did show a significant association between childhood maltreatment and spontaneous reappraisal use during the TSST, and also showed associations between both spontaneous suppression and reappraisal and multiple stress reactivity indexes. These results also revealed the deleterious effects of childhood maltreatment not only on habitually-used ER strategies (Study 1 & 2), but also on the spontaneous use of ER strategies.

In general, I believe that by exploring possible links explaining the associations of childhood maltreatment, including emotional neglect, in relation to adult mental health and stress responses, the studies I conducted make significant contributions to the literature on pathways from childhood maltreatment to adult psychosocial and physiological functioning. Established institutes and projects focusing on child prevention/protection research may find this research helpful to the international effort to

combat the negative effects of childhood maltreatment. Other important avenues of research have been suggested by the findings. First, in the current research project, we focused on the role of only two ER strategies – suppression and reappraisal. Future studies might consider incorporating additional ER strategies, such as rumination and avoidance, and examining their potential mediating effects in the relationship between childhood maltreatment and mental health or stress responses. Second, all three studies in this dissertation are cross-sectional studies that used retrospective measures of childhood maltreatment; more longitudinal studies are needed to examine the long-term impact of childhood maltreatment on developmental outcomes. Third, as childhood maltreatment and its associations with mental health and stress responses appear to vary to some extent by gender and cultural background, further attention to these variables seems important in future research. The majority of our U.S. sample are White young adults from middle-class families. Thus, more studies are needed to determine the extent to which the current results apply to a broader range of cultures, ethnicities, and social-economic backgrounds. Finally, the current research program is innovative in its attention to the role of childhood maltreatment, including emotional neglect, in later neurological, physiological, emotional and behavioral reactivity patterns to psychosocial stress. As some research has shown an association between emotional concordance (or coherence) during a stress test and lower well-being, future studies should examine the effect of childhood maltreatment and ER strategies on the emotional concordance of physiological, emotional, and behavioral responses.

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