EXAMINING SELF-REGULATION IN THE PRESCHOOL YEARS

EXAMINING SELF-REGULATION IN THE PRESCHOOL YEARS: LINKS TO PSYCHOSOCIAL OUTCOMES, MATERNAL ADVERSE CHILDHOOD EXPERIENCES, AND PARENTAL EMOTION REGULATION

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LAY ABSTRACT

Self-regulation (SR) refers to an individual's ability to regulate or control their behaviour, emotions, and thoughts. Attaining the ability to self-regulate is considered an important area of development for children, and research has shown that SR ability impacts a wide range of outcomes throughout the lifespan. Within this dissertation, I sought to examine how several factors may impact preschoolers' ability to self-regulate, including maternal exposure to adverse or traumatic events within mothers' childhoods, maternal ability to regulate emotions, and paternal ability to self-regulate. Given that difficulties with SR appear to have persistent negative effects on a number of outcomes for children, I also examined how child SR impacts behavioural and emotional difficulties. Using data collected from 93 mothers and children, and 47 fathers from the same families, the results indicated that mothers who experienced adverse childhood events were more likely to have preschoolers who had lower SR abilities and greater behavioural difficulties. In addition, fathers who had more difficulty with SR were more likely to have children who also had difficulty with SR. Collectively, the results from this dissertation point to maternal early life adversity and paternal SR difficulties as factors that may increase risk for young children. Given that we know that difficulties with child SR and behavioural problems are associated with persistent negative outcomes across the lifespan, it will be important to continue to research ways to reduce risk for children. The results of this dissertation indicate that research investigating the effectiveness of interventions targeting maternal early adversity and paternal SR are worthy future pursuits.

ABTRACT

Self-regulation (SR), which refers to the ability to regulate one's own behaviour, emotions, and thoughts, is an important developmental milestone that impacts an array of outcomes throughout the lifespan. The purpose of the current study was to examine how SR is related to theoretically linked constructs among preschool-aged children. Based on previous research, several parental factors, including maternal adverse childhood experiences (ACEs), maternal emotion regulation (ER), and paternal SR, were investigated to determine how they impacted child SR. As well, child SR was investigated as a factor that may impact externalizing and internalizing difficulties. The current study represents cross-sectional data from a larger longitudinal research project focused on mothers and their young children. The final sample consisted of 93 mothers and three-year-old offspring. Based on the literature, three mediation models were tested using structural equation modelling: 1) maternal ER was hypothesized to mediate the relation between maternal ACEs and child SR, 2) child SR was hypothesized to mediate the relation between maternal ACEs and child externalizing difficulties, and 3) child SR was hypothesized to mediate the relation between maternal ACEs and child internalizing difficulties. Main effects between these variables were also investigated. A sub-study focused on paternal SR with 47 fathers was also conducted with the same families. Using paternal data, hypotheses were explored that were related to how paternal regulatory variables (including difficulties managing behaviours and emotions) were related to child SR. As well, the impact of paternal and maternal ER was compared for the outcome of child SR. Overall, results of the mediation models were not significant, however there were notable main effects in the maternal and child data. Specifically, maternal ACEs

significantly predicted child SR and externalizing difficulties, even after accounting for covariates, indicating that maternal ACEs appear to an important risk factor for specific child outcomes. As well, in the paternal data, there was a significant relationship between paternal SR and child SR, such that fathers who reported difficulty regulating their emotions and behaviours were more likely to have children that demonstrated difficulty with SR. The remaining paternal hypotheses were not significant. Collectively, these results point to maternal ACEs and paternal SR difficulties as factors that appear to increase risk for young children. Given that difficulties with both child SR and externalizing difficulties are associated with persistent negative outcomes, it will be imperative to continue to examine the sequelae associated with maternal ACEs, as well as to evaluate the effectiveness of interventions targeting difficulties associated with maternal ACEs and paternal SR.

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

LIST OF ALL ABBREVIATIONS

ACEs.....Adverse childhood experience
BRI .....Behavioural Regulation Index
BRIEF-A.....Behavior Rating Inventory of Executive Function – Adult Version
CBCL..... Child Behavior Checklist
CESD.....Center for Epidemiologic Studies Depression Scale
CFA ..... Confirmatory factor analysis
CTQ ..... Childhood Trauma Questionnaire
DERS.....Difficulties in Emotion Regulation Scale
DCCS.....Dimensional Change Cart Sort
EC .....Effortful control
EF .....Executive function
ER ..... Emotion regulation
ERQ ..... Emotion Regulation Questionnaire
FIML..... Full information maximum likelihood
GW ..... Gift wrap task
NCS-R ..... National Comorbidity Survey-Revised
PPVT .....Peabody Picture Vocabulary Test-4
SEM..... Structural equation modelling
SES ..... Socioeconomic status
SR ..... Self-regulation
TB .....Transparent box task
NCS-R ..... National Comorbidity Survey-Revised

DECLARATION OF ACADEMIC ACHIEVEMENT

I hereby certify that I am the sole author of this thesis and that no part of this thesis proposal has been published or submitted for publication or for a higher degree at another institution.

I certify that, to the best of my knowledge, my thesis does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my thesis, published or otherwise, are fully acknowledged in accordance with the standard referencing practices.

INTRODUCTION

Self-regulation (SR) refers broadly to an individual's ability to regulate behaviour, emotions, and thoughts for the purposes of goal-directed action (Blair & Ursache, 2011; Bridgett, Burt, Edwards, & Deater-Deckard, 2015; Karoly, 1993; Sulik, Daneri, Pintar-Breen, & Blair, 2016). SR has long been considered to be a fundamental early childhood developmental achievement (e.g., Flavell, 1977; Kopp, 1982). It has been argued that understanding SR is the most important task for advancing knowledge related to typical development and psychopathology (Posner & Rothbart, 2000). SR abilities have been shown to be related to many important developmental outcomes among children, including externalizing and internalizing problems (Choe, Olson, & Sameroff, 2013; Compas et al., 2017; Eisenberg, Spinrad, & Eggum, 2010), academic achievement (Willoughby, Kupersmidt, Voegler-Lee, & Bryant, 2011), and social outcomes (Calkins & Fox, 2002; Shields, Cicchetti, & Ryan, 1994). Longitudinal studies have demonstrated that childhood SR is also related to outcomes within adolescence (Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990) and adulthood (Casey et al., 2011; Schlam, Wilson, Shoda, Mischel, & Ayduk, 2013), indicating that the impact of childhood SR is very persistent.

Consistent with biopsychosocial theories, SR is thought to be related to a number of factors, including genetics, temperament, and parenting (Hawn, Overstreet, Stewart, & Amstadter, 2015; Kochanska, Philibert, & Barry, 2009; Rothbart & Bates, 1998; Willems et al., 2018). Studies of how parenting relates to the development of SR have emphasized the importance of many environmental factors, including

parental style and response to the child's emotional displays, marital conflict, household chaos, household socioeconomic status (SES), accumulation of risk factors in the family, and parental SR (Bridgett et al., 2015; Brieant, Holmes, Deater-Deckard, King-Casas, & Kim-Spoon, 2017; Chang, Schwartz, Dodge, & McBride-Chang, 2003; Eisenberg et al., 1999; Morris et al., 2002). Past research provides fairly robust evidence that parental regulatory abilities predict child regulatory abilities, though the specific variables considered vary by study (for a review, see Bridgett et al., 2015). Overall, a substantial body of research supports the link between parental emotion regulation (ER), in particular, and child regulatory capacity (Morelen, Shaffer, & Suveg, 2016; Morris, Criss, Silk, & Houltberg, 2017; Samuelson, Krueger, & Wilson, 2012). What remains to be investigated is the impact of more foundational factors, such as maternal exposure to adverse childhood experiences (ACEs), which are likely to impact both maternal and child regulatory ability.

Given that child SR is theorized to develop within an environment that offers a suitable parent-child relationship, such as the secure attachment relationship (Bridgett et al., 2015; Calkins & Leerkes, 2011; Cassidy, 1994; Morris et al., 2017; Sroufe, 1996), it is important to examine experiences that may disrupt the home environment and parental relationships. ACEs refer specifically to the following 10 experiences: childhood physical, sexual, and emotional abuse, physical and emotional neglect, and childhood exposure to parental separation or divorce, domestic violence, parental mental health difficulties and addiction issues, and parental incarceration (Felitti et al., 1998). In general, greater exposure to ACEs is related to a number of adverse outcomes, including increased risk of cancer, heart disease, and obesity

(Felitti et al., 1998), increased risk of mental illness and substance use (Anda et al., 2006; Merrick et al., 2017), higher rates of unemployment (Liu et al., 2013), and increased risk of intimate partner violence in adulthood (Mair, Cunradi, & Todd, 2012). Maternal childhood adversity likely impacts maternal parenting, and has been shown to be related to insecure attachment (Cooke, Racine, Plamondon, Tough, & Madigan, 2019), greater parental distress (Lange, Callinan, & Smith, 2019; Steele et al., 2016), and difficulties with ER (Barlow, Goldsmith Turow, & Gerhart, 2017; Carvalho Fernando et al., 2014; Dvir, Ford, Hill, & Frazier, 2014; Lovallo, 2013). There have been a small number of studies that have examined the impact of early maternal adversity on child regulatory outcomes, and found maternal childhood adversity is associated with increased risk for children (Delker et al., 2014; DeOliveira, Wolfe, & Bailey, 2004; Gray, Jones, Christoner, Theall, Glackin, & Drury, 2017). Overall, however, the link between maternal ACEs and child SR has yet to be fully elucidated. Despite this, there are important theoretical reasons to consider this link to be worth investigating. Specifically, ACEs have been shown to lead to a number of negative outcomes, as mentioned above, and such outcomes are likely to disrupt the parent-child relationship and to contribute to more stress in the home environment, both of which are important to child SR development (Bridgett et al., 2015; Brieant et al., 2017). Overall, there is evidence indicating that maternal ACEs impact maternal ER, and are likely to impact child SR, and that maternal ER is likely to predict child SR.

As mentioned above, SR is considered to be a foundational milestone within early childhood (e.g., Flavell, 1977; Kopp, 1982), and has been shown to be

associated with a number of later outcomes, including externalizing and internalizing problems (Choe et al., 2013; Compas et al., 2017; Eisenberg et al., 2010). Although both externalizing and internalizing difficulties are characterized by high levels of negative emotion, the nature of these emotions and their behavioural expression differ. Whereas externalizing difficulties are characterized by high levels of anger and aggressive and impulsive behaviours (Ştefan & Avram, 2017), internalizing difficulties are characterized by high levels of depression and anxiety, and are marked by increased avoidance and withdrawal (Ştefan & Avram, 2017; Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). These constructs are studied because research has consistently indicated that these two broad factors, internalizing and externalizing difficulties, represent the majority of psychological problems for both children (Achenbach & Edelbrock, 1978; Achenbach, Hensley, Phares, & Grayson, 1990) and adults (Carragher, Krueger, Eaton, & Slade, 2015). Externalizing and internalizing difficulties have been shown to be associated with problems with SR, though results have been more consistent for studies examining SR and externalizing difficulties compared to internalizing difficulties (Eisenberg, Hernandez, & Spinrad, 2017; Eisenberg et al., 2010). Maternal ACEs have also been shown to predict child externalizing and internalizing difficulties (Fredland, McFarlane, Symes, & Maddoux, 2018; Letourneau et al., 2019; McDonald et al., 2019; Stepleton et al., 2018; Treat, Sheffield-Morris, Williamson, & Hays-Grudo, 2019). Recently, two studies found that child ER mediated the relationship between variables that impact the parent-child relationship (i.e., attachment security and maternal incarceration) and externalizing and/or internalizing difficulties (Ştefan & Avram, 2017; Zeman,

Dallaire, Folk, & Thrash, 2018). In light of this evidence, it appears as though maternal ACEs could be an important factor in predicting both child SR and well-being variables, such as externalizing and internalizing difficulties, and that child SR may be an important mediating variable in explaining how well-being variables are impacted; however, these particular variables have yet to be tested together. Overall, the impact of mothers on children's development continues to be examined and is beginning to be better understood; however, the impact of fathers is far less clear.

In developmental research, fathers have generally been studied considerably less than mothers (Phares, Lopez, Fields, Kamboukos, & Duhig, 2005), and this remains true for research focused on child SR. When fathers have been considered in research focused on child SR, they have often been studied jointly alongside mothers to determine the parental impact on SR (Karreman, van Tujil, van Aken, & Dekovic, 2006). More recently, however, attempts have been made to examine the unique impact of fathers on child regulatory outcomes. Several studies have examined how fathers' parenting styles, including intrusive and controlling interactions with their young children, are associated with children's difficulties with various regulatory tasks (Meuwiseen & Carlson, 2015; Owen et al., 2013; Stevenson & Crnic, 2013). By comparison, there are more studies focused on child regulatory outcomes that include mothers and fathers together. Among studies that have attempted to compare the impact of mothers and fathers, results have been mixed. Whereas some have shown that mothers and fathers have a similar impact on child regulatory ability (Bridges, Grolnick, & Connell, 1997; Diener, Mangelsdorf, McHale, & Frosch, 2002), others have suggested that mothers are more important (Bariola, Hughes, & Gullone, 2012;

Doan, Son, & Kim, 2018). A recent study demonstrated that both mothers' and fathers' ER difficulties uniquely predicted adolescents' ER and emotional lability (Li, Li, Wu, & Wang, 2019). On the whole, however, results have not been consistent with regard to the importance of fathers on children's regulatory outcomes, especially when fathers were compared with mothers. The current study was designed to clarify this work for fathers and preschoolers.

Overall, there is an array of previous research connecting the variables of interest in the current study. What appears missing from the literature is an attempt to draw them together into cohesive models that examine explanatory factors within the relationships. The current study will test three mediation models focused on maternal and child variables, which examine the intergenerational impact on child SR and child externalizing and internalizing difficulties. These models do not appear to have been tested in the past, and doing so now will provide important novel information to the field. In addition, the current study will test whether paternal variables predict child SR, and whether fathers' ER skills are related to child SR after accounting for the impact of mothers' ER skills. In this matter, this thesis helps to clarify the role of fathers in terms of development of child SR, and offers important and novel evidence about the impact of fathers on developmental outcomes.

Purpose of the Present Study

This research was designed to examine preschooler SR and related factors. A primary purpose was to examine how parental factors—such as maternal ACEs, maternal ER, and paternal regulatory variables—impact child SR. Child SR was also investigated as a potential indirect link between maternal ACEs and child

externalizing and internalizing difficulties. Although child SR has become an area of intense research focus within the last few decades, studies examining explanatory variables are still needed. Likewise, even though the study of ACEs has increased dramatically in recent years, based on early research indicating the potent and cumulative effect of ACEs on an individual's own later development, studies linking parental ACEs and child outcomes are still relatively infrequent. Thus, further elucidation of the relationships involved in the generational transmission of adverse and traumatic experiences are complex and in need of further study.

Research Questions and Hypotheses

Research Question 1: Are maternal ACEs and maternal ER determinants of SR for preschool-aged children?

Previous research indicates that the development of SR is associated with an array of variables, including parental factors (e.g., Bridgett et al., 2015). What remains to be tested is whether maternal ACEs predict child SR. The current study will also test whether maternal ER difficulties predict child SR, in hopes of replicating previous findings. In order to combine these variables into a comprehensive model, a mediation analysis will be conducted to determine whether maternal ER difficulties provide a potential pathway whereby maternal ACEs impact child SR.

Hypothesis 1a. Maternal ER difficulties will mediate the relation between maternal ACEs and child SR.

Hypothesis 1b. Maternal ACEs will be negatively associated with child SR.

Hypothesis 1c. Maternal ER difficulties will be negatively associated with child SR.

Research Question 2: How do maternal ACEs and child SR relate to externalizing difficulties for preschoolers?

Studies support the link between maternal ACEs and externalizing difficulties for children (Fredland et al., 2018; Letourneau et al., 2019; McDonald et al., 2019; Stepleton et al., 2018), as well as the link between child SR and externalizing difficulties (Choe et al., 2013; Compas et al., 2017; Schoemaker, Mulder, Deković, & Matthys, 2013; Smith & Day, 2018). What remains to be tested is whether child SR functions as a mechanism whereby maternal ACEs impact child externalizing difficulties. The current study will examine this question, and also explore main effects to determine if the current data replicates past findings.

Hypothesis 2a. Child SR will mediate the relation between maternal ACEs and child externalizing difficulties.

Hypothesis 2b. Maternal ACEs will be positively associated with child externalizing difficulties.

Hypothesis 2c. Child SR will be negatively associated with child externalizing difficulties.

Research Question 3: How do maternal ACEs and child SR relate to internalizing difficulties for preschoolers?

Studies also support the link between maternal ACEs and internalizing difficulties for children (Fredland et al., 2018; McDonald et al., 2019; Stepleton et al., 2018), as well as the link between child SR and internalizing difficulties (Compas et

al., 2017; Dennis, Brotman, Huang, & Gouley, 2007; Murray & Kochanska, 2002; Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997). However, previous research has not yet identified many causal pathways between maternal ACEs and internalizing difficulties, and both research and theory support testing child SR as a potential mediator. The current study will empirically test this relationship, and explore main effects to determine if previous findings are replicated in the current data.

Hypothesis 3a. Child SR will mediate the relation between maternal ACEs and child internalizing difficulties.

Hypothesis 3b. Maternal ACEs will be positively associated with child internalizing difficulties.

Hypothesis 3c. Child SR will be negatively associated with child internalizing difficulties.

Research Question 4: What is the impact of paternal regulatory variables on child SR?

Previous research has typically been focused on the impact of mothers on child outcomes; however, fathers likely have an important impact on their children's development. Although fathers have recently begun to be included in studies, many questions remain about the impact of fathers on children's development, as well as the relative impact of mothers and fathers. Fathers remain understudied in examinations of regulatory variables, and those studies that have compared the impact of mothers and fathers on child SR have sometimes yielded inconsistent results (Bariola et al., 2012; Bridges et al., 1997; Diener et al., 2002; Doan et al., 2018). As

such, our understanding of the paternal impact on child SR is ongoing. The current study will test basic relationships between paternal regulatory variables and child SR, and will also attempt to determine whether maternal or paternal ER difficulty is a better predictor of child SR.

Hypothesis 4a. Paternal ER difficulties will negatively predict child SR ability.

Hypothesis 4b. Paternal SR will positively predict child SR.

Hypothesis 4c. Paternal ER difficulties will predict child SR after considering the effect of maternal ER difficulties.

LITERATURE REVIEW

Defining Self-Regulation

Self-regulation (SR) is a broad and conceptually complex construct, and researchers have suggested that it is closely related to several concepts, including effortful control (EC), executive function (EF), self-control, and emotion regulation (e.g., Blair & Ursache, 2011; Bridgett, Burt, Edwards, & Deater-Deckard, 2015). Until recently, the field of SR has lacked an overarching theory, with studies of SR and similar constructs being approached from several different theoretical perspectives. Some researchers have argued that research focused on "self-regulation" has been informed by two different fields: research focused on EC and research focused on EF (Sulik et al., 2016). Conversely, some researchers have suggested that SR and EF are conceptually distinct, and have argued that SR is rooted in social and personality psychology, whereas EF, a related concept, is rooted in cognitive psychology and neuropsychology (Hofmann, Schmeichel, & Baddeley, 2012). In general, definitions of SR have varied widely within the literature, and an exploration of the conceptual and methodological issues related to studying SR is thus warranted.

Contemporary conceptualizations of SR typically acknowledge that it is made up of two different, but inter-related, sets of processes; that is, "top down" processes involving executive or attentional control, and "bottom up" processes that refer to more automatic responses (Blair & Ursache, 2011; Bridgett et al., 2015). Specifically, there are at least two different theoretical models that recently have been posited to define SR. Bridgett and colleagues (2015) offer a conceptualization of SR that further

differentiates such top-down and bottom-up processes. In this case, the authors specify that top-down regulatory processes include behavioural SR and emotional SR.

Behavioural SR consists of constructs that have been previously referred to as EC, EF, and self-control (Bridgett et al., 2015). EC represents the biologically-based self-regulatory aspect of temperament, and refers to the ability to inhibit a dominant response in order to allow for a subdominant response, to detect errors, and to plan (Rothbart & Bates, 2006). Historically, conceptual definitions of EC have focused on the inhibition of dominant responses, and so inhibition of behaviour was considered to be the hallmark of the development of executive attention within the temperament literature (Posner & Rothbart, 2000). Alternatively, EF refers to cognitive abilities that are utilized when automatic brain processes and behaviour are not sufficient in a given situation (Sulik et al., 2016). Considerable research has focused on three primary, and partially related, EF abilities: working memory, inhibitory control, and set shifting (Blair & Ursache, 2011; Miyake et al., 2000; Sulik et al., 2016). Notably, temperament research, including studies focused on EC, has historically had a strong developmental focus (Rothbart, 2012), whereas studies of EF are often rooted in neuroscience and neuropsychology (Bridgett et al., 2015; Hofmann et al., 2012). The definition and measurement of EC has also become more closely aligned with the definition of EF over time (Rothbart, 2007). Importantly, behavioural SR constructs, including EC, EF, and self-control, have been shown to have considerable overlap at conceptual, behavioural, and neurological levels (Bridgett et al., 2015; Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013).

Beyond behavioural SR, Bridgett and colleagues (2015) refer to an additional aspect of top-down SR, emotional SR. This construct is frequently described as emotion regulation (ER) or emotion-related self-regulation. Like behavioural SR, emotional SR is thought to originate from neural structures within the frontal lobe and anterior cingulate cortex (Bridgett et al., 2015). As such, these top-down processes stem from neurologically similar origins and have considerable conceptual overlap.

Within bottom-up processes, Bridgett and colleagues (2015) differentiated between behavioural inhibition/fear (i.e., behavioural overcontrol) and impulsivity (i.e., behavioural undercontrol). These constructs have theoretical roots in the temperament and personality literatures and are considered more automatic processes than the top-down processes mentioned above. The bottom-up regulatory systems originate neurologically in subcortical structures, further emphasizing their distinction from top-down processes. However, bottom-up and top-down processes work together to support SR (Bridgett et al., 2015).

Blair and Ursache (2011) offer an earlier bidirectional model of SR. This model indicates that effective top-down cognitive EF processes lead to improved SR of behaviour and, from a bottom-up perspective, SR is dependent on regulation of attention, emotion, and stress physiology (Blair & Ursache, 2011). In this case, the authors theorize that SR is the behavioural correlate of EF processes, and that the regulation of emotional processes is necessary in order for SR to be possible. This is different from Bridgett et al.'s (2015) model, which includes behavioural and emotional SR as components of SR overall. In general, it seems that Bridgett et al.'s (2015) model is more comprehensive and based on a substantial review of the

literature. The current paper will focus on the nature of top-down processes in the study of SR, which have a different developmental trajectory than bottom-up processes (although these are certainly related to overall function of SR). SR studies rooted in conceptual definitions related to EC and EF will also be described and contrasted, as relevant.

From a methodological perspective, temperament research, including studies focused on EC, has historically had a strong developmental focus and has typically involved studying children (Rothbart, 2012). Accordingly, the developmental trajectory of EC has been well studied, primarily by Grazyna Kochanska and her colleagues (e.g., Kochanska, Coy, & Murray, 2001; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Kochanska, Murray, & Harlan, 2000; Kochanska & Knaack, 2003). In this body of literature, EC has been shown to increase substantially within the first few years of life and become relatively longitudinally stable by about age three or four (Kochanska & Knaack, 2003; Kochanska et al., 2000). Kochanska's battery of behavioural measures, which is frequently used to measure EC, includes both complex and simple measures of inhibitory control. An example of a complex measure of inhibitory control is the Bear and Dragon task, which involves asking children to respond to commands given by the bear puppet, but inhibit commands given by the dragon puppet (e.g., "touch your tummy;" Kochanska et al., 1996). Simple measures of inhibitory control, such as those focused on delay of gratification tasks, are also used by Kochanska and colleagues. An example is the Wrapped Gift task, which requires children to wait for one minute without peeking while a gift is wrapped noisily behind their backs (Kochanska et al., 1996, 2000). The Bear and

Dragon task is considered to be more complex because it requires two different responses on behalf of the child (i.e., engaging in an action, or inhibiting and waiting for the next command), whereas the Wrapped Gift task merely requires a child to inhibit and wait. Although these are certainly not the only measures of EC used by researchers, they are representative of the types of tasks frequently used in the literature.

In contrast, research focused on EF is often rooted in the adult neuropsychological literature, although developmental studies of EF are increasing (Bridgett et al., 2015). From a methodological perspective, studies focused on EF typically reflect a wider set of skills often associated with EF (e.g., working memory, inhibitory control, set shifting). Studies measuring SR from an EF perspective also often break down tasks into those that measure "hot" or "cool" EF. "Hot" regulation tasks refer to motivationally salient tasks that often include high emotionality, whereas "cool" regulation tasks refer to primarily cognitive tasks with low emotionality (Metcalfe & Mischel, 1999; Willoughby et al., 2011; Zelazo & Anderson, 2014). Measures of "hot" regulation include delay of gratification tasks, such as those described by Kochanksa and colleagues (Kochanska et al., 1996, 2000), as well as tasks that involve the regulation of emotions, such as the management of anger required during the Frustration Box Task, which requires children to attempt to open a clear, locked box using a number of keys, in order to a retrieve a desired toy (Goldsmith, Reilly, Lemery, Longley, & Prescott, 1999). Measures of "cool" regulation include card sort tasks (Hongwanishkul, Happaney, Lee, & Zelazo, 2005; Zelazo & Carlson, 2012), as well as other tasks that appear emotionally neutral and

therefore require less ER (Willoughby et al., 2011). Note that hot and cool aspects of SR appear to be distinct based on factor analyses, but are also considered to be correlated processes; that is, hot and cool regulation are not orthogonal aspects of SR, and the two processes often work together (Willoughby et al., 2011; Zelazo & Anderson, 2014).

It is evident that many researchers have emphasized the importance of behavioural measures of SR in early childhood. However, although there are some parent-report measures focused on regulatory abilities for older children (e.g., Emotion Regulation Checklist; Shields & Cicchetti, 1997) and adolescents (e.g., Behavior Rating Inventory of Executive Function-2; Gioia, Isquith, Guy, & Kenworthy, 2015), there are relatively fewer parent-report measures focused on SR in early childhood (e.g., Behavior Rating Inventory of Executive Function-Preschool version; Gioia, Epsy, & Isquith, 2003). Unfortunately, few studies have utilized both parent-report and behavioural measures of child SR, but limited findings suggest that parent-report and behavioural tasks conducted in the laboratory are likely to be fairly consistent for preschoolers (Kochanska et al., 2000). Presently, behavioural measures of SR, which are consistent with best practice recommendations in the field (Bridgett et al., 2015; Sulik et al., 2016), are used in the vast majority of studies (e.g., Choe et al., 2013; Kochanska et al., 2009; Willoughby et al., 2011).

Notably, although the EC and EF literatures have relied on different conceptualizations and operationalizations, both observe a substantial increase in SR ability in the early years, followed by a period of slower, more longitudinally stable growth between ages three and five (Kochanska & Knaack, 2003; Willoughby, Wirth,

Blair, & The Family Life Project Investigators, 2012). An overlap within the types of tasks used is noted as well, especially for tasks related to inhibition. Overall, researchers have begun to identify the overlap between these previously separated fields, and call for greater theoretical and methodological integration across different approaches to studying SR (Blair & Ursache, 2011; Bridgett et al., 2015, 2013; Sulik et al., 2016). Several researchers have also emphasized the importance of multiple measures of SR and the inclusion of latent variables of SR, both of which tend to provide a more stable and reliable estimate of SR throughout development (Bridgett et al., 2015; Kochanska et al., 2000; Sulik et al., 2016). As such, current best practices suggest that the best models of SR include constructs that have previously been thought of as distinct (e.g., EC and EF), and that studies of SR in childhood should include multiple measures of SR, including measures that stem from the EC and EF literature, and the use of latent variables in analyses, which appear to improve reliability of measurement over childhood.

Emotion regulation. Emotion regulation (ER) has become an area of increased interest over the past several decades, and is frequently studied as a standalone construct (e.g., Gross, 2013). For this reason, it is useful to reiterate the relationship between ER and SR. Throughout the literature, several researchers have attempted to demonstrate the important link between emotion and cognition in terms of the development of regulatory capacity. As mentioned above, Blair and Ursache (2011) and Bridgett et al. (2015) have each described a conceptual model of SR that includes top-down cognitive and emotional processes supporting SR, understanding that SR is simultaneously dependent on reactive bottom-up processes. This work is

consistent with previous theories of cognition and emotion that emphasize how these processes are intricately linked (e.g., Bell & Wolfe, 2004). Thus, ER, which is often identified as a construct worthy of study in its own right, is clearly intricately linked to the SR literature more broadly.

Emotion regulation refers to the process of modifying the intensity and duration of internal emotional states (including both positive and negative emotional states), and regulating when and how emotions are expressed (Gross, 1998; Morris et al., 2017; Thompson, 1994). Similar to SR (as will be described in a forthcoming section), from a developmental perspective, ER is viewed as a process that emerges based on both intrinsic characteristics as well as extrinsic socioemotional experiences, which have been proposed to largely take place within the parent-child attachment relationship (Calkins & Leerkes, 2011; Kopp, 1989; Morris et al., 2017; Morris et al., 2007; Thompson, 1990). As with SR, definitions of ER have not been consistent within the literature (e.g., Cole, Martin, & Dennis, 2004). Eisenberg and colleagues argue that ER processes that are intrinsic are more fundamental in terms of our understanding of the development of SR generally (Eisenberg & Spinrad, 2004; Eisenberg & Sulik, 2012). In the current thesis, ER is viewed as closely linked with SR, which involves characteristics such as self-control, inhibition, and restraint (Kochanska, Aksan, & Joy, 2007), and is considered a core skill relevant to the development of socio-emotional and cognitive processes (Eisenberg, Sadovsky, & Spinrad, 2005).

It also appears likely that SR and ER are more difficult to parse among very young children, like toddlers and preschoolers. Given that children of this age are

unable to articulate their regulation strategies or answer paper-and-pencil measures focused on a particular construct, researchers are left to rely on behavioural measures or parent-report measures which reflect observable behaviour. As such, in practical terms, the cross-over between the measurement of self-regulation and emotion/behavioural regulation is likely higher among this population. As well, given the conceptual and neurological relatedness of ER and SR (e.g., Bridgett et al., 2015), studies of both regulatory abilities will be considered and contrasted within the current review as appropriate.

The Development of Self-Regulation

As with many developmental abilities, SR is thought to develop based on a range of biological and environmental factors. As mentioned, some researchers have posited that SR is an aspect of temperament (Rothbart & Bates, 1998), which refers to stable and biologically based aspects of SR and emotional and attentional reactivity (Rothbart, 2007; Rothbart & Bates, 2006). As such, SR would be related to the biological factors that impact children's ability to self-regulate. There is also evidence supporting a genetic component to SR and related constructs, such as ER (Hawn et al., 2015; Willems et al., 2018). However, in addition to biology, parenting and household context also appear to have a significant impact on the development of SR (Bridgett et al., 2015; Brieant, Holmes, Deater-Deckard, King-Casas, & Kim-Spoon, 2017; Kochanska, Philibert, & Barry, 2009; Morris et al., 2007, 2017).

Within an environment that offers a suitable parent-child relationship, such as a secure attachment bond, it has been demonstrated that SR develops gradually from about 12 months onward (Kopp, 1982) and children begin to demonstrate the ability

to self-regulate independently at about 36 months (Kochanska et al., 2001). As children develop, they transition from relying on external cues and comfort provided by parents in order to regulate themselves to becoming increasingly self-regulated by the preschool years (Calkins & Fox, 2002; Kochanska et al., 2001; Posner & Rothbart, 2000).

Bridgett and colleagues (2015) have provided an in-depth review on the intergenerational transmission of SR, and included a focus on the development of SR. The authors emphasized that parental factors, such as parenting style, marital conflict, household chaos, household socioeconomic status (SES), accumulation of risk factors in the family, and parental SR, all contribute to development of SR in children. The importance of parenting has been well established in developmental of emotional SR. Researchers have argued that emotional SR develops within a parent-child relationship (Sroufe, 1996), and have emphasized the importance of the secure attachment relationship (Calkins & Leerkes, 2011; Cassidy, 1994). Morris and colleagues (2007, 2017) also offer a theory focused on how family context may influence the development of ER. They implicated three particular pathways through which children's ER is influenced: observational learning, parental emotional socialization, and the broader emotional climate in the family, including parenting style, attachment relationship, marital relationship characteristics, and family emotional expressiveness. Morris et al.'s theory is mirrored in the work done by Bridgett et al. (2015), though Bridgett et al. focused on SR more broadly. Both Morris et al. and Bridgett et al.'s theories implicated a wide range of parental and familial factors associated with the development of SR among children. As such, the evidence

suggests that parental factors are of the utmost importance in terms of how SR develops. Parental factors relevant to the current study will be discussed in a later section.

Some developmental theorists have offered a more in-depth description of the development of SR, including phases that take place over time. Among the earliest of these is Claire Kopp's (1982) theory, which is based heavily on Piaget's work (1952, 1954) on cognitive development. Kopp delineates five phases from birth to about age three, at which point she suggests that most children have attained the ability to use SR independently and flexibly, in contrast to the more immature uses of SR. She describes a gradual shift from early attempts at modulating arousal soon after birth (e.g., averting gaze, sucking on fingers), to attempts to voluntarily change behaviour in order to adapt to a given environment (e.g., moving away, grasping at desired objects), to more cognitively controlled attempts at regulation, which include an awareness of social and parental demands and expectations, and result in more frequent self-initiated behaviour changes that are specific to a particular environment (e.g., running and playing while at a playground, but attempting to be still and quiet at a religious place of worship). At around age one, infants gain the ability to "control" some behaviours, but this ability is rather limited. Beginning at around age two, children attain representational thinking and evocative (or recall) memory, which aid in their ability to independently and flexibly use "self-control." Kopp argues that self-control differs from SR only in the degree to which children are able to engage in controlling responses, but she emphasizes that there is no qualitative difference among these stages. As such, around age three, children attain SR, and this growth

parallels cognitive development. She also emphasizes the role of the caregiver, but states that it is likely that caregivers facilitate SR, rather than cause SR (Kopp, 1982).

A few decades later, Posner and Rothbart (2000) offered a contemporary follow-up to Kopp's (1982) work, suggesting that the development of SR parallels growth in neurological systems, especially those related to plasticity. Posner and Rothbart's work is rooted in temperamental theory, and as such they examined the impact of development of EC and executive attention in relation to SR. The authors state that executive attention undergoes a substantial change during the first three years of life, especially between ages two and three. Similar to Kopp's theory, Posner and Rothbart examine how neurological changes, primarily in the frontal cortex, correspond to cognitive changes that allow for EC and executive attention to inhibit emotional or impulsive responses associated with the more primitive brain regions, such as the amygdala (Posner & Rothbart, 2000). Together, these theories emphasize the importance of cognitive development in dictating capacity for SR.

More recent theories of the development of SR and related regulatory capacities, such as ER, de-emphasize specific stages of development and focus instead on how SR develops in relation to other biological, social, and psychological variables (Bridgett et al., 2015; Morris et al., 2017). Although it appears that significant changes in SR occur within the first three years of life, it is unclear how useful stage-based theories are in clarifying the trajectory of this development. Given that SR goes through rapid growth and development in early childhood, it is important to examine why it is a critical adaptation and to uncover the variables that can alter the course of its development.

The Importance of Self-Regulation

Self-regulation is considered to be a foundational milestone within early childhood (e.g., Flavell, 1977; Kopp, 1982). Studies have demonstrated that early SR is related to a number of variables, including externalizing and internalizing problems (Choe et al., 2013; Compas et al., 2017; Eisenberg et al., 2010), academic achievement (Willoughby et al., 2011), and social outcomes (Calkins & Fox, 2002; Shields et al., 1994). Beyond this, SR in early childhood appears to have a persistent impact on adult outcomes. This has been shown most notably within Walter Mischel's longitudinal studies related to the Marshmallow Test (Casey et al., 2011; Mischel et al., 1988; Schlam et al., 2013; Shoda et al., 1990). Within this series of studies, Mischel and colleagues demonstrated that a child's ability to delay gratification and inhibit a dominant response (i.e., delay eating a marshmallow in order to receive two marshmallows) was associated with a range of positive outcomes through adolescence (Mischel et al., 1988; Shoda et al., 1990) and adulthood (Casey et al., 2011; Schlam et al., 2013). A recent replication of Mischel's delay of gratification studies indicated that the results are likely more complicated and not as robust as initial studies appeared to indicate, and this work brought up questions about the reliability and validity of the delay of gratification findings (Watts, Duncan, & Quan, 2018). However, Michaelson and Munakata (2020) examined the same replication dataset and found that delay of gratification in early childhood was associated with later outcomes, such as problem behaviours in adolescence, and that this effect was better explained by social support than self-control, suggesting the importance of early environments for children. As emphasized by Michaelson and

Munakata, these studies point to the importance of the impact of researcher decisions, even when working with the same dataset. Overall, despite recent criticism of the classic marshmallow task findings, several longitudinal studies appear to suggest that SR develops along a relatively stable trajectory and influences a number of critical outcomes throughout one's life, though ongoing replication of these findings will continue to be paramount.

Within childhood, poorly developed SR has been linked to difficulties with externalizing and internalizing problems (Choe et al., 2013; Compas et al., 2017; Eisenberg et al., 2010). Externalizing difficulties are characterized by high levels of negative emotions, especially anger, and high levels of aggressive and impulsive behaviours (Ştefan & Avram, 2017). Internalizing difficulties are characterized by negative emotions, such as depression and anxiety, and are marked by behaviour changes, such as increased avoidance and withdrawal (Ştefan & Avram, 2017; Zahn-Waxler et al., 2000). These two broad constructs are studied because research has consistently indicated that they statistically represent the majority of psychological difficulties for both children (Achenbach & Edelbrock, 1978; Achenbach et al., 1990) and adults (Carragher et al., 2015). Among children, internalizing and externalizing difficulties are also theorized to predict risk of future psychopathology (Mathyssek, Olino, Verhulst, & van Oort, 2012; Reef, Diamantopoulou, Van Meurs, Verhulst, & Van Der Ende, 2010). As such, investigating factors, such as SR, that are associated with the development of these difficulties, is of the utmost importance, and may support future preventive efforts.

The Impact of Parenting on Self-Regulation

As previously suggested, parents have a significant impact on the development of SR among children. Studies have emphasized the importance of factors related to parental emotion socialization, including parental response to a child's emotional displays (Eisenberg et al., 1999), and parenting styles that are hostile versus those that are warm (Chang, Schwartz, Dodge, & McBride-Chang, 2003; Morris et al., 2002). Parental ability to regulate emotion is of particular interest because it is likely to impact a number of facets of the parent-child relationship, including parental emotional stability, discipline techniques, parental warmth, maternal sensitivity, and attachment (e.g., Bariola, Gullone, & Hughes, 2011; Morris et al., 2017). Examination of factors that may impact parental ER, or the emotional climate in the home, is also likely to be useful in determining antecedents of early childhood SR.

Maternal adverse childhood experiences. An important foundational factor that may affect parenting is whether mothers have experienced adverse events within their own lives. Adverse childhood experiences (ACEs) specifically refer to childhood physical, sexual, and emotional abuse, physical and emotional neglect, and childhood exposure to parental separation or divorce, domestic violence, parental mental health difficulties and addiction issues, and parental incarceration (Felitti et al., 1998). These ten factors, measured together as ACEs, have been shown to be related to a number of adverse health outcomes over the course of individuals' lives, including increased risk of cancer, heart disease, and obesity (Felitti et al., 1998), as well as maladaptive psychosocial outcomes, such as mental illness and substance

abuse (Anda et al., 2006; Merrick et al., 2017), unemployment (Liu et al., 2013), and intimate partner violence in adulthood (Mair et al., 2012). Cumulative adversities, such as those indicated by higher scores on measures of ACEs, can affect a range of biological systems (e.g., gene expression, conditioned stress response) that appear related to a cascade of negative responses through development (Jacob et al., 2019), such as the negative outcomes mentioned above. This is thought to occur because the prolonged stress response alters the brain, potentially damaging cognitive, regulatory, and relational competencies (Center for the Developing Child at Harvard University, 2010; Stepleton et al., 2018).

There is also evidence to support why and how parental ACEs may impact children. Specifically, there are two main routes through which children are impacted by maternal ACEs (mothers have been the primary parents studied with regard to ACEs; Letourneau et al., 2019). First, there is evidence that pregnant women who have experienced increased adversity in childhood also have increased activity in the hypothalamic-pituitary-adrenal (HPA) axis, which results in increased cortisol for both mother and fetus, which may be a mechanism by which the intergenerational impact of ACEs is passed (Thomas et al., 2018). Second, given that exposure to ACEs are associated with negative physical and mental health outcomes across the lifespan, such difficulties are likely to impact one's ability to parent, and will likely impact child outcomes.

Although studies focusing on how maternal ACEs impact parenting are sparse, some studies have found that maternal ACEs are related to greater parental distress (Lange et al., 2019; Steele et al., 2016) and insecure attachment style

(Murphy et al., 2014), including insecure attachment with young children (Cooke et al., 2019). By comparison, there have been more studies examining the relationship between maternal ACEs and offspring outcomes, and this appears to be an emerging area of interest (e.g., Ximenes, Ximenes, Nascimento, Roddy, & Leite, 2019). Recent studies have demonstrated that maternal ACEs are related to poorer infant socioemotional functioning at 6 months (McDonnell & Valentino, 2016), poorer infant development at 12 months (Racine, Plamondon, Madigan, McDonald, & Tough, 2018), and poorer physical and emotional well being for infants at 18 months (Madigan, Wade, Plamondon, Maguire, & Jenkins, 2017). Notably, indirect pathways through mediating mechanisms, such as increased biological and socioemotional health risk, were identified in each of these studies. Increased parental ACEs have been linked to an increased risk of a suspected developmental delay in 2-year-olds (Folger et al., 2018). Furthermore, a number of recent studies have identified a link between maternal ACEs and child externalizing and internalizing problems (e.g., McDonald et al., 2019). Among families with a history of intimate partner violence, Fredland and colleagues (2018) found that maternal ACEs significantly predicted a number of concerns at age 36 months, including externalizing and internalizing difficulties. Treat and colleagues (2019) found that maternal ACEs predicted child externalizing and internalizing difficulties indirectly through parenting self-efficacy for children around 20 months of age. This indirect effect indicates that maternal ACEs may impact how mothers feel about their ability to parent, which subsequently impacts child well-being. Notably, this effect was found despite a small sample size ($N = 52$; Treat et al., 2019). Letourneau et al. (2019) found that maternal ACEs

directly predicted externalizing difficulties among children age 24 months. They also found that maternal ACEs predicted both externalizing and internalizing difficulties indirectly through maternal depression and anxiety, and that this effect was more pronounced for boys. They concluded that maternal mental health may be a causal mechanism whereby maternal ACEs impact offspring (Letourneau et al., 2019). Lastly, Stepleton and colleagues (2018) found that maternal ACEs predicted both externalizing and internalizing difficulties among children aged 1.5 to 18 (mean = 7.9). The authors hypothesized that this effect would differ by age, but found no evidence to support this hypothesis (Stepleton et al., 2018). In summary, there is preliminary evidence that maternal ACEs impact children's well-being with regard to externalizing and internalizing difficulties, and some research teams have found that more proximal variables, such as maternal self-efficacy and mental health symptoms, may help to explain this relationship.

Prior to the specific study of ACEs, many researchers examined the impact of childhood trauma more generally, which can be representative of one or more specific types of ACE, depending on how adversity was defined. It has been well established that childhood maltreatment represents a harmful relational context that poses significant risks for maladaptation across a wide range of developmental domains (Cicchetti & Toth, 2005). Studies have indicated that childhood trauma impacts a wide range of socioemotional variables that may be related to parenting. For example, childhood trauma is associated with increased risk of psychopathology (Robinson et al., 2009), including depression and anxiety disorders, alcohol and drug abuse, suicidal behaviour, risky sexual behaviour (Norman et al., 2012), impaired cognitive

functioning (Irigaray et al., 2013), poorer physical health (Min, Minnes, Kim, & Singer, 2013), academic problems, obesity, as well as increased risk of criminal behaviour (for a review, see Gilbert et al., 2009). All of these outcomes could be expected to impact parenting. Studies have also indicated that childhood trauma is associated with difficulties with ER (Marusak, Martin, Etkin, & Thomason, 2015) and EF (Gould et al., 2012), and such regulatory deficits can lead to harsh parenting (Deater-Deckard, Wang, Chen, & Bell, 2012). Other studies have more closely examined the impact of maternal childhood trauma on parenting and child outcomes, indicating that maternal childhood trauma is associated with decreased maternal sensitivity (Pereira et al., 2012), greater maternal hostility toward children (Bailey, DeOliveira, Wolfe, Evans, & Hartwick, 2012), adjustment problems for children (Collishaw, Dunn, O'Connor, & Golding, 2007), and externalizing problems for children (Miranda, de la Osa, Granero, & Ezpeleta, 2013; Myhre, Dyb, Wentzel-Larsen, & Grogaard, 2013; van de Ven, van den Heuvel, Bhogal, Lewis, & Thomason, 2019). These studies further emphasize the potential negative impact that early maternal adversity can have on parenting and child development.

One of the major aims of the research reported in this thesis is to elucidate the link between maternal childhood adversity and child regulatory outcomes. This link has been relatively neglected within the literature to date. One study found that maternal ACEs were related to a physiological measure of SR among four-month-old infants (Gray et al., 2017). Maternal ACEs predicted decreased respiratory sinus arrhythmia (RSA) in response to a stressful experience (i.e., the Still Face Paradigm; Tronick, Als, Adamson, Wise, & Brazelton, 1978). A higher baseline RSA is

typically considered adaptive and associated with increased infant reactivity and attention (Gray et al., 2017). Interestingly, Gray et al. theorized that ACEs disrupt mothers' stress response systems, which then impact infants' stress response systems. Some studies examining the impact of maternal childhood trauma more generally have identified a link between such adversity in mothers' backgrounds and child self-regulatory difficulties. One study that is particularly relevant to the current thesis indicated that maternal childhood abuse indirectly predicted adolescents' self-regulatory difficulties through maternal controlling parenting in early childhood (Delker et al., 2014). There is also evidence that maternal childhood maltreatment is associated with child ER difficulties (DeOliveira et al., 2004). As well, previous studies have shown that controlling or harsh parenting may be linked to deficits in ER ability in particular (Chang et al., 2003; Morris et al., 2007; Saritaş, Grusec, & Gençöz, 2013). Aside from these studies, no other papers examining maternal ACEs (or similar childhood traumatic experience) and child regulatory outcomes were identified.

Given that the examination of maternal ACEs and child outcomes is an area of research in its infancy, it is not particularly surprising that maternal ACEs have yet to be thoroughly investigated with regard to child regulatory outcomes. However, there is a clear rationale for investigating this link. As mentioned above, optimal SR is theorized to develop within a suitable parent-child relationship and home environment (Bridgett et al., 2015; Calkins & Leerkes, 2011; Cassidy, 1994; Morris et al., 2017; Morris et al., 2007; Sroufe, 1996). Maternal ACEs are likely to impact parenting and home environment, given that ACEs have been linked to numerous

physical and mental health difficulties, as well as difficulties with unemployment and intimate partner violence (Anda et al., 2006; Liu et al., 2013; Mair et al., 2012; Merrick et al., 2017). It appears plausible that maternal ACEs could disrupt the parent-child relationship and contribute to more disruption and stress in the home environment, both of which are important to child SR development (Bridgett et al., 2015; Brieant et al., 2017). As such, it is important to investigate the relationship between maternal ACEs and child SR, as well as mediating factors that may help to clarify the relationship.

Experiencing adverse events within the family environment may be particularly likely to disrupt emotion regulation in children (Alink, Cicchetti, Kim, & Rogosch, 2009; Davies, Winter, & Cicchetti, 2006; Shipman et al., 2007). This may be due to insecure attachment relationships (Baer & Martinez, 2006), as well as deficits in parental validation of emotions and emotion coaching (Shipman et al., 2007). Several studies have identified that childhood trauma is associated with later difficulties regulating emotions in adulthood (Barlow et al., 2017; Carvalho Fernando et al., 2014; Dvir et al., 2014; Lovallo, 2013), and difficulties with ER have been identified as a mediating factor in the relationship between childhood trauma and adult psychopathology (Gaher, Hofman, Simons, & Hunsaker, 2013; Hopfinger, Berking, Bockting, & Ebert, 2016; Kuo, Khoury, Metcalfe, Fitzpatrick, & Goodwill, 2015). Additionally, a study that compared the impact of childhood trauma versus trauma sustained in adulthood on reported ER ability found that individuals who experienced childhood abuse had significantly more difficulty with ER than those who had experienced trauma in adulthood (Ehring & Quack, 2010). Neurobiological

studies have pointed to differences in amygdala structure and function among individuals who have experienced early childhood trauma that may help to explain longstanding ER difficulties (Marusak et al., 2015; Tottenham et al., 2010). Although examination of ACEs (as a specific conceptualization of childhood adversity) and subsequent ER difficulties appear to be lacking, there is ample evidence that childhood adversity more generally is associated with later difficulties with ER.

Maternal ER. ER refers to the process of modifying the intensity and duration of internal emotional states, and regulating when and how emotions are expressed (Gross, 1998; Morris et al., 2017; Thompson, 1994). Parents' ability to manage emotions is likely to impact their ability to parent effectively. Parenting undoubtedly can be emotionally challenging at times, such as when children are oppositional or angry. Deficits in ER may lead to high levels of parental negative affect, which in turn can be become a pattern of harsh parenting leading to increased risk for child maltreatment and further child behaviour problems (Deater-Deckard et al., 2012). Thus, it is important to examine the literature regarding how maternal ER may impact parenting and child outcomes.

Broadly, maternal ER deficits are likely to impact parenting and child outcomes negatively. A comprehensive review by Crandall and colleagues (2015) suggested that low maternal emotion and cognitive control is associated with increased risk of child maltreatment. As well, previous research has shown that parental deficits in ER are linked to less positive parent-child interactions (Shaffer & Obradović, 2017), reduced emotion availability during mother-infant interactions (Kim, Teti, & Cole, 2012), increased use of problematic discipline approaches (Kim,

Pears, Capaldi, & Owen, 2009), and higher scores on a measure of child abuse potential (Smith, Cross, Winkler, Jovanovic, & Bradley, 2014). Conversely, more adequate maternal ER has been linked to less use of harsh or overreactive discipline (Lorber, 2012), indirectly linked (through parental warmth) to increased prosocial behaviour among preschoolers (Xiao, Spinrad, & Carter, 2018), and associated with decreased child ER difficulties in the context of trauma exposure (Pat-Horenczyk et al., 2015). Overall, it appears that maternal ER is likely to impact the parent-child relationship and family environment, both of which have been implicated as important factors related to the development of child SR.

A number of studies have examined the impact of maternal ER on child regulatory behaviours. There is a fairly well-established link between parent and child ER in particular. One study demonstrated that, among young children (i.e., average age of about five years), parent self-reported use of specific ER strategies predicted children's use of the same strategies (e.g., reappraisal, suppression; Gunzenhauser, Fäsche, Friedlmeier, & Suchodoletz, 2014). Self-reported maternal ER has been linked to children's ER, based on behavioural observation, in a sample of children aged 8-11 (Morelen et al., 2016). In a study conducted in Turkey, maternal ER difficulties predicted adolescent ER difficulties, and this effect was mediated by harsh maternal parenting practices, such as hostility and rejection (Saritaş et al., 2013). Another study examining the link between parent and adolescent ER indicated that parents who reported greater ER difficulties tended to invalidate their adolescents' emotions more often (i.e., disregard, belittle, or punish emotional responses; Linehan, 1993), and such invalidation was associated with greater adolescent ER difficulty

(Buckholdt, Parra, & Jobe-Shields, 2014). More recently, an examination of the link between parental and adolescent ER suggested that an authoritarian parenting style was an important mediating factor, as indicated by a significant indirect effect between parental and adolescent ER through parenting style (Shaw & Starr, 2019). As well, mothers' and fathers' ER has been associated with adolescent ER ability (Li, Li, Wu, & Wang, 2019). Overall, a number of studies have examined the association between parental and child ER, including some examining mediating factors. Most of these studies have focused on parents and adolescents, possibly because it is simpler to differentiate ER and SR for older children.

More generally, there is an abundance of research demonstrating a link between parental regulatory variables and offspring regulatory variables; however, the particular variables studied vary widely. Bridgett and colleagues (2015) comprehensively reviewed studies of the link between parental and child SR, and offered a conceptual framework for understanding generational transmission of SR. They suggested that many studies indicate a significant relationship between parent and child SR. For instance, studies found a link between parental and infant vagal tone (Bornstein & Suess, 2000), maternal and toddler effortful control (Bridgett et al., 2011; Gartstein, Bridgett, Young, Panksepp, & Power, 2013), and maternal and child executive functioning (Cuevas et al., 2014). Maternal ER has also been linked to aspects of child executive function, including tasks of cognitive flexibility, among children who had been exposed to intimate partner violence (Samuelson et al., 2012).

In summary, there appears to be substantive research demonstrating a relationship between parental and child regulatory abilities. What remains to be

explored is the role of maternal ER as a mediating factor that may explain how more foundational factors, such as maternal childhood adversity, impact child SR. Before discussing how such variables fit into the broader framework proposed in the current study, I will briefly review how ER is theorized to develop, being particularly mindful of how maternal childhood variables may have impacted the development of mothers' ER abilities.

Emotion regulation is often thought of as a dyadic process that develops within the parent-child relationship (Calkins & Leerkes, 2011; Kopp, 1989; Morris et al., 2017; Morris et al., 2007; Thompson, 1994). In early infancy and childhood, when children largely lack neurological and cognitive capacities to modulate their emotions internally, external resources, such as parents, are often used to help manage emotional experiences (Eisenberg & Sulik, 2012; Kopp, 1989; Morris et al., 2017; Thompson, 1994). However, as children begin to develop greater ER capacity, they are more able to utilize internal strategies, such as cognitive strategies (e.g., distraction, cognitive reframing), in order to manage their emotions more independently (Eisenberg & Sulik, 2012; Kopp, 1989; Morris et al., 2017; Thompson, 1994).

Given that ER develops within the parent-child relationship, disruptions to that relationship or the family's environment may also disrupt the development of ER. As emphasized above, ACEs can be associated with a wide range of negative outcomes. Although ACEs in particular have not been examined in relation to ER ability, childhood trauma more generally can produce difficulties with ER (Barlow et al., 2017; Carvalho Fernando et al., 2014; Dvir et al., 2014; Lovallo, 2013), and

parental ER is likely related to child SR (e.g., Bridgett et al., 2015). As such, maternal ER may explain how maternal ACEs impact child SR, although such a meditational model has yet to be examined.

Examining Child Outcomes

Young children's ability to regulate is often examined in relation to externalizing and internalizing difficulties. Many studies focused on young children study externalizing and internalizing difficulties as the overarching umbrella-terms for socioemotional problems that young children experience, and SR has been examined as a predictor of such difficulties.

Eisenberg and colleagues (Eisenberg & Fabes, 1992; Eisenberg et al., 2017; Eisenberg & Morris, 2002) posited that SR is differentially related to externalizing and internalizing difficulties, based on the particular aspect of SR involved. Externalizing difficulties are thought to be related to low effortful control, including attentional, activational, and inhibitory control, and high levels of impulsivity. Conversely, internalizing difficulties were theorized to be related to low attentional and activational control, low levels of impulsivity, and typical levels of effortful control (Eisenberg et al., 2017). Overall, then, based on their work, it would be reasonable to conclude that SR is related to both externalizing and internalizing difficulties, but for individual children a particular SR deficit may not always relate to both difficulties.

Broadly, children with regulatory difficulties often have more problems with externalizing difficulties. Given that externalizing difficulties are defined as concerns with anger, aggression, and impulsivity, one could argue that there is a degree of

cross-over between the definitions of externalizing difficulties and SR, especially when considering the frameworks proposed by Eisenberg et al. (2002, 2017) and Bridgett et al. (2015), both of which emphasize the importance of effortful control and impulsivity. Reviews of the literature have found that, among children, deficits in SR are associated with difficulties with externalizing problems (Compas et al., 2017; Eisenberg et al., 2010). A meta-analysis found that EF is moderately associated with externalizing difficulties for preschool children, especially when analyses were limited to studies focused on inhibition (rather than working memory and cognitive flexibility, which demonstrated small effect sizes; Schoemaker, Mulder, Deković, & Matthys, 2013). Moreover, several longitudinal studies have shown that difficulties with SR in early childhood are associated with difficulties with externalizing behaviours several years later (Choe et al., 2013; Honomichl & Donnellan, 2012; Rubin, Burgess, Dwyer, & Hastings, 2003; Trentacosta & Shaw, 2009). Similarly, a recent study found that higher levels of SR (conceptualized as effortful control) measured around age three were associated with lower levels of externalizing behaviours two years later, but this effect was significant only for boys (Smith & Day, 2018). In addition, ER can function as a mediator in the relation between parental emotion socialization and externalizing and internalizing difficulties for children (Cunningham, Kliewer, & Garner, 2009). Eisenberg and colleagues (2010) have argued regulatory ability is more consistently linked to externalizing difficulties than it is to internalizing difficulties.

Nevertheless, children with SR difficulties may also have internalizing concerns. They may struggle to manage negative emotions, such as anxiety and

depression, which can then lead to avoidance and withdrawal. Eisenberg and colleagues (2002, 2017) emphasized that overcontrol of emotions is likely to be associated with internalizing difficulties. Importantly, effective regulation of emotion among young children has been shown to relate to less anxiety and withdrawal (Di Maggio, Zappulla, & Pace, 2016; Miller et al., 2006). A recent meta-analysis found evidence that effective ER is associated with decreased internalizing difficulties among cross-sectional studies of children and adolescents, though evidence was lacking for longitudinal studies (Compas et al., 2017).

Although several studies found difficulties with regulatory ability associated with internalizing concerns among older children (Cunningham, Kliewer, & Garner, 2009; Dunsmore, Booker, & Ollendick, 2013; El-Sheikh, 2001; Jin, Zhang, & Han, 2017; Kim & Cicchetti, 2010), studies focused on younger children appear to be lacking. One longitudinal study indicated that factors related to ER measured around age two predicted internalizing difficulties at age five (Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997). A more recent study found that the relationship between SR, as conceptualized as effortful control, and internalizing difficulties was moderated by age; better SR predicted lower internalizing difficulties at age four, but this relationship was no longer significant at age five and six (Dennis, Brotman, Huang, & Gouley, 2007). One study found that higher levels of SR, again conceptualized as effortful control, were associated with higher levels of internalizing difficulties for preschoolers (Murray & Kochanska, 2002). In summary, although evidence linking SR and externalizing difficulties appears quite robust, the evidence concerning SR and internalizing difficulties is considerably more inconsistent.

Externalizing and internalizing concerns can have major impacts upon a child's development. As indicated, externalizing difficulties have been associated with later difficulties including increased substance use (Miettunen et al., 2014), higher body mass index (BMI; Anderson, He, Schoppe-Sullivan, & Must, 2010), increased risk of criminality (Huesmann, Eron, & Dubow, 2002; Leschied, Chiodo, Nowicki, & Rodger, 2008), and poorer quality of life in early adulthood (Korhonen, Luoma, Salmelin, Siirtola, & Puura, 2018). Importantly, externalizing difficulties appear to stabilize throughout childhood and early adulthood, which likely further exacerbates individual risk (Korhonen et al., 2018). Alternatively, child internalizing difficulties have been associated with increased risk of depression in adolescence, lower educational attainment (Dekker et al., 2007), future peer victimization via bullying (Vaillancourt, Brittain, McDougall, & Duku, 2013), and increased risk of depression, anxiety, and avoidant personality problems in early adulthood (Korhonen et al., 2018). Children who experience persistent externalizing and internalizing difficulties may also be more likely to have psychotic-like experiences in adolescence (Lancefield, Raudino, Downs, & Laurens, 2016). Notably, high internalizing difficulties throughout childhood appear to relate to decreased risk of externalizing difficulties and antisocial problems in young adulthood (Korhonen et al., 2018), lending support to Eisenberg et al.'s (2010) view that externalizing and internalizing difficulties are supported by different SR processes. As these difficulties can have adverse impacts throughout the life course, further research is needed to identify factors that increase or decrease risk of them.

It is evident that recent research suggests a link between maternal ACEs and child externalizing and internalizing problems (e.g., Fredland et al., 2018; Letourneau et al., 2019; McDonald et al., 2019; Treat et al., 2019). Given theoretical reasons to investigate the relation between maternal ACEs and child SR, and studies linking child SR and externalizing and internalizing difficulties, a mediation model would be suitable for testing the relations between these variables. Two recent studies have tested conceptually similar mediation models. In one study, child ER was identified as a mediator in the relationship between maternal incarceration and both externalizing and internalizing difficulties in children who were about 10 years of age on average (Zeman et al., 2018). Parental incarceration is both an identified ACE for the children studied, and it likely reflects a history of ACEs for those incarcerated mothers (Reavis, Looman, Franco, & Rojas, 2013). Second, a study of preschoolers found that child ER mediated the relationship between attachment security and internalizing difficulties (Ştefan & Avram, 2017). This study examined parent-child attachment, and it has been demonstrated that maternal ACEs can impact attachment (Baer & Martinez, 2006; Cooke et al., 2019). Both of these studies indicated that child regulatory ability mediated the relationship between a parental variable and internalizing and/or externalizing difficulties. In summary, theory and evidence supports the notion that child SR is a mediating factor in the relationship between maternal ACEs and child externalizing and internalizing difficulties, however this particular model has not yet been tested.

Paternal Impact on Self-Regulation

Previously, fathers have been studied far less than mothers in terms of impact on parenting and child outcomes. In 2005, it was observed that 48% of studies focused on parenting and psychopathology included only mothers, whereas only 1% included only fathers (Phares et al., 2005). As well, Phares et al. found that only 25% of studies that included both parents analyzed the data separately for mothers and fathers. As these numbers suggest, the previous state of developmental literature left very few opportunities for studying the impact that fathers have on their children. Interestingly, a recent study asked a group of fathers why they thought that they were not typically included in pediatric research, and 80% indicated that they were excluded because they were not asked to be included (Davison, Charles, Khandpur, & Nelson, 2017). However, there appear to be recently increased efforts to engage fathers in developmental research (Davison et al., 2017; Panter-Brick et al., 2014; Parent, Forehand, Pomerantz, Peisch, & Seehuus, 2017).

A number of studies examining the impact of parents on child SR have included fathers and mothers together. A review of the developmental ER literature covered several studies that included both mothers and fathers, but there has been limited work on the specific role of fathers (Bariola et al., 2011). A slightly older meta-analysis indicated that while 33 papers the authors reviewed included mothers, only eight examined the joint impact of mothers and fathers on child SR, and the authors called for increased study of the impact of fathers (Karreman et al., 2006). As such, it appears that fathers are beginning to be more included in developmental

research focused on SR, but are often only included as part of a parental group, rather than examined for unique contributions.

Few studies have examined the impact of mothers versus fathers on child regulatory outcomes. Chang and colleagues (2003) showed that, when comparing the impact of harsh parenting used by mothers and fathers, mothers impacted young children's difficulties with ER more than fathers, whereas fathers' harsh discipline had a stronger impact on children's aggression. Similarly, studies have shown that fathers' parenting styles, including intrusive and controlling interactions with their young children, are associated with difficulties with regulatory tasks, including complex inhibition (Owen et al., 2013), behavioural dysregulation (including disruptive or defiant behaviour during a task; Stevenson & Crnic, 2013), and a composite measure of both hot and cool executive function tasks (Meuwiseen & Carlson, 2015). It therefore appears that fathers' behaviour impacts child SR. Given that parental styles, such as use of control or harsh parenting, may be indicative of parental difficulties with SR, these studies give some indication of how parental regulatory abilities may impact child regulatory abilities. It is worthwhile to consider the evidence related to the impact of paternal regulatory abilities more specifically.

It is well established that mothers' regulatory abilities impact children's regulatory abilities; however, it is less clear how fathers play a role in children's development of SR. With regard to regulatory ability generally, two studies have found that infant ER strategies were similar across situations with mothers versus fathers (Bridges et al., 1997; Diener et al., 2002), indicating that infants appear to respond similarly to each parent. Conversely, Bariola et al. (2012) demonstrated that,

among children age 9-19, maternal ER strategy use was associated with child ER strategy use, whereas paternal ER strategy use was unrelated to child ER strategy use. Doan et al. (2018) also found that mothers were more important than fathers in terms of parental ER predicting children's ability to tolerate distress. More recently, however, one study has shown that both mothers' and fathers' ER difficulties uniquely predicted adolescents' emotion regulation and lability (Li et al., 2019). Overall, it appears that studies have not been entirely consistent with regard to the impact of mothers versus fathers on children's regulatory abilities.

In summary, the impact of fathers' regulatory ability on children remains to be fully elucidated. Although some studies have found that children's regulatory abilities are related to paternal parenting behaviours, such as intrusive and controlling interactions, studies regarding the impact of paternal regulatory variables on children's regulatory variables have been inconclusive and have typically focused specifically on ER. As such, an investigation of how paternal regulatory variables, including SR and ER, impact child SR more broadly has yet to be undertaken. As well, studies have compared the impact of parents on development of regulatory variables for children, but such studies have again largely been focused on ER specifically. An investigation of the impact of mothers' versus fathers' regulatory abilities on child SR more broadly would benefit our collective understanding of how parents impact development of SR among young children.

Overall, the purpose of the current study was to examine preschooler SR, including potential contributory factors, such as maternal ACEs, maternal ER, and paternal regulatory variables, and to investigate how SR may be related to child

externalizing and internalizing difficulties. This is the first known attempt to look at these specific variables together, and to create theory-driven models to explain relationships between the variables.

METHODS

Participants

Participants (n = 97) were preschoolers who completed the study with their mothers. Four children were removed from subsequent analyses—three because they were unable to be tested at the visit, and one because the mother was unavailable for the home visit (n = 93). This study was the fourth visit in a longitudinal study. Mothers were originally recruited in the hospital after their infants were born, and they have been followed prospectively since. Previous study visits took place when offspring were 3 months, 8 months, and 18 months of age. The current visit took place just after the children's third birthdays (M age = 39.28 months; SD = 1.19). Mothers were 34.30 years old on average (SD = 5.10), and 50.5% of children were female (n = 47). Fathers (n = 51; M age = 36.00; SD = 5.10), including step-fathers (n = 1), were also given the opportunity to complete several questionnaires. Four fathers were removed from subsequent analyses because of violations of validity scales on the BRIEF-A (n = 47). Table 1 summarizes sociodemographic data for mothers, and Table 2 summarizes data for fathers.

Procedures

Participants completed a two-hour study visit in their homes, with two researchers present. The author completed tasks with the child, while a research assistant carried out measures and tasks with the mothers. Child tasks were video recorded and coded by trained coders. All child tasks were completed in the presence of mothers, and sometimes fathers or siblings were present in homes as well. During the Gift Wrap (GW) task and the Transparent Box (TB) task, mothers were asked to

Table 1. Sociodemographic characteristics for mothers (n = 93).

	n (%)
Maternal Ethnicity	
Caucasian	76 (81.7%)
Black	1 (1.1%)
Hispanic	1 (1.1%)
Asian/Pacific	5 (5.4%)
Native/Aboriginal	1 (1.1%)
Arab/Middle Eastern	0 (0%)
Other	2 (2.2%)
Marital Status	
Married	74 (79.6%)
Living common law	10 (10.8%)
Divorced	1 (1.1%)
Widowed	0 (0%)
Single	5 (5.4%)
Separated	3 (3.2%)
Maternal income	
<$20,000	24 (25.8%)
$20,000-34,999	11 (11.8%)
$35,000-69,000	30 (30.2%)
$70,000-91,999	14 (15.1%)
$92,000-113,999	11 (11.8%)
$114,000-149,999	2 (2.2%)
$150,000-199,999	0 (0%)
$200,000+	1 (1.1%)

Table 2. Sociodemographic characteristics for fathers (n = 47).

	n (%)
Paternal Ethnicity	
Caucasian	43 (91.5%)
Hispanic	1 (2.1%)
Asian/Pacific Islander	2 (4.3%)
Arab/Middle Eastern	1 (2.1%)
Paternal income (as reported by mothers)	
<$20,000	1 (2.1%)
$20,000-34,999	5 (10.6%)
$$35,000-69,000	23 (48.9%)
$70,000-91,999	8 (17.0%)
$92,000-113,999	9 (19.1%)
$114,000-149,999	1 (2.1%)
$150,000-199,999	0 (0%)
$200,000+	0 (0%)

sit next to their children. Unbeknownst to the children, mothers were encouraged to speak to them minimally and offer minimal support during these tasks, as our interest was in how preschoolers sought support from their mothers while attempting to engage in a task independently. Upon completion of each visit, mothers were given $20 cash, and were sent a recording of the tasks completed during the study visit.

In addition, if mothers consented, a small package of questionnaires for fathers was left at each visit. Fathers were encouraged to complete the package and mail it back to the research team using a stamped envelope provided. When the package was received, fathers were sent $5 gift certificates for a coffee shop.

All elements of the current research were approved by the Hamilton Integrated Research Ethics Board.

Measures

Child self-regulation. Child self-regulation was operationalized based on a number of behavioural measures described below. In general, observational measures (rather than paper-and-pencil measures) are considered the "gold standard" in developmental research, and this is also true specifically for studies of children's regulatory abilities (Adrian, Zeman, & Veits, 2011). Consistent with recent calls to integrate the fields of executive function and effortful control (Sulik et al., 2016), diverse tasks were chosen in order to measure self-regulation overall. The lion-alligator task, and the dimensional card sort task are more consistent with measures traditionally used in the executive function literature, and tap aspects of "cool" self-regulation (i.e., primarily cognitive tasks with low emotionality; Metcalfe & Mischel, 1999; Zelazo & Anderson, 2014). The transparent box task and the gift wrap task

stem from the effortful control and temperament literature, and tap "hot" self-regulation (i.e., motivationally salient tasks with high emotionality; Metcalfe & Mischel, 1999; Zelazo & Anderson, 2014). Given that behavioural measures are often weakly correlated in young children for whom self-regulation continues to develop and differentiate, several measures were used (Sulik et al., 2016). The use of both "hot" and "cool" measures of regulation is also consistent with conceptualizations that indicate that these measures are correlated and often work together (Zelazo & Anderson, 2014), indicating that they likely represent unitary construct at this young age (Posner & Rothbart, 2000).

Lion-alligator task. The lion-alligator task (LA task) was based on a measure of inhibitory control that Kochanska, Murray, Jacques, Koenig, and Vandegeest (1996) referred to as "Bear and Dragon." In the current task, a research assistant used two hand puppets—a lion and an alligator—that directed children to complete various actions (e.g., "touch your head"). Initially, the child was given instructions to listen to the "nice lion" and to ignore requests from the "naughty alligator." The research assistant used a high voice to provide instructions from the "nice lion" and a gruff voice for "naughty alligator." After 10 practice trials, 10 experimental trials were completed. Responses were coded based on the degree to which children followed instructions from the "nice lion" and inhibited actions suggested by the "naughty alligator." For each lion trial, children received a score of 0 if they did not execute any movement, a score of 1 if they executed an incorrect movement, a score of 2 if they executed a partial and correct movement, and score of 3 if they executed a complete and correct movement. Scoring was the opposite for alligator trials; that is,

children received a score of 0 if the executed a complete commanded movement, a score of 1 if they executed a partial commanded movement, a score of 2 if they executed an incorrect movement, and a score of 3 if they did not execute any movement. Scores were summed to a maximum of 30 total, or a lion score of 15 and an alligator score of 15.

Card sort task. The Dimensional Change Card Sort (DCCS; Zelazo, 2006) is a well-established measure of executive function, specifically tapping cognitive flexibility. A set of cards were utilized that included two different shapes (i.e., a car, a rabbit) in two different colours (i.e., red, blue). There were two target cards (i.e., a blue rabbit, a red car) that were fixed to the two sorting trays, and there were 14 standard test cards (i.e., seven red rabbits, seven blue cars). Two of these test cards were used during the scripted demonstration phase, when children were taught to play the "colour game" and sort the cards by colour (e.g., if given a red rabbit, it should be placed in the tray with the red car target card). Once the demonstration trials were completed, the children were asked to play the colour game on their own and were given six cards to be sorted by colour. Following this, children were taught the "shape game" and given instructions to begin sorting the cards by shape (e.g., if given a red rabbit, it should be placed in the tray with the blue rabbit target card). Children were given a score of 1 for each time they correctly sorted the cards, for a total possible score of 12.

Gift wrap task. The Gift Wrap (GW) task was based on Kochanska and colleagues' widely used task, which has alternatively been referred to as the Wrapped Gift task and Home/Lab Gift task (Kochanska et al., 1996, 2000). In the original task,

the researchers brought a small gift and gift-wrapping supplies. Children were asked to sit with their back to the researcher and not to peek while the gift was being wrapped. The researcher then wrapped the gift noisily for 60 seconds. In the current study, the task was adapted to be conducted in the children's homes, and with their mothers' present sitting beside them. The rationale for this was to improve generalizability of the task, because lack of generalizability of laboratory tasks has been suggested as a limitation in the past (e.g., Jones Harden et al., 2017). The task was video recorded and coded for peeking behaviour (i.e., duration to first peek). About 20% of videos (n = 19) were coded by two raters in order to establish reliability. The intraclass correlation (ICC) for latency until children peeked the first time was r = 1.00, which is consistent with data from Kochanska and colleagues (2000).

Transparent box task. Children's ability to regulate emotion and persist on a task was measured using the Transparent Box (TB) task from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1999). The Lab-TAB contains a series of standardized, observational assessments for children. The TB task was designed to elicit frustration from preschoolers.

For the current study, children were seated on the floor or at a table in their homes. They sat with their mother and with one of the researchers. They were given a 6x6" pad-locked plexiglass transparent box with a toy of their choosing inside (i.e., either a doll or a truck). Children were asked to try to open the lock using a large ring of keys, none of which fit in the lock. Mothers were given questionnaires to complete

while their child completed the task. As well, they were given written instructions asking them to give their child short answers if they asked for help and to try not to become too involved. They were told that the researchers would intervene if children became upset for more than about 20 seconds. Mothers were assured that they could intervene at any point if they did not feel comfortable with the task. The task lasted four minutes and was video recorded.

The original instructions for this task indicate that children should be alone in a room in order to complete the task (Goldsmith et al., 1999). However, a frequently cited limitation of developmental laboratory research is focused on lack of generalizability, because of the way that the studies were conducted (e.g., Jones Harden et al., 2017). Thus, the task was completed in a more externally valid manner – in the presence of the child's mother in their home.

Based on the original conceptualization of this task, duration of several ER strategies were coded, after adapting the coding strategy used by Khoury et al. (2015). These included behaviours such as persistence on the task, distraction, self-talk, and orientation to mothers (e.g., asking for help). However, after determining that it would be advantageous to combine several measures of SR (and not limit use of the TB task to a single measure of ER, as it has been sometimes used in the past; e.g., Khoury et al., 2015; Smith & Day, 2018), it was decided that persistence on the task would be the most suitable behaviour to use as a part of a composite measure of SR, which is consistent with past studies (Binion & Zalewski, 2018; Dennis, 2006; Hayden, Klein, Durbin, & Olino, 2006; Kochanska et al., 1996; Spinrad et al., 2006; Spinrad, Eisenberg, & Gaertner, 2007). In the current study, persistence on the task

was conceptualized as an indication of children's ability to regulate frustration elicited by the task, and was coded when children spent time working on opening the TB. Duration of persistence on the task was coded based on videos using the BEST system (S & K NorPark Computer Design, Toronto). Persistence duration was calculated, and divided by the total time spent on the task resulting in a proportion score. The task was designed to be four minutes, but in two cases, mothers asked to stop the task early because they thought the task was too upsetting for the child. In each case, the task was stopped with less than 30 seconds of the task remaining, indicating that data was available for the majority of the task. Approximately 20% of videos (n = 19) were coded by two raters in order to establish reliability. Inter-rater reliability (r) for persistence was .75, which is considered excellent for intraclass correlations measuring agreement between coders (Cicchetti, 1994).

Externalizing and internalizing difficulties. Child externalizing and internalizing difficulties were measured using the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) developed for children ages 1.5 through 5 years. The CBCL is a 99-item parent-report measure of child behaviours, difficulties, problems, and concerns. Parents are asked to rate each item, based on the preceding two months, on a three-point Likert-type scale, in which higher scores indicate greater presence of the problem (0 = *not true*, 2 = *very true or often true*). The CBCL includes a number of subscales corresponding to problem areas and/or symptoms consistent with psychiatric disorders (e.g., emotionally reactive, anxiety problems). However, for the purposes of the current study, only the overarching internalizing problems and externalizing problems subscales were utilized. The CBCL has been used extensively

in developmental research and has demonstrated adequate validity and reliability (Achenbach & Rescorla, 2001). In the current study, the CBCL had good internal consistency for the externalizing and internalizing subscales (Cronbach's α = .89 and .87, respectively).

Child receptive vocabulary. Child receptive vocabulary was measured using the Peabody Picture Vocabulary Test-4 (PPVT; Dunn & Dunn, 2007). The PPVT is a norm-referenced test that has been used extensively in developmental research. It has demonstrated adequate reliability and validity (Dunn & Dunn, 2007). During this task, children are read a series of words, and asked to choose the picture that represents the word from four options. The task is discontinued when a child makes eight consecutive incorrect responses. A standard score (with a mean of 100 and a standard deviation of 15) is produced based on the data from the normative sample, resulting in possible scores between 20 and 160. The mean score in the current sample was higher than average (M = 115.04, SD = 15.92).

Past research primarily from the executive function (EF) literature has implicated language development as a relevant covariate (Berthelsen, Hayes, White, & Williams, 2017; Cuevas et al., 2013; Li, Riis, Ghazarian, & Johnson, 2017; Meuwiseen & Carlson, 2015; Talwar, Carlson, & Lee, 2011; Willoughby, Magnus, Vernon-Feagans, & Blair, 2017). Researchers have noted that language ability may develop in a bidirectional manner with EF (i.e., EF improving language ability, and language ability mediating improvements in EF; Fatzer & Roebers, 2012; Kapa & Colombo, 2013). EF, as outlined in the literature review above, is conceptually similar to self-regulation. As such, child receptive vocabulary was included in the present study, in order to investigate it as a possible covariate of self-regulation.

Child receptive vocabulary was also tested as a potential covariate of internalizing difficulties. Past research indicated that language difficulties are associated with increased internalizing problems for children (Helland, Roysamb, Wang, & Gustavson, 2018), so it may be important to account for language ability in the relevant analyses.

Maternal adverse childhood experiences. Maternal exposure to adverse childhood experiences (ACEs) was measured using the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998; Berstein et al., 2003) and the National Comorbidity Survey-Revised (NCS-R): Childhood Questionnaire (Section 37; Kessler & Merikangas, 2004). In contrast to the rest of the measures included in the current study, these were the only measures that were completed at a different time point. As mentioned, the current study included data from the fourth visit in a longitudinal study. However, data regarding maternal adverse childhood experiences were collected at the first longitudinal study visit, when children were approximately three months old.

The CTQ is a 28-item self-report measure assessing retrospective report of five different types of childhood trauma, including emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Participants responded to items on a five-point Likert-type scale (1 = *never*, 5 = *very often*), indicating how often negative events took place in their childhood. These items are then summed into subscale scores representing the five types of abuse and neglect mentioned above. The CTQ has been shown to have excellent psychometric properties within both clinical and community samples (Bernstein & Fink, 1998; Bernstein et al., 2003; Scher, Stein, Asmundson, McCreary, & Forde, 2001). In the present sample, the

subscales from the CTQ had high internal consistency estimates (Cronbach's $\alpha \geq 0.88$), with the exception of the physical neglect subscale, which demonstrated lower internal consistency (Cronbach's $\alpha = 0.57$). Notably, this is consistent with data from the original reliability study of the CTQ, which found a Cronbach's α of .61 in a community sample for the physical neglect subscale, which was considerably lower than the α values for the remaining subscales reported (Bernstein et al., 2003). In addition to the CTQ, participants also completed several items of Section 37 of the NCS-R, which provided information about additional adverse childhood events that were not assessed by the CTQ. Items considered in the current study included two questions that assessed childhood exposure to parental relationship changes and possible parental loss (i.e. divorce, separation, death), and 12 items that assessed parental mental illness (e.g., anxiety, depression; Kessler & Merikangas, 2004). For the NCS-R data, items were combined to create subscales measuring endorsement of *any* parental loss, and *any* parental mental illness.

Previous studies have used the ACE Study Questionnaire, which is a retrospective measure of exposure to childhood abuse, neglect, and household dysfunction (Dube et al., 2003; Felitti et al., 1998). The original ACE Study Questionnaire examines ten types of adverse experiences, with a maximum score of ten. In the current study, a summary variable of maternal childhood adversity was created based on responses consistent with a moderate cut-off score on CTQ subscales (0 = *none or low*; 1 = *moderate to extreme*; Bernstein & Fink, 1998) and positive responses on the NCS-R summary scales (0 = denial of parental difficulties; 1 = endorsement of parental difficulties). Experiences accounted for included three subtypes of abuse, two subtypes of neglect, parental loss, and parental mental illness. A score of "one" was given to each positive response, leading to a maximum possible score of seven. The current study did not include items associated with three ACEs measured in the original ACE Study Questionnaire (i.e., exposure to domestic

violence, exposure to parental substance use, and having a parent incarcerated). In line with previous research involving the ACEs index (Anda et al., 2006; Bellis, Lowey, Leckenby, Hughes, & Harrison, 2014), summary scores were created, and a score of four or more was collapsed into a single category, such that participant scores ranged from zero to four. Given that ACEs appear to have a dose-response relationship with outcomes (Anda et al., 2006; Bellis et al., 2014), creating a cumulative summary score appears to be the most suitable approach. See Table 3 for the distribution of ACE scores in the current sample.

Maternal emotion regulation. Maternal emotion regulation (ER) was measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) and the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The DERS is a 36-item self-report measure examining six aspects of emotion regulation, including difficulties accepting emotional responses, engaging in goal-directed behaviour when emotionally upset, and controlling impulses, as well as lack of emotional awareness, lack of emotional clarity, and limited access to emotion regulation strategies. Responses were provided on a five-point Likert-type scale (1 = *almost never*, 5 = *almost always*). The DERS provides six subscale scores, which correspond to the areas of difficulties outlined above, and a total score, which reflects overall difficulties with emotion regulation. Higher scores are indicative of greater difficulties regulating emotions. The DERS has been shown to have excellent psychometric properties in both community (Gratz & Roemer, 2004) and clinical (Hallion, Steinman, Tolin, & Diefenbach, 2018) samples. In the current study, the DERS subscales had good internal consistency (Cronbach's $\alpha \geq .82$), with the exception of the clarity subscale, which was slightly lower ($\alpha = .78$) and still considered acceptable. Internal consistency for the total score was excellent ($\alpha = .95$).

Table 3. Number of participants in each ACE category/count ($n = 89$)

Maternal Adverse Childhood Experiences (ACEs)	*n* (%)
0	29 (31.2%)
1	33 (35.5%)
2	15 (16.1%)
3	7 (7.5%)
4+	5 (5.4%)

Participants also completed the ERQ, which is a 10-item self-report measure assessing two emotion regulation strategies: cognitive reappraisal and suppression (Gross & John, 2003). Responses were provided on a seven-point Likert-type scale (1 = *strongly disagree*, 7 = *strongly agree*). Higher scores on each subscale indicate greater use of that strategy. Cognitive reappraisal and suppression are theorized to be distinct strategies that are associated with different outcomes; therefore, a total score is not produced for the ERQ (Gross & John, 2003). In general, use of cognitive reappraisal has been shown to be associated with positive outcomes, and use of suppression has been associated with negative outcomes (e.g., Gross & John, 2003). The ERQ has been shown to have adequate psychometric properties (Gross & John, 2003; Preece, Becerra, Robinson, & Gross, 2019). In the current study, the ERQ subscales demonstrated acceptable internal consistency. The Cronbach's alpha for the cognitive reappraisal subscale was .79, and the Cronbach's alpha for the suppression subscale was .70.

Maternal depression. Maternal depression was measured using the Center for Epidemiologic Studies Depression (CESD) Scale (Radloff, 1977). The CESD is a 20-item self-report measure of depressive symptoms. Items inquire about experiences over the past seven days, with 16 items measuring depressive symptoms, and four reverse-coded items measuring positive well-being. Responses are provided on a four-point Likert-type scale, and higher scores indicate greater depressive symptoms. The CESD has been used extensively and has demonstrated adequate validity and reliability in a number of populations, including women in middle life (Knight, Williams, McGee, & Olaman, 1997), low-income women (Thomas, Jones, Scarinci,

Mehan, & Brantley, 2001), and post-partum mothers (Chi, Zhang, Wu, & Wang, 2016; Mosack & Shore, 2006). In the current study, the CESD had high internal consistency (Cronbach's $\alpha = 0.86$).

Within the current study, maternal depression was included as a potential covariate within analyses examining child externalizing and internalizing difficulties. Maternal depression has previously been linked to child difficulties with externalizing and internalizing problems (Ewell Foster, Garber, & Durlak, 2008; Flouri, Ruddy, & Midouhas, 2017; Trapolini, McMahon, & Ungerer, 2007). As such, it is important to account for potential differences caused by maternal depression in analyses that focus on externalizing and internalizing difficulties as outcomes.

Paternal Sub-study

As mentioned above, fathers were given the opportunity to participate in the current study, if mothers consented and passed along materials to them. The following measures were left for fathers to complete.

Paternal emotion regulation. In line with the maternal data, paternal ER was also measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). For the paternal data, the DERS subscales had acceptable internal consistency (Cronbach's $\alpha \geq .78$). Internal consistency for the total score was excellent ($\alpha = 0.92$).

Paternal self-regulation. Paternal SR was measured using the Behavior Rating Inventory of Executive Function – Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005). The BRIEF-A is a norm-referenced, standardized measure of EF that includes 75 items. Participants respond to items based on experiences over the past

month. Responses are provided on a three-point scale (i.e., 1 = *never*, 2 = *sometimes*, 3 = *often*), and higher scores indicate greater difficulties with EF.

The BRIEF-A has validity indices, including measures of inconsistent responses and infrequent responses. In the current sample, one paternal case was removed from analyses due to inconsistent scores on the BRIEF-A, and three cases were removed due to infrequent scores on the BRIEF-A.

The BRIEF-A provides several subscale scores, however, in the current study, only the Behavioural Regulation Index (BRI) summary score was considered, because it was deemed the most relevant to the current set of analyses. The BRI measures difficulty with regulating behaviour and emotional responses appropriately (Roth et al., 2005). In general, the BRIEF-A has demonstrated validity and reliability across a wide range of samples, including community and clinical samples (Roth et al., 2005). In the current study, the BRIEF-A BRI subscale had good internal consistency (Cronbach's $\alpha = .84$).

RESULTS

Statistical Analyses

All analyses were completed in MPlus Version 8.2 (Muthén & Muthén, 2017), and IBM SPSS Version 25. SPSS was used for preliminary analyses, including basic reliability of measures and evaluation of missing data. MPlus was used for all subsequent analyses, including correlation tables and hypothesis testing.

Missing data. Variables of interest had relatively low levels of missing data for maternal and child data (see Table 4 for details). With the exception of variables related to income (i.e., 6.5% missing) and the Transparent Box task (8.6% missing), variables of interest were at or above 95% complete. However, there were 68 cases (73.12%) that contained at least one missing element. Overall, 98% of the values were present and non-missing in the data. The pattern of missing data was examined using Little's Missing Completely at Random (MCAR test) and determined to be acceptable, $\chi^2(131) = 153.42$, $p > 0.05$.

Missing data were dealt with using full information maximum likelihood (FIML) procedures, consistent with best-practice recommendations (Enders, 2010). Rather than imputing or replacing values, FIML handles missing data within each analysis model and utilizes all available data to estimate the model (Enders, 2010).

Normality

Normality was assessed for the outcome variables, including the child self-regulation (SR) composite score, and child externalizing and internalizing scores. The variables were visually reviewed using histograms and appeared to be approximately

Table 4. Missing data for total maternal and child sample (n = 93 dyads)

Measure	Missing data n (%)
Child variables	
Lion-alligator	5 (5.4%)
Dimensional Change Card Sort	4 (4.3%)
Gift wrap	0 (0 %)
Transparent Box	8 (8.6%)
Child Behavior Checklist	3 (3.2%)
Peabody Picture Vocabulary Test-4	0 (0 %)
Child age	1 (1.1 %)
Maternal variables	
Adverse Childhood Experiences	4 (4.3%)
Difficulties in Emotion Regulation	0 (0 %)
Scale	
Emotion Regulation Questionnaire	0 (0 %)
CESD	0 (0 %)
Mom age	1 (1.1 %)
Family income	6 (6.5%)

Note. CESD = Center for Epidemiologic Studies Depression Scale

normally distributed. As well, all of the variables met suggested criteria for skewness and kurtosis (i.e., values between -1 and 1). Results of the Kolmogorov-Smirnov and Shapiro-Wilk tests were indicative of normality among the variables; however, these tests have been noted to be significantly impacted by sample size and are often too conservative (Patricio, Ferreira, Oliveiros, & Caramelo, 2017; Yap & Sim, 2011), and many researchers suggest reviewing data graphically to determine normality. As such, Q-Q plots, which plot the observed data points of a given variable against a normal distribution with the same number of observations, were also reviewed. All Q-Q plots indicated that the data fell close to the line, which indicates a normal distribution (see Appendix).

Descriptives and Sample Characteristics

A summary of descriptives can be found in the following tables. See Table 5 for child data, Table 6 for maternal data, and Table 7 for paternal data. As described in the Methods section, families were given the opportunity to complete a paternal sub-study, and a portion of the families in the current study completed the sub-study (n = 51). Prior to analyses, independent sample t-tests were conducted to compare families who completed the paternal sub-study with those who did not. Differences were not found among demographic variables, including family income, maternal age, child gender, and child age. However, differences were found for maternal ACEs, $t(91) = 3.013$, $p = .003$, indicating that families in which fathers did not participate included mothers who reported higher levels of maternal childhood adversity (M = 1.64, SD = 1.35) than in families where the fathers did participate (M = 0.90, SD = 1.01).

Table 5. Descriptive data for children ($n = 93$)

Variable	Mean	Range	Standard deviation
Lion-Alligator score	18.872	10-30	6.866
DCCS score	10.164	5-12	2.275
Gift Wrap (GW) time until peek	24.872	0-60	24.569
TB Persistence (proportion of time)	0.618	.152-.955	0.192
CBCL externalizing	50.3488	28-76	8.829
CBCL internalizing	50.662	29-78	9.732
PPVT standard score	115.038	76-158	15.924

Note. DCCS = Dimensional Change Card Sort; TB = Transparent Box; CBCL = Child Behaviour Checklist; PPVT = Peabody Picture Vocabulary Test-4

Table 6. Descriptive data for mothers ($n = 93$)

Variable	Mean	Range	Standard deviation
ACE	1.169	0-4	1.141
DERS			
Nonacceptance (NA)	11.677	6-26	5.328
Goals (G)	12.613	6-24	4.080
Impulse (I)	9.989	6-21	3.614
Awareness (A)	12.720	6-27	4.449
Strategies (S)	13.914	8-33	5.662
Clarity (C)	8.720	5-21	3.032
Total DERS score	69.634	40-127	20.202
ERQ			
Suppression	11.269	4-23	4.656
Reappraisal	29.677	11-41	6.041
CESD	8.484	0-43	9.018

Note. ACE = Adverse Childhood Experiences; DERS = Difficulties in Emotion Regulation Scale; ERQ = Emotion Regulation Questionnaire; CESD = Center for Epidemiologic Studies Depression Scale

Table 7. Descriptive data for fathers ($n = 47$)

Variable	Mean	Range	Standard deviation
DERS			
Nonacceptance (NA)	10.787	6-24	4.117
Goals (G)	11.362	5-20	3.723
Impulse (I)	8.745	6-20	3.378
Awareness (A)	14.106	6-24	4.300
Strategies (S)	12.638	8-26	4.445
Clarity (C)	8.894	5-20	3.150
Total DERS score	66.532	41-123	16.119
BRIEF-A			
BRI	49.106	37-72	6.886

Note. DERS = Difficulties in Emotion Regulation Scale; BRIEF-A = Behavior Rating Inventory of Executive Function – Adult Version; BRI = Behavioural Regulation Index

Analysis Plan

The analysis plan involved structural equation modeling (SEM) with the use of latent variables. SEM analyses with latent variables and bootstrapping were utilized to examine the mediation hypotheses outlined in the Introduction section above. Latent variables refer to constructs that are unobservable, but inferred from a number of observable and directly measured variables (Borsboom, Mellenbergh, & Van Heerden, 2003). The primary difference between utilizing observed variables and latent variables in analyses is the way that error is considered. When latent variables are used, measurement error is explicitly accounted for in the analysis, which increases the accuracy of estimates of the relationships between variables (Geiser, 2013). As such, the use of latent variables can improve power by minimizing the impact of measurement error on estimates (Ledgerwood & Shrout, 2011). The use of latent variables in mediation analyses is particularly useful, because measurement error has been shown to be problematic in mediation analyses (Muthén & Asparouhov, 2015). Given the limited sample size in the current study, it was important to consider ways to maximize power.

Bootstrapping was also utilized in the mediation models. Bootstrapping refers to a nonparametric resampling technique that is used to estimate a population parameter. The data are resampled a large number of times and the indirect effect, in this case, is estimated in each resampled dataset (Preacher & Hayes, 2008). Repeating this process many times allows computer programs to build a sampling distribution with confidence intervals for the indirect effect (MacKinnon, Lockwood, & Williams, 2004). Bootstrapping does not require normality in the data, and it is in line with best

recommendations for assessing the indirect effect in mediation models (MacKinnon et al., 2004; Preacher & Hayes, 2004, 2008).

Sample size minimums for SEM were also considered. Recommendations regarding sufficient sample size for SEM vary widely in the literature because estimates are very dependent on the particular characteristics of the model. Decades ago, some researchers posited "rules of thumb," such as minimum sample sizes of at least 100 participants (Boomsma, 1985; Gorsuch, 1983), or 200 participants (Guilford, 1954), whereas more recent data suggest that model and sample specific factors can radically change the number of participants required (MacCallum, Widaman, Zhang, & Hong, 1999). One study based on data simulations has indicated that sample size requirements can vary from 30 to 460, depending on the specifics of the model and data (Wolf, Harrington, Clark, & Miller, 2013). MacCallum and colleagues stated that sample sizes of 100, or even fewer, can often be sufficient for factor analytic studies (which are one example of a type of SEM), though they acknowledged that the likelihood of "nonconvergent or improper solutions may increase greatly" depending on the sample specifics (MacCallum et al., 1999). Given that the current sample was limited to the number of participants remaining as a part of an ongoing, longitudinal study, SEM analyses were attempted, though it is wise to be mindful of the warnings provided by statisticians regarding low sample sizes and SEM. As well, it is notable that some researchers have found that although latent variable SEM provides more accurate estimates, they may provide less precise estimates; that is, although the models tend to produce larger coefficient estimates,

standard errors also tend to be larger which can reduce statistical significance (Ledgerwood & Shrout, 2011).

While keeping these caveats in mind, latent SEM models were examined for the planned mediation models. Following the examination of the indirect effect in the mediation model, total and direct effects within the model were explored, consistent with the hypotheses outlined above. Finally, for analyses focused on the subsample that participated in the paternal study, simple linear regressions were utilized, along with a composite variable for the child self-regulation (SR) variable, rather than the latent variable used in the above analyses. This was done to account for the reduced sample size for these analyses.

Measurement Model of Latent Variables

Measurement model of latent variables. Two latent variables were tested in the current study. First, a latent variable representing "child self-regulation" was created based on standardized scores for the following variables: the Lion-Alligator (LA) task total score, the Dimensional Change Cart Sort (DCCS) total score, Gift Wrap (GW) task time to first peek, and Transparent Box (TB) persistence score (i.e., the proportion of time spent persisting on the task, relative to total time spent on the task). These variables were chosen because they represent "hot" and "cool" regulation, and stem from different areas of study of SR. As such, using multiple tasks allows us to examine the broad construct of SR in early childhood. This is in line with recommendations from experts in the field (Sulik, Daneri, Pintar-Breen, & Blair, 2016; Willoughby, Kupersmidt, Voegler-Lee, & Bryant, 2011).

Second, a latent variable representing "mom ER" was created. Models were tested that utilized subscale scores from the Difficulties in Emotion Regulation Scale (DERS) and the Emotion Regulation Questionnaire (ERQ). Previous research has utilized a latent variable of maternal ER that was created based on data from the DERS and ERQ (England-Mason, Khoury, Atkinson, Hall, & Gonzalez, 2018; England-Mason et al., 2017).

Confirmatory Factor Analysis (CFA) was used to assess the measurement models of the latent variables. This is considered the first step in an analysis of SEM, followed by an assessment of the structural model, as discussed below. The latent models were evaluated using standard recommendations in the literature regarding model fit (Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999). Model fit statistics indicate the degree to which the model is likely to be consistent with the sample data. Acceptable fit statistics are as follows: the χ^2 test should be nonsignificant, the RMSEA (Root Mean Square Error of Approximation) value should be below 0.06, the SRMR (Standardized Root Mean Square Residual) should be less than 0.08, and the CFI and TLI values should be above 0.95 (Hooper et al., 2008; Hu & Bentler, 1999).

Model evaluation. Correlations among the variables making up the "child self-regulation" latent construct were examined—see Table 8. In general, correlations appeared low to moderate. Two tasks were relatively uncorrelated with the other variables: persistence on the TB task, which is considered a task that elicits frustration, and the DCCS, which is a measure of cognitive flexibility. Although persistence on a frustrating task has been conceptualized to be an aspect of SR by

Table 8. Correlations among child self-regulation variables and relevant covariate (n = 93)

	1	2	3	4	5
1. Lion-alligator	-				
2. DCCS	.070	-			
3. GW peek	.311**	.195	-		
4. TB Persistence	-.032	.184	.186	-	
5. PPVT	.409**	.126	.262**	.222*	-

Note. DCCS = Dimensional Change Card Sort; GW = Gift Wrap; TB = Transparent Box; PPVT = Peabody Picture Vocabulary Test-4; *p < .05, **p < .01.

other researchers (Dennis, 2006; Spinrad et al., 2007), Kochanska and colleagues also found that a persistence task was uncorrelated with an array of tasks theorized to represent SR among young children (Kochanska et al., 1996). Alternatively, the DCCS is frequently used in composites of SR for young children (Cuevas et al., 2014; Lengua et al., 2015; Welsh, Nix, Blair, Bierman, & Nelson, 2010). Based on the correlations, latent variable models were tested with and without the TB persistence variable, and with and without the DCCS variable. Considerably better fit was found when the persistence variable was excluded and the DCCS variable was retained. Thus, the final model included standardized versions of the lion-alligator score, the DCCS score, and the GW duration to first peek score. One covariate was included because it was significantly associated with the overall latent variable (i.e., the Peabody Picture Vocabulary Test-4 [PPVT]), and the link between language development and executive processes, such as those underlying SR, has been well established in the literature (Berthelsen et al., 2017; Li et al., 2017; Talwar et al., 2011). Based on the recommendations in the literature (Hooper et al., 2008; Hu & Bentler, 1999), the measurement model of the child SR latent construct fit well, $\chi^2(2) = 2.182$, $p = .336$, RMSEA = 0.031, SRMR = 0.037, CFI = 0.992, TLI = 0.977. Inclusion of the receptive vocabulary covariate significantly improved the fit of the model. For complete results of the child self-regulation latent construct, see Table 9.

Correlations were also examined regarding the latent variable for maternal ER. Correlation coefficients were predominantly in the moderate to strong range (see Table 10). As expected, the reappraisal subscale of the ERQ was negatively correlated with all other items, because reappraisal is theorized to be an adaptive ER

Table 9. Results of Confirmatory Factor Analysis (CFA) for child self-regulation latent variable ($n = 93$)

	Standardized estimate (β)	Standard errors	p-value	R^2
Child self-regulation BY				.365*
Lion-Alligator	.646	0.134	.000	.417*
DCCS	.188	0.143	.189	.035
GW peek	.474	0.124	.000	.225
Child self-regulation WITH				
PPVT	.604	0.127	.000	

Note. DCCS = Dimensional Change Card Sort; GW = Gift Wrap; PPVT = Peabody Picture Vocabulary Test-4; BY statements refer to latent models; WITH statements specify a covariance and represent a correlation; *$p < .05$, **$p < .01$.

Table 10. Correlations among DERS and ERQ subscales ($n = 93$)

	1	2	3	4	5	6	7	8
1. DERS – Nonacceptance (NA)	-							
2. DERS – Goals (G)	.405**	-						
3. DERS – Impulse (I)	.576**	.573**	-					
4. DERS – Awareness (A)	.384**	.159	.281**	-				
5. DERS – Strategies (S)	.732**	.665**	.731**	.345**	-			
6. DESR – Clarity (C)	.621**	.296**	.499**	.646**	.623**	-		
7. ERQ – Suppression	.182	.124	.138	.501**	.303**	.353**	-	
8. ERQ – Reappraisal	-.185	-.310**	-.318**	-.336**	-.357**	-.395**	-.073	-

Note. DERS = Difficulties in Emotion Regulation Scale; ERQ = Emotion Regulation Questionnaire; *p < .05, **p < .01.

strategy, whereas the other subscales reflect theoretically maladaptive approaches to ER (Gross & John, 2003). Correlations among the DERS subscales were typically greater than correlations between the DERS subscales and the ERQ subscales. Maternal depression (i.e., Centre for Epidemiological Studies Depression Scale [CESD]) was included as a covariate in the measurement model because it was significantly associated with the latent variable overall, and the literature supports a link between maternal depression and ER (England-Mason et al., 2018, 2017; Haga et al., 2012). A latent variable measurement model was tested using the DERS and ERQ subscales. Maternal depression was included as a covariate and correlations among the subscales were accounted for within the CFA model. However, this model did not demonstrate good fit, based on recommendations in the literature (Hooper et al., 2008; Hu & Bentler, 1999). This is in contrast with previous work that has found adequate fit for a latent variable including the DERS and ERQ subscales (England-Mason et al., 2018, 2017). Using the current data, adequate fit was found for a latent variable model that included only the DERS subscales, as well as maternal depression as a covariate, and significant correlations among the subscales accounted for, $\chi^2(10) = 13.209$, $p = .212$, RMSEA = 0.059, SRMR = 0.036, CFI = 0.991, TLI = 0.982. Inclusion of the maternal depression covariate significantly improved the fit of the model. For complete results of the maternal emotion regulation latent construct, see Table 11.

Covariates

Several variables were investigated as potential covariates in the main SEM structural models, and in regression models using paternal sub-study data. This

Table 11. Results of CFA for maternal ER latent variable ($n = 93$)

	Standardized estimate (β)	Standard errors	p-value	R^2
Maternal ER BY				.559**
DERS – NA	.851	0.040	.000	.724**
DERS – G	.499	0.088	.000	.249**
DERS – I	.671	0.067	.000	.450**
DERS – A	.463	0.090	.000	.214*
DERS – S	.851	0.040	.000	.725**
DERS – C	.752	0.054	.000	.566**
Maternal ER WITH				
CESD	.748	0.055	.000	

Note. ER = Emotion Regulation; DERS = Difficulties in Emotion Regulation Scale; NA = Nonacceptance; G = Goals; I = Impulse; A = Awareness; S = Strategies; C = Clarity; CESD = Centre for Epidemiological Studies Depression Scale; BY statements refer to latent models; WITH statements specify a covariance and represent a correlation; *p < .05, **p < .01.

included child receptive vocabulary, maternal depression, maternal age, total family income, and in the case of analyses including fathers, paternal age. These variables were chosen based on the literature, which indicated that they may be significantly correlated with the outcomes studied. Descriptives for these variables are shown in Table 5 for child variables, Table 6 for maternal variables, and Table 7 for paternal variables. Given that sample size was significantly reduced for the data from fathers, correlations among observed variables and relevant potential covariates are also provided in two separate tables with noted sample size differences. See Table 12 and Table 13 for correlation data.

After examining the correlational data and considering covariates that have been identified in previous studies, variables that were associated with the outcomes in the current study were identified. For analyses focused on maternal and child data, the PPVT score was included as a relevant covariate in analyses when child SR was an outcome. This is consistent with past research indicating that language development is a potential covariate of EF, which is conceptually similar to SR (Berthelsen et al., 2017; Cuevas et al., 2013; Li et al., 2017; Meuwiseen & Carlson, 2015; Talwar et al., 2011; Willoughby, Magnus, Vernon-Feagans, & Blair, 2017). Total household income was also utilized as a covariate in models examining child SR as an outcome. Despite total family income not being significantly correlated with child SR, family income is an important covariate that is often considered in psychological research generally, as well as in developmental research specifically.

For analyses examining child externalizing behaviours as an outcome, covariates included maternal depression and total family income, both of which were

Table 12. Correlations among maternal and child variables (n = 93 dyads)

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Child SR[+]	-								
2. CBCL-ext	-.206	-							
3. CBCL-int	-.023	.602**	-						
4. PPVT	.586**	-.153	-.258**	-					
5. Maternal ER[+]	-.151	.236*	.256**	-.099	-				
6. Maternal ACEs	-.296*	.370**	.217*	-.168	.172	-			
7. Maternal CESD	-.190	.459**	.344**	-.063	.748**	.369**	-		
8. Maternal age	.096	-.066	-.055	.119	.122	-.136	-.016	-	
9. Family income	.041	-.203*	-.209*	.236*	-.054	-.187	-.030	.519**	-

Note. SR = self-regulation; CBCL = Child Behaviour Checklist; ext = externalizing; int = internalizing; PPVT = Peabody Picture Vocabulary Test-4; ER = emotion regulation; ACEs = adverse childhood experiences; CESD = Centre for Epidemiological Studies Depression Scale; [+]Latent variable correlations are approximate given that values change slightly based on the particular variables included in the model. To produce correlations with latent variables, only one other variable was entered into the model at a time; *p < .05, **p < .01.

Table 13. Correlations among observed paternal, maternal and child variables for families who completed paternal sub-study (n = 47 dyads)

	1.	2.	3.	4.	5.	6.	7.
1. Child SR	-						
2. PPVT	.236	-					
3. DERS total – dad	-.126	.071	-				
4. BRIEF-A BRI – dad	-.309*	-.103	.633**	-			
5. Paternal age	.032	.125	-.268*	-.261	-		
6. DERS total – mom	.015	.041	.111	-.032	.061	-	
7. Family income	.028	.226	-.294*	-.223	.700**	.129	-

Note. Child SR = child self-regulation composite variable; PPVT = Peabody Picture Vocabulary Test-4; DERS = Difficulties in Emotion Regulation Scale; BRIEF-A = Behavior Rating Inventory of Executive Function – Adult Version; BRI = Behavioural Regulation Index; *p < .05, **p < .01.

significantly correlated with child externalizing behaviours. Maternal depression has been linked to child difficulties with externalizing and internalizing problems in past research (Ewell Foster et al., 2008; Flouri et al., 2017; Trapolini et al., 2007), and it is important to account for the variance caused by maternal depression in analyses that consider externalizing and internalizing difficulties as outcomes. For analyses examining child internalizing behaviours as an outcome, covariates also included maternal depression and total family income, as well as child receptive vocabulary, which was significantly correlated with internalizing difficulties. Past research has indicated that language difficulties are associated with increased internalizing problems for children (Helland et al., 2018), so it is important to account for language ability in the relevant analyses as well.

For paternal analyses, the only outcome considered was the child SR composite variable. In the reduced sample of those involved in the paternal sub-study, child SR was not significantly associated with any potential covariates (see Table 13). As such, only total family income was used as a covariate in these analyses, given that total income was included for theoretical rather than statistical reasons.

Main Analyses

Hypothesis 1a: Maternal ER difficulties will mediate the relation between maternal ACEs and child self-regulation. In line with the first mediation hypothesis outlined above, maternal ER was tested as a mediator in the relationship between maternal ACEs and child SR. Total family income was used as a covariate in the structural model. Child receptive vocabulary was included as a covariate in the child SR measurement variable and therefore was not accounted for in the structural model. The

indirect effect was tested using bootstrapping (1000 replications), and associated confidence intervals were produced.

Although each latent measurement model discussed above demonstrated excellent fit individually, the overall fit of the current SEM structural mediation model did not meet the most stringent fit requirements, $\chi^2(56) = 88.934$, $p = .003$, RMSEA = 0.080, SRMR = 0.090, CFI = 0.921, TLI = 0.898. As a reminder, recommended fit requirements are as follows: the χ^2 test should be nonsignificant, the RMSEA value should be below 0.06, the SRMR should be less than 0.05, and the CFI and TLI values should be above 0.95 (Hooper et al., 2008; Hu & Bentler, 1999). However, these recommendations are not absolute. Previous research has suggested that CFI and TLI typically do not vary much with differing sample sizes (Kenny, 2015), and these values were approximately at or above 0.9 in the current data. Although 0.95 is often given as an appropriate cutoff for CFI and TLI, other researchers have suggested 0.9 as a cutoff suitable for CFI and TLI (Awang, 2012; Hair, Black, Babin, & Anderson, 2010). As well, Hu and Bentler (1999) noted that SRMR values up to 0.09 can be considered indicative of acceptable model fit. Lastly, the chi-square test has been questioned as a measure of fit in SEM models for various reasons, including the assumption of multivariate normality, sensitivity to sample size, and low power (see Hooper et al., 2008). Alternative approaches to interpreting the chi-square index have been used in the past. One measure, commonly referred to as the relative or normed chi-square test (Wheaton, Muthén, Alwin, & Summers, 1977), uses the ratio of the chi-square value divided by the degrees of freedom to indicate acceptable fit. Although there is not total consensus regarding acceptable values for this statistic, researchers have recommended values ranging from less than two (Tabachnick & Fidell, 2013) to less than five (Wheaton et al., 1977). In the current data, the value was about

1.59, which is lower than the more conservative threshold that has been presented in the literature. Overall, while noting that the current model does not meet the most stringent fit requirements put forth in the literature, it does appear that some fit requirements demonstrate adequate fit. As such, results of the current mediation analysis were examined.

Results indicated that the indirect effect was not significant, B = -0.123 (β = -.032), p = .493, 95% CI [-0.660, 0.078]. Given that zero is included in the limits of the confidence interval, it is implied that zero is a possible value for the effect; only when the confidence interval does not include zero is it considered indicative of a significant effect. Therefore, maternal ER difficulties did not mediate the relation between maternal ACEs and child SR ability. See Table 14 for a summary of the remaining paths included in the structural model.

Follow-up analyses included a Monte Carlo simulation to determine power level of the indirect effect (Muthén & Muthén, 2002). A Monte Carlo simulation is in line with best practices for estimating power in mediation analyses (Schoemann, Boulton, & Short, 2017; Thoemmes, MacKinnon, & Reiser, 2010). Using the current sample size and effects found in the data, after 1000 replications, power was estimated to be about .06 for the indirect effect, indicating that a significant effect was found 6% of the time in the replications. Given that power is a function of the effect size and sample sizes considered, it appears clear that the indirect effect size is very small in the current sample. The Monte Carlo simulation was re-run while adjusting the sample size, and it was determined that obtaining suitable power (i.e., approximately 80%) for the effect size of the indirect effect in the current data would require a sample size of 500.

Table 14. Results of SEM testing maternal ER as a mediator in relation between maternal ACEs and child self-regulation (n = 93 dyads)

	Unstandardized estimate (B); (standard errors)	Standardized estimate (β)	p-value
Child SR on			
Maternal ER	-0.181 (0.183)	-.183	.324
Maternal ACEs	-0.757 (0.596)	-.200	.203
Maternal ER on			
Maternal ACEs	0.679 (0.404)	.177	.093

Note. SR = Self-Regulation; ER = Emotion Regulation; ACEs = Adverse Childhood Experiences; ON statements refer to regressions within the model (e.g., child SR regressed ON maternal ACEs)

Hypothesis 1b: Maternal ACEs will be negatively associated with child SR. As a follow-up to the mediation analysis completed above, some main effects were also explored, including the impact of maternal ACEs on child SR. Specifically, it was predicted that mothers who reported greater childhood adversity would be more likely to have children who demonstrated more difficulty with SR. As such, this hypothesis can be examined using the total effect from the mediation model above. Despite the fact that the relation between maternal ACEs and child SR was nonsignificant within the model (see Table 14), this particular analysis is examining the relationship between the two variables when accounting for the other variables in the model (see the *direct effect* in the mediated model in Figure 1). If, however, one wants to examine the impact of maternal ACEs on child SR without the influence of the mediator, it is most useful to instead look at the total effect of the model (see the unmediated model in Figure 1). The total effect accounts for both the indirect effect and the direct effect, which refer to the effect of the mediator on the outcome when the predictor is held constant, and the effect of predictor on the outcome while accounting for the mediator, respectively. The total effect was examined based on a one-tailed p-value and 95% confidence interval, because it was predicted a priori that maternal ACEs would negatively predict child SR.

In the current model, the total effect was significant and confidence intervals did not overlap zero, B = -0.880 (β = -.232), p = .049, 95% CI [-2.501, -0.129], indicating that mothers who reported more maternal adversity were more likely to have children who demonstrated poorer SR ability, even after accounting for child receptive vocabulary and total family income.

Hypothesis 1c: Maternal ER difficulties will be negatively associated with child SR. The last hypothesis associated with the current model was evaluated using the

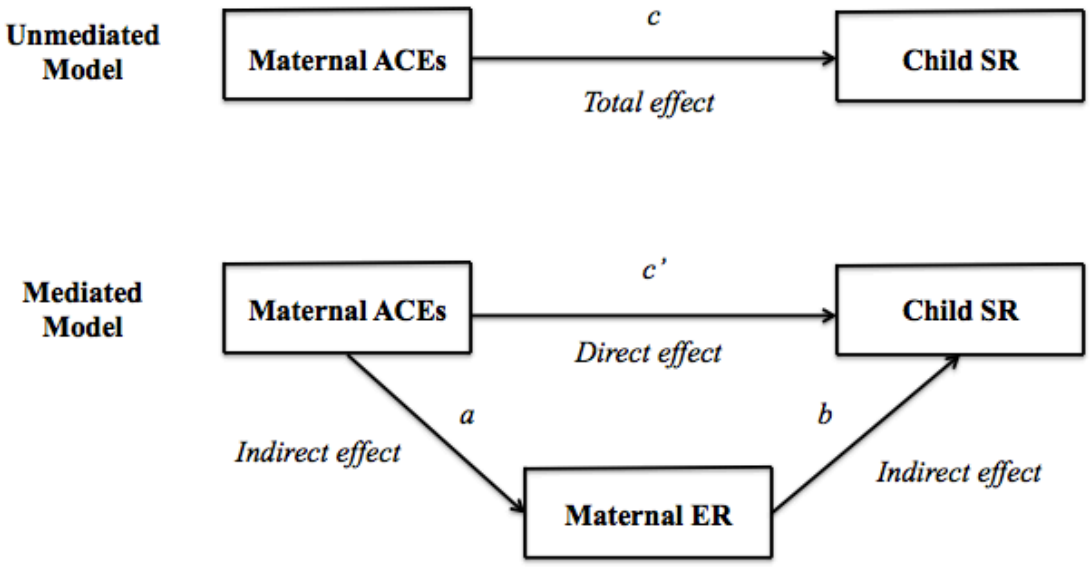

Figure 1. Example of unmediated and mediated models using variables from Hypothesis 1a.

pathways from the structural model. It was predicted that mothers who reported more ER difficulties would be more likely to have children who demonstrated poorer SR. As mentioned, child receptive vocabulary and total family income were included as covariates in the model. In this case, the model data indicated that the relationship was nonsignificant, B = -0.181 (β = -.183), p = .324 (see Table 14). As such, mothers who reported greater difficulty with ER were no more likely to have children with SR difficulties.

Hypothesis 2a: Child self-regulation will mediate the relation between maternal ACEs and child externalizing difficulties. Consistent with the second mediation hypothesis, child SR was examined as a mediator in the relation between maternal ACEs and child externalizing difficulties. Maternal depression and total family income were included as covariates. The indirect effect was tested using bootstrapping (1000 replications), and associated confidence intervals were produced.

Results indicated that the structural model demonstrated excellent fit, $\chi^2(13) = 9.617$, p = .725, RMSEA = 0.000, SRMR = 0.039, CFI = 1.000, TLI = 1.117. As such, the remaining hypotheses associated with this model were interpreted.

Results indicated that the indirect effect was not significant, B = 0.225 (β = .034), p = .486, 95% CI [-0.225, 1.335]. Given that zero is included in the limits of the confidence intervals, the effect is assumed to be nonsignificant, which is consistent with the p-value produced. As such, based on the current results, child SR did not mediate the relation between maternal ACEs and child externalizing difficulties. See Table 15 for a summary of the remaining paths included in the structural model.

Follow-up analyses included a Monte Carlo simulation to determine power level of the indirect effect. Using the current sample size and effects found in the data, power

Table 15. Results of SEM testing child SR as a mediator in relation between maternal ACEs and child externalizing difficulties (n = 93 dyads)

	Unstandardized estimate (B); (standard errors)	Standardized estimate (β)	p-value
Child externalizing on			
Child SR	-0.244 (0.397)	-.114	.538
Maternal ACEs	1.243 (0.882)	.164	.159
Child SR on			
Maternal ACEs	-1.042 (0.506)	-.294	.040

Note. SR = Self-Regulation; ER = Emotion Regulation; ACEs = Adverse Childhood Experiences; ON statements refer to regressions within the model (e.g., child SR regressed ON maternal ACEs)

was estimated to be .02 for the indirect effect, indicating that a significant effect was found 2% of the time in the 1000 replications completed. Again, this result indicates that a very small effect size was found for the indirect effect in the current sample. The Monte Carlo simulation was re-run while adjusting the sample size, and it was determined that obtaining suitable power (i.e., approximately 80%) for the effect size of the indirect effect in the current data would require a sample size of 1000.

Hypothesis 2b: Maternal ACEs will be positively associated with child externalizing difficulties. Following up on the mediation analysis above, the impact of maternal ACEs on child externalizing difficulties was also explored. Specifically, it was predicted that mothers who reported greater childhood adversity would be more likely to also report their children had greater problems with externalizing difficulties. This hypothesis was assessed using the total effect of the meditation model described above. Again, the hypothesis was assessed based on a one-tailed p-value and 95% confidence interval, because it was specifically predicted that the relationship between the variables would be positive.

In the current model, the total effect was significant and confidence intervals did not overlap zero, B = 1.497 (β = .198), p = .026, 95% CI [0.169, 3.278], indicating that mothers who reported greater childhood adversity tended to also report that their children had greater difficulty with externalizing behaviours, even after accounting for maternal depression and total family income.

Hypothesis 2c: Child SR will be negatively associated with child externalizing difficulties. The last hypothesis associated with the current model was evaluated using the pathways from the structural model. It was predicted that children who demonstrated poorer SR would be more likely to have mothers who reported that they have difficulties

with externalizing behaviours. As mentioned, maternal depression and total family income were included as covariates in the model. In this case, the model data indicated that the relationship was nonsignificant, B = -0.244 (β = -.114), p = .538 (see Table 15). As such, children who had more difficulties with SR were no more likely to have mothers report that they also had difficulty with externalizing behaviours.

Hypothesis 3a: Child self-regulation will mediate the relation between maternal ACEs and child internalizing difficulties. Consistent with the third mediation hypothesis, child SR was also examined as a mediator in the relation between maternal ACEs and child internalizing problems. Child receptive vocabulary, maternal depression and total family income were included as covariates. Again, the indirect effect was tested using bootstrapping (1000 replications), and associated confidence intervals were produced.

Similar to the mediation analysis above examining externalizing behaviours as an outcome, the structural mediation model examining internalizing problems as an outcome also demonstrated excellent fit $\chi^2(12) = 7.189$, p = .845, RMSEA = 0.000, SRMR = 0.037, CFI = 1.000, TLI = 1.239. The remaining hypotheses associated with this model are interpreted below.

Results indicated that the indirect effect was not significant, B = -0.199 (β = -.024), p = .864, 95% CI [-3.094, 1.047]. Given that zero is included in the limits of the confidence intervals, the effect is assumed to be nonsignificant, which is consistent with the p-value produced. Based on the current results, child SR did not mediate the relation between maternal ACEs and child internalizing difficulties. See Table 16 for a summary of the remaining paths included in the structural model.

Table 16. Results of SEM testing child SR as a mediator in relation between maternal ACEs and child internalizing difficulties (n = 93 dyads)

	Unstandardized estimate (B); (standard errors)	Standardized estimate (β)	p-value
Child internalizing on			
Child SR	0.188 (1.100)	.082	.864
Maternal ACEs	0.633 (1.394)	.076	.649
Child SR on			
Maternal ACEs	-1.062 (0.495)	-.292	.032

Note. SR = Self-Regulation; ER = Emotion Regulation; ACEs = Adverse Childhood Experiences; ON statements refer to regressions within the model (e.g., child SR regressed ON maternal ACEs)

Again, follow-up analyses included a Monte Carlo simulation to determine power level of the indirect effect. Using the current sample size and effects found in the data, power was estimated to be <.01 for the indirect effect, indicating that a significant effect was found less than 1% of the time in the 1000 replications completed. This result indicates that an extremely small effect size was found for the indirect effect in the current sample. The Monte Carlo simulation was re-run while adjusting the sample size, and it was determined that obtaining suitable power (i.e., approximately 80%) for the effect size of the indirect effect in the current data would require a sample size of 5000 participants.

Hypothesis 3b: Maternal ACEs will be positively associated with child internalizing difficulties. Following the mediation analysis above, the impact of maternal ACEs on child internalizing difficulties was also explored. Specifically, it was hypothesized that mothers who reported greater childhood adversity would be more likely to also report their children had greater problems with internalizing difficulties. This prediction was assessed using the total effect of the meditation model described above. Again, the hypothesis was assessed based on a one-tailed p-value and 95% confidence interval, because it was specifically predicted that the relationship between the variables would be positive.

In the current model, the total effect was not significant and confidence intervals overlapped zero, B = 0.434 (β = .052), p = .314, 95% CI [-1.070, 2.778], indicating that mothers who reported greater childhood adversity were no more likely to also report that their children had greater difficulty with internalizing behaviours.

Hypothesis 3c: Child SR will be negatively associated with child internalizing difficulties. The last hypothesis associated with the current model was evaluated using the

pathways from the structural model. It was predicted that children who demonstrated poorer SR would be more likely to have mothers who reported that they have difficulties with internalizing behaviours. As mentioned, maternal depression and total family income were included as covariates in the model. In this case, the model data indicated that the relationship was not significant, B = -0.244 (β = -.114), p = .538 (see Table 15). As such, children who had more difficulties with SR were no more likely to have mothers report that they also had difficulty with internalizing behaviours.

Paternal Sub-study

The subset of the sample who participated in the paternal sub-study were examined using simple linear regressions. Consistent with the regression analyses completed above, the child SR composite variable was created based on an average of the LA task, the DCCS, and the GW peek score, after standardizing each variable. The DERS total scores were used for both fathers and mothers in the current set of analyses. Sample size for all analyses in the paternal sub-study was n = 47.

As described above, prior to analyses, several covariates were examined with regard to their association with the child self-regulation composite outcome variable (see Table 13). This included child receptive vocabulary (i.e., PPVT) scores, family income, and paternal age. As indicated in Table 13, none of the potential covariates were significantly related to the child SR composite variable, and these were subsequently dropped from further analyses. The only exception is total family income, which is considered an important covariate often included in developmental research, and therefore was included as a covariate in subsequent analyses.

Hypothesis 4a: Paternal ER difficulties will be negatively associated with child SR ability. To test the hypothesis that paternal ER difficulties negatively predict child SR, a linear regression analysis was utilized. Fathers' ER difficulties (i.e., DERS) scores were entered as the predictor, and the child self-regulation composite score was entered as the outcome. Total family income was entered as a covariate. Results indicated that paternal ER difficulties scores were not associated with the child SR composite scores after controlling for total family income, B = -0.006 (β = -.129), p = .394. The result was also nonsignificant when total family income was not included as a covariate. Overall, then, fathers who reported more difficulty with regulating emotions were no more likely to have children who demonstrated difficulties with SR.

Hypothesis 4b: Paternal SR difficulties will be negatively associated with child SR ability. Paternal self-reported SR was hypothesized to be positively related to child SR. Fathers completed the BRIEF-A and the Behaviour Regulation Index (BRI) was chosen as the subscale that was most conceptually similar to SR as measured in the children in the current study. Again, a linear regression was run, and paternal SR was tested as a predictor of child SR. Total family income was entered as a covariate. Results indicated that paternal SR difficulties significantly predicted child SR ability after controlling for total family income, B = -0.034 (β = -.319), p = .025. In this case, fathers who reported more difficulty managing emotions and behavioural responses were more likely to have children who demonstrated difficulty with SR in behavioural tasks, even after controlling for the impact of total family income.

Hypothesis 4c: Paternal ER will predict child SR after considering the effect of maternal ER. In order to compare the relative impact of mothers' versus fathers' regulatory scores on child self-regulation, the DERS scores were used, because mothers

did not complete the BRIEF. In this case, it was hypothesized that mothers' ER scores would predict more variance than fathers' ER scores with regard to the child SR outcome score. In order to test this hypothesis, two regressions were completed. In the first, mothers' ER scores, fathers' ER scores, and total family income were included as predictors, and the variance for fathers' ER scores was held at zero. In the second regression, the same predictors were entered, and fathers' ER score variance was returned to its original value in the sample. This procedure was undertaken to determine whether fathers' ER had a significantly greater impact on child SR after accounting for the impact of mothers' ER. The first regression yielded an R^2 value of .001, p = .917. The second regression yielded an R^2 value of .017, p = .650. This suggests that including fathers explained some additional variance in child SR, but that overall the effect was not significant. As well, in the second regression, which included both maternal and paternal ER as predictors, it was found that neither significantly predicted the child SR outcome (see Table 17). Overall, in the subset of the sample that participated in the paternal data collection, neither mothers' difficulties with ER nor fathers' difficulties with ER significantly predicted child SR, and fathers' ER did not predict child SR over and above the impact that mothers' had.

Post Hoc Analyses

For maternal and child data, a small number of post hoc analyses were explored in order to test if the relationships between variables were present when covariates were not accounted for. Rather than complex SEM analyses using latent models, the current set of analyses used linear regressions with composite variables. The rationale for completing this set of analyses was to determine if the covariates included in the current study

Table 17. Results of "step two" regression, including maternal and paternal ER as predictors of child SR after accounting for effect of total family income, when paternal ER was included with unrestricted variance ($n = 47$ dyads)

	Unstandardized estimate (B); (standard errors)	Standardized estimate (β)	p-value
Child self-regulation ON			
DERS-mom	0.001 (0.006)	.032	.827
DERS-dad	-0.006 (0.007)	-.134	.381

Note. DERS = Difficulties in Emotion Regulation Scale; ON statements refer to regressions within the model (e.g., child SR regressed ON maternal DERS scores)

provided a possible reason that the current data did not fit with previous findings, which may not have always used covariates.

First, the total DERS score was tested as a predictor of the child SR composite variable, which was calculated in the same manner as used in the paternal analyses described above. This result was not significant, B = -0.005 (β = -.156), p = .129, indicating that even when covariates are not included, maternal ER difficulties were not related to child SR in the current data.

Second, the child SR composite variable was tested as a predictor of child externalizing difficulties. This relationship was significant, B = -2.870 (β = -.229), p = .022, suggesting that children who had better SR abilities were less likely to have mothers' report that they had difficulty with externalizing problems, when covariates were not controlled for.

Third, maternal ACEs were entered into a regression as a predictor, and child internalizing difficulties were set as the outcome. In this case, the result was significant, B = 1.794 (β = .216), p = .041, which indicates that mothers who reported more childhood adversity were also more likely to report that their children had difficulty with internalizing problems, when covariates were not accounted for.

Lastly, the child SR composite variable was tested as a predictor of child internalizing difficulties. This result was not significant, B = -1.806 (β = -.131), p = .209, suggesting that, even when covariates were not controlled for, children's SR abilities were unrelated to mothers' reports of internalizing difficulties.

DISCUSSION

The purpose of the present study was twofold. First, a primary objective was to examine determinants of child SR, including parental factors, such as maternal ACEs, maternal ER, and paternal regulatory variables. Second, child SR was investigated as a potential causal link between maternal ACEs and child externalizing and internalizing difficulties. This study represents the first known attempt to look at these specific variables together, and to create cohesive models that link them based on theory and the existing literature.

Determinants of Child Self-Regulation

Previous research suggested that several parenting factors affect child regulatory difficulties. A small number of studies have found that maternal childhood adversity predicts child regulatory difficulties (Delker et al., 2014; DeOliveira et al., 2004; Gray et al., 2017). Few empirical studies have examined the underlying mechanisms of this relationship, but there are theoretical reasons to do so. Specifically, mothers who experience ACEs are more likely to report numerous physical and mental health difficulties, as well as difficulties with unemployment and intimate partner violence (Anda et al., 2006; Liu et al., 2013; Mair et al., 2012; Merrick et al., 2017), all of which are likely to disrupt the parent-child relationship and increase stress in the home environment. Both of these variables are important to child SR development (Bridgett et al., 2015; Brieant et al., 2017). Many studies have examined the relationship between maternal and child SR, and a comprehensive review (Bridgett et al., 2015) suggested that there is good evidence of a positive relationship between these variables. Given that maternal adversity is also likely to impact the mother's ability to regulate her own

emotions (Barlow et al., 2017; Carvalho Fernando et al., 2014; Dvir et al., 2014; Lovallo, 2013), a mediation model was best suited to testing whether maternal ER explained the impact of maternal ACEs on child SR. I sought to investigate this link, as well as the main effects of maternal ACEs and maternal ER on child SR.

The current study tested a mediation model in which maternal ER was proposed to mediate the relation between maternal ACEs and child SR. Although the model was theoretically derived, it did not meet the most stringent fit criteria often cited in the literature; however, adequate fit appeared to have been achieved. Overall, the indirect effect was very small and nonsignificant, and there are many possible reasons for this. First, this result may be accurate and indicative of a small effect that would require a larger sample size to detect. This does not mean that the effect is inconsequential, and it could have an impact when looking at a population level. Indeed, statistical experts have advised that placing too much emphasis on nonsignificant mediation results can be misleading if the study is underpowered (Fritz, Cox, & MacKinnon, 2015). It is important to consider practical significance in addition to statistical significance, and it is not clear whether the current result points to a potentially meaningful effect given the small effect size. It is also critical to recognize that sample size may also be a factor that is limiting model fit and statistical testing, and the current study included fewer participants than recommended in the literature for SEM (MacCallum et al., 1999; Wolf et al., 2013).

It is also important to recall that intergenerational work, such as the model considered here, is arguably still in its infancy. It is possible that, despite theoretical and empirical support for the links between the mediation model variables, more preliminary steps need to be taken before a more complex model can be effectively assessed. Within the current literature, there is little if any research assessing a similar model. The novelty

of this model is arguably a strength of the current work, however given the results it may have been too ambitious.

As a follow-up to the first mediation model, the impact of maternal ACEs on child SR was explored. Results clearly indicated that maternal ACEs significantly predicted child SR, even after accounting for the relevant covariates of child receptive vocabulary and total family income. In this case, mothers who reported greater childhood adversity tended to have children who demonstrated poorer SR ability on behavioural tasks. Although no studies examining this relationship were found within the literature review, this result is consistent with theory discussing important determinants of child SR. As outlined in the review above, SR is theorized to develop within a suitable parent child relationship and home environment (Bridgett et al., 2015; Calkins & Leerkes, 2011; Cassidy, 1994; Morris et al., 2017; Morris et al., 2007; Sroufe, 1996). In addition, maternal ACEs are associated with an array of persistent negative outcomes for individuals, which are likely to impact parenting ability and the stability of the home environment more generally. Thus, it is unsurprising that exposure to maternal ACEs predicts poor SR among three-year-old offspring.

Contrary to previous work, which appears to demonstrate a rather consistent link between maternal and child regulatory variables (e.g., Bridgett et al., 2015), the current study did not find a significant link between maternal ER and child SR. Post hoc analyses confirmed that the relationship between these variables was not statistically significant even when covariates were not taken into account. Although it is not totally clear why these results were not statistically significant, there are a few plausible explanations. First, among the many previous studies that have examined the relation between maternal and child regulatory variables, most appear to have examined similar constructs for mothers

and children. For example, studies have found a link between parental and infant vagal tone (Bornstein & Suess, 2000), maternal and toddler effortful control (Bridgett et al., 2011; Gartstein et al., 2013), and maternal and child executive functioning (Cuevas et al., 2014). Notably, though, at least one previous study has found a link between maternal ER and aspects of child EF, including tasks of cognitive flexibility (Samuelson et al., 2012), which is conceptually similar to the current study. It is possible that the measures chosen for the current study were more disparate than is ideal. Unfortunately, a measure of maternal SR that more closely resembles the SR construct measured for the children in the current thesis was not included.

Relative to the second and third mediation models, the first mediation model demonstrated poorer fit statistics. Given that the models are conceptually similar and include many of the same variables, it is likely that the maternal ER difficulties latent variable contributed to the reduced fit in the first model, as this variable was not included in the second and third models. The DERS, which was originally derived by factor analysis (Gratz & Roemer, 2004), has been widely used and psychometrically tested in a large number of languages, but several researchers have questioned its factor structure. In their original paper, Gratz and Roemer (2004) theorized that a four-factor structure of the DERS would be most suitable. However, after the authors conducted an exploratory factor analysis, they found that a six- or seven-factor structure best fit the data, and a six-factor structure was retained because it was most easily interpreted. Since then, several studies have conducted independent confirmatory factor analyses (CFA) in order to test Gratz and Roemer's (2004) six-factor structure. Many have found that it does not demonstrate adequate fit (Kökönyei, Urbán, Reinhardt, Józan, & Demetrovics, 2014; Lee, Witte, Bardeen, Davis, & Weathers, 2016), or that it only demonstrates adequate fit after

conducting post hoc modifications of the model, such as allowing cross-loadings and removing items (Neumann, van Lier, Gratz, & Koot, 2010; Perez, Venta, Garnaat, & Sharp, 2012). Similarly, the current study required cross-loadings and the inclusion of a covariate to improve the measurement model fit for the maternal ER latent variable, which focused on the DERS. Accordingly, evidence suggests that use of the DERS may be statistically problematic, and it questions the original theory establishing the validity of this measure (Kökönyei et al., 2014; Medrano & Trogolo, 2016). The factor structure of the DERS may help to explain the lack of significant association between maternal ER and child SR in the current study, given that mother and child regulatory variables appear to be fairly consistently linked in the literature (e.g., Bridgett et al., 2015). Overall, in contrast with predictions based on previous literature, only maternal ACEs were a significant determinant of child SR. Maternal ER did not predict child SR, nor did it explain the relationship between maternal ACEs and child SR in this study.

Determinants of Child Externalizing Difficulties

Previous studies have indicated that variables associated with parenting and child SR are related to child externalizing difficulties. Specifically, a number of recent cross-sectional studies demonstrated the link between maternal ACEs and child externalizing difficulties among toddlers and preschoolers (Fredland et al., 2018; Letourneau et al., 2019; McDonald et al., 2019; Treat et al., 2019). This effect has also been found for children ages 1.5 to 18, with no differences associated with age (Stepleton et al., 2018), indicating that it is important throughout childhood and adolescence. More broadly, maternal childhood trauma (i.e., a more general term than maternal ACEs) has also been linked to externalizing difficulties in offspring (Miranda et al., 2013; Myhre et al., 2013;

van de Ven et al., 2019). Similarly, SR in early childhood has been shown to be inversely linked to externalizing difficulties (Choe et al., 2013; Compas et al., 2017; Eisenberg et al., 2010; Schoemaker et al., 2013), suggesting that children with SR difficulties also tend to struggle with externalizing problems. Given that externalizing difficulties are associated with a range of later problems, including poorer quality of life in early adulthood generally (Korhonen et al., 2018), it is important to understand the mechanisms that may be impacting the development or maintenance of externalizing problems among young children. The current study investigated two important predictors, maternal ACEs and child SR, and given theory supporting the link between maternal ACEs predicting poorer child SR outcomes, these variables were tested in a mediation model with externalizing difficulties as the outcome. Main effects were also investigated.

In order to assess a comprehensive model, child SR was examined as a mediator in the relationship between maternal ACEs and child externalizing difficulties. In this case, the model demonstrated excellent fit. With regard to hypothesis testing, however, the indirect effect was very small and nonsignificant. This result suggests that there was no evidence that child SR explained the relationship between maternal ACEs and child externalizing difficulties. Similar to the discussion of the mediation model above, there are many possible reasons that help to explain this finding. It is possible that the effect is accurate and would require a larger sample size in order to be detected (i.e., approximately 1000 participants to reach adequate power using the current effect sizes). Such a small effect may be meaningful on a population level, but have limited value on an individual level. As such, the practical significance of the indirect effect appears rather limited in this case. However, given that the current study was arguably underpowered to test a complex mediation model with a number of covariates, it is also important to be

mindful of recommendations from experts indicating that placing too much emphasis on nonsignificant mediation results when studies are underpowered can be misleading (Fritz et al., 2015).

Although research focused on intergenerational impacts of maternal early adversity is in early stages and continues to develop, there are somewhat similar models that have been tested in the literature. A recent study indicated that child ER mediated the relationship between maternal incarceration and both externalizing and internalizing difficulties for children of about age 10 (Zeman et al., 2018). Maternal incarceration is both a specific type of ACE for the children studied and a likely indicator of maternal ACEs (Reavis et al., 2013). A second study of preschoolers found that child ER mediated the relationship between attachment security and internalizing difficulties in particular (Ştefan & Avram, 2017). Attachment security is likely to be disrupted by maternal ACEs (Baer & Martinez, 2006; Cooke et al., 2019). As such, these studies represent conceptually similar work to the current study, and it is not clear why the data in the current thesis did not produce similar results.

As a follow-up to this mediation model, the impact of maternal ACEs on child externalizing difficulties was explored. Results indicated that maternal ACEs significantly predicted child externalizing difficulties, after controlling for relevant covariates (i.e., maternal depression and total family income). In this case, mothers who reported greater childhood adversity also reported that their children had greater difficulty with externalizing problems. This result replicates recent studies that have also found that maternal ACEs predicted child externalizing difficulties in early childhood (Fredland et al., 2018; Letourneau et al., 2019; McDonald et al., 2019; Treat et al., 2019), as well as past studies that have linked maternal childhood trauma, more generally, to child

externalizing difficulties (Miranda et al., 2013; Myhre et al., 2013; van de Ven et al., 2019). This result, paired with the significant relationship between maternal ACEs and child SR mentioned above, further emphasizes the significant impact of maternal childhood adversity on offspring. This fits with the literature that has emphasized the profound impact of ACEs on an array of negative outcomes in one's adult life (Anda et al., 2006; Felitti et al., 1998; Liu et al., 2013; Mair et al., 2012; Merrick et al., 2017). Most related to the current study, maternal ACEs have also been shown to impact parenting. Maternal ACEs may increase the likelihood of an insecure attachment with one's child (Cooke et al., 2019) and increase parental distress (Lange et al., 2019; Steele et al., 2016). Although not tested in the current thesis, these factors are plausible mechanisms that may explain how children are negatively impacted by maternal ACEs. Overall, there is evidence in the current data that maternal ACEs are associated with more difficulties for three-year-old offspring, including greater difficulties with SR and externalizing problems.

The current study did not find a significant link between child SR and externalizing difficulties once covariates of maternal depression and total family income were included. This contrasts with previous studies that have demonstrated a relationship between child SR and externalizing difficulties, including evidence cited in a large scale review (Compas et al., 2017) and meta-analysis (Schoemaker et al., 2013). Although it is unclear why this relationship was not significant in the current sample, there was a significant link between child SR and externalizing difficulties when covariates were not included. It seems possible that at least some studies have not utilized the same covariates (i.e., child receptive vocabulary and total family income). Child receptive vocabulary, in particular, has been utilized as a covariate in studies of EF, but is sometimes neglected in

work focused on SR, when defined more broadly (Berthelsen et al., 2017; Cuevas et al., 2013; Li et al., 2017; Meuwiseen & Carlson, 2015; Talwar et al., 2011; Willoughby, Magnus, Vernon-Feagans, & Blair, 2017). As mentioned in the literature review, EF and SR are conceptually similar, though EF is more grounded in neuropsychological research than many studies focused on SR. As such, it is plausible that the inclusion of important covariates in the current study, which account for a substantial amount of variance in the outcome, are eliminating a significant effect given the current sample size limitations. This, however, is the reason why covariates are included, so that it can be said with a degree of certainty that an effect exists between two variables that is not just variance related to other potentially impactful variables. Overall, based on an examination of determinants of externalizing difficulties in preschoolers, only maternal ACEs were a significant predictor of child externalizing problems in the current thesis. Child SR did not explain the relationships between maternal ACEs and child externalizing difficulties in the current data.

Determinants of Child Internalizing Difficulties

Previous research has indicated that maternal ACEs and child SR are both related to child internalizing difficulties. A number of recent studies have suggested that maternal ACEs predict child internalizing difficulties among young children both directly (Fredland et al., 2018; McDonald et al., 2019) and indirectly (Cooke et al., 2019; Letourneau et al., 2019; Treat et al., 2019). Stepleton et al. (2018) demonstrated that this effect can persist over the course of childhood, as they found no differences by age among 1.5 to 18-year-olds. Likewise, child SR has also been linked to internalizing difficulties, but results in this area have been more inconsistent. Broadly, several studies

have shown that there is a link between early childhood SR and internalizing difficulties (for a review, see Compas et al., 2017), although Eisenberg and colleagues (2010) have noted that results appear inconsistent until later childhood, at which point child SR appears to be inversely linked with internalizing difficulties. Consistent with this view, although there are several studies indicating that concerns with regulatory ability are associated with internalizing difficulties among older children (Cunningham, Kliewer, & Garner, 2009; Dunsmore, Booker, & Ollendick, 2013; El-Sheikh, 2001; Jin, Zhang, & Han, 2017; Kim & Cicchetti, 2010), there are substantially fewer studies demonstrating this link among younger children (Dennis et al., 2007; Murray & Kochanska, 2002). Further, Eisenberg et al. (2017) have emphasized that externalizing and internalizing difficulties may be related to different aspects of SR, which may account for some of the inconsistency in results. While acknowledging the state of the literature, a mediation model was explored in the current data to determine whether child SR would explain the relation between maternal ACEs and child internalizing difficulties. Main effects were also examined.

In order to examine the hypotheses, a model testing child SR as a mediator in the relationship between maternal ACEs and child internalizing difficulties was assessed. This model demonstrated excellent fit. Results indicated that the indirect effect was small and not significant, suggesting that there was no evidence that child SR explained the relationship between maternal ACEs and child internalizing difficulties in the current data. In contrast to the mediation models assessed above, it appears clear that the current indirect effect is so small that it is essentially nonexistent. Given that any non-zero effect will have adequate power at a certain sample size, the current model would require 5000 participants in order to have sufficient power. However, there is room to argue that this

effect is non-zero essentially by chance, because few if any effect sizes are absolutely zero, and that this result points to a probable lack of effect. If one wanted to discuss practical significance in this case, the effect is so miniscule that the practical effect is also likely to be nil.

Previous research has often found that the link between maternal ACEs and child internalizing difficulties requires a mediator and is not significant as a direct effect (Cooke et al., 2019; Letourneau et al., 2019; Treat et al., 2019). In attempts to understand similar models, researchers have found that several maternal variables function as mediators in the relationship between maternal ACEs and child internalizing behaviours, including parenting efficacy (Treat et al., 2019), maternal depression and anxiety (Letourneau et al., 2019), and maternal attachment avoidance, attachment anxiety, and depression (Cooke et al., 2019). As such, no studies were identified that attempted to examine a child variable as a mediator in this relationship. Currently, there is more evidence for maternal variables explaining the relation between maternal ACEs and child internalizing difficulties than any child variables. I had hypothesized that child SR could help to explain this relationship because it is a foundational milestone in development that may causally impact a child's well-being, including internalizing problems. However, the data did not bear this out.

As a follow-up, the impact of maternal ACEs on child internalizing difficulties was examined. Contrary with hypotheses, this effect was not significant, indicating that mothers who reported greater childhood adversity were no more likely to also report that their children had greater difficulty with internalizing behaviours, after accounting for child receptive vocabulary, maternal depression, and total family income. Notably, post hoc analyses revealed that when this effect was examined without covariates, it was

significant, and maternal ACEs were positively associated with internalizing difficulties among children. Although past studies have examined variables associated with socioeconomic status as covariates (Cooke et al., 2019; Letourneau et al., 2019; Stepleton et al., 2018), no studies found in the current literature search utilized either maternal depression or child receptive vocabulary. In fact, some studies did not appear to control for any covariates, including socioeconomic variables (Fredland et al., 2018; Treat et al., 2019). Although it is useful when an area of research is in its infancy to establish a relationship between two variables, examination of the intergenerational impact of adversity is complex and requires a number of control variables in order for effects to be valid and reliable. In the current study, controlling for relevant covariates meant that the relationship between maternal ACEs and child internalizing difficulties was no longer significant, because of the variance explained by the covariates. As such, it cannot be said with certainty that it is maternal ACEs that are impacting children, rather than some or all of the relevant covariates.

Lastly, the relationship between child SR and internalizing difficulties was examined to determine whether results were in line with hypotheses based on the literature. Using data from the mediation model that included maternal depression and total family income as covariates, it was determined that child SR was not significantly related to internalizing difficulties. As such, children who had more difficulties with SR were no more likely to have mothers report that they also had difficulty with internalizing problems. Despite being inconsistent with some past findings (Compas et al., 2017; Dennis et al., 2007; Murray & Kochanska, 2002), this result is less surprising given that prominent researchers have noted that the link between SR and internalizing difficulties appears less consistent overall than the link between SR and externalizing difficulties

(Eisenberg et al., 2017, 2010). Eisenberg et al. (2017) have posited that SR is differentially related to externalizing and internalizing difficulties based on the particular aspect of SR that was involved. This may explain why different results are sometimes found for internalizing and externalizing difficulties, especially for young children.

Combined, based on the inconsistency in the literature regarding SR and internalizing difficulties, it is perhaps not surprising that the mediation model overall and the main effect specifically examining child SR and internalizing difficulties were both not significant in this study. What is conceivably more notable is that maternal ACEs did not predict internalizing difficulties, despite recent research frequently identifying this effect. As mentioned above, however, maternal ACEs are often indirectly related to maternal ACEs, which may explain the lack of direct effect found in the current study. It is also worth considering whether child SR is acting as a "double-edged sword" for some children; that is, whether children who are very high in SR, and thus overcontrolled, are perhaps experiencing more internalizing difficulties overall.

Paternal Sub-study

Until recently, developmental studies that have included fathers have been relatively uncommon, and studies focused on the impact of fathers in particular have been even rarer. Fathers have most often not even been asked to participate (Davison et al., 2017). Although this is beginning to change, a gap remains in our knowledge of the impact that fathers have on children, relative to the impact of mothers. As such, father participation was viewed as a priority in the current study, and 51 fathers or step-fathers opted to complete the sub-study.

This sub-study was designed to extend previous work examining the impact of fathers on child regulatory outcomes. As previously suggested, limited work has been done in this area. Some studies have suggested that fathers' parenting styles, including intrusive and controlling interactions with their young children, which may be indicative of paternal SR difficulties, are associated with child difficulties with various regulatory tasks (Meuwiseen & Carlson, 2015; Owen et al., 2013; Stevenson & Crnic, 2013). Overall, when mothers and fathers were compared, the results have been mixed. Some studies demonstrated that mothers and fathers have a similar impact on child regulatory ability (Bridges et al., 1997; Diener et al., 2002), whereas others indicated that mothers are more important (Bariola et al., 2012; Doan et al., 2018). Recently, a single study showed that both mothers' and fathers' ER difficulties uniquely predicted adolescents' ER and lability, indicating that mothers and fathers offer an important and distinctive contribution (Li et al., 2019). In general, results have not been consistent across studies with regard to the importance of fathers on children's regulatory outcomes, especially when fathers are compared with mothers. I sought to clarify this work for fathers and preschoolers.

The first hypothesis focused on how paternal ER difficulties were related to child SR. Similar to the maternal data, the current study found no evidence of a relationship between paternal ER and child SR, in contrast with past research that has included fathers. With regard to the DERS, it is important to remember the caveats regarding statistical and theoretical issues mentioned in the maternal section (e.g., Lee et al., 2016). For example, it is possible that use of the DERS total score for the paternal data led to less clear results regarding paternal ER here.

Second, it was hypothesized that paternal difficulties with SR would be negatively associated with child SR ability. Results provided support for this hypothesis, even after accounting for the impact of total family income. This suggests that fathers who reported more difficulty managing emotions and behavioural responses were more likely to have children who demonstrated difficulty with SR during behavioural tasks. In general, it is possible that the BRIEF subscale measuring SR was more closely aligned to SR as measured in children in the current study than the DERS measure of ER difficulties, given that the DERS was unrelated to child SR for both parents. As mentioned above, past studies have tended to focus on the same specific variable in parents and children, though there have been exceptions (Bridgett et al., 2015). Overall, the current study represents the first known finding linking paternal and preschooler SR, and this finding supports the limited work that has been done indicating that fathers have an important impact on children's development of regulatory abilities.

Lastly, I compared the impact of mothers' versus fathers' regulatory abilities in predicting children's SR, specifically aiming to explore whether fathers had an impact on children's SR after controlling for the impact of mothers. Because it was important to use the same measure for both parents, the DERS was used, and parental ER difficulties were examined in relation to child SR. Results indicated that fathers' ER did not significantly predict child SR after accounting for mothers' ER. Perhaps more importantly, neither mothers' nor fathers' ER scores were significantly associated with child SR. As such, the current data provides little information that would allow clarification about the relative importance of fathers for the development of SR in children. In general, sample size for the paternal sub-study was substantially lower than for the main maternal study, and this likely impacted power.

It is important to be mindful that the families with fathers who opted to complete the sub-study were not statistically equivalent to the families with fathers who did not complete the sub-study. In particular, fathers who completed the study came from families in which maternal ACEs were lower. Thus, the finding that paternal SR predicted child SR may not be generalizable to all families, including those wherein mothers experienced greater childhood adversity. Further research and larger sample sizes will be necessary in order to examine the impact of fathers on child SR more thoroughly.

Strengths and Limitations

This study was designed to fill a gap in the literature regarding the connections between several key variables related to SR in preschoolers. It tested models supported by the existing literature in order to determine factors that may predict SR and investigate how SR may be related to child well-being more generally. Three unique mediation models were tested based on theoretically defined relationships among variables. Use of multiple measures of SR and latent models in the mediation models is consistent with recommendations in the literature with regard to providing stable estimates of SR over the course of development (Bridgett et al., 2015; Kochanska et al., 2000; Sulik et al., 2016). Although the current mediation models were not statistically significant, results were followed up with power analyses to determine the number of people that would need to be included in order to have adequate power to detect such effects. Power analyses also provide a sense of the size of the effect being measured, and whether this is likely to be an effect that is significant in a practical manner. All of these approaches to study design and statistics are consistent with best practices for hypothesis testing and for dealing with complex developmental data.

More generally, the approach to SR utilized in the current study is consistent with calls for greater theoretical and methodological integration across different approaches to studying SR (Blair & Ursache, 2011; Bridgett et al., 2015, 2013; Sulik et al., 2016). As mentioned in the literature review, the fields of EC and EF had previously remained distinct, though there have been recent efforts to combine these fields for a more unified approach to SR. The current study combined several measures of SR, including ones that stemmed from approaches consistent with EC and EF, which allowed for integration across these previously disparate areas. As well, the current study gave fathers the opportunity to participate in developmental research about their children and more than half of the fathers asked decided to participate. This is especially important given the finding that the primary reason fathers do not participate in research is that they have not been asked (Davison et al., 2017). Overall, the integrative theoretical and methodological approach to SR and the inclusion of fathers extend previous work and are considerable strengths of the current research study.

Limitations include sample size and the cross-sectional nature of the study. The longitudinal nature of the overarching project associated with the current data placed a limit on the number of participants available for contact and analyses. In addition, although this project was a part of a longitudinal study, the data included in the current thesis can be considered cross-sectional, which limits the ability to make causal inferences. The one exception was that the measures related to maternal ACEs were collected at the first longitudinal study visit when children were approximately three months old. However, given that these are retrospective data, the point at which they are collected should be unlikely to change the outcome. Consistent with this view, test-retest data of the CTQ appear adequate (Bernstein & Fink, 1998), and a recent study has

indicated that among postpartum mothers, CTQ results taken from prior to pregnancy and followed-up up to five years later typically demonstrate moderate to substantial test-retest reliability (Cammack et al., 2016). Combined, these data suggest that maternal responses to the measures associated with the ACEs variable are likely to be consistent over time. As such, although the current study does not perfectly fit the description of either a cross-sectional or longitudinal design, it is likely most correctly interpreted as a cross-sectional study, and includes all of the associated limitations. The cross-sectional nature of the current study represents a limitation according to recommendations made by developmental researchers focused on SR, who frequently emphasize the importance of longitudinal research (Blair & Ursache, 2011; Bridgett et al., 2015; Schoemaker et al., 2013).

Second, although multiple measures of child SR were utilized in the current study, even more measures could have been included. Substantive studies of SR often include upwards of 10 measures (e.g., Kochanska et al., 2000; Willoughby et al., 2017). The current study included a fourth measure of SR—the Transparent Box (TB) task—that ended up not being used in subsequent analyses because it did not appear to fit with the remaining tasks based on correlations and results of the CFA for the measurement model for child SR. Although this result is consistent with past work indicating that a frustrating task may not be correlated with an array of tasks theorized to represent SR among young children (Kochanska et al., 1996), there have been other studies in which a frustrating task has been utilized as an aspect of SR (Binion & Zalewski, 2018; Dennis, 2006; Spinrad et al., 2007). It is not totally clear why a frustrating task did not fit well with the current study's conceptualization of SR, but it is suspected that the TB task was too

dissimilar to the remaining three tasks. Perhaps if a wider array of tasks had been used, the TB task may have fit in better because of a broader definition of SR.

Third, the issues related to the construction of the maternal ER variable were a limitation. As described above, the DERS factor structure has been questioned by a number of researchers in the past decade (Kökönyei et al., 2014; Lee et al., 2016; Neumann et al., 2010; Perez et al., 2012). In the current study, adequate fit of the CFA of the measurement model was only obtained after including cross-loadings and a covariate, and comparison across structural models of the mediation models indicated that there may be statistical issues with the DERS for the maternal data. A wider array of measures of ER and/or SR for mothers could have been used, perhaps even including behavioural measures. Data from the ERQ was also collected and not subsequently used because of poor fit with the CFA focused on the DERS. Overall, the maternal ER variable (and likely the paternal ER variable as well) is a limitation of the current study.

On a related note, the current study might have been improved by having mothers and fathers do all of the same measures. Although there was overlap in many of the measures, fathers completed the BRIEF-A whereas mothers did not. The subscale on the BRIEF-A used in the current study (i.e., the BRI) significantly predicted child SR ability; if mothers had also completed this measure, it would have provided greater information about the impact of mothers versus fathers. Given questions raised about the DERS, it is debatable whether this was a suitable measure of ER for both parents in the current study. Even when looking at the level of correlations, the maternal DERS was uncorrelated with child SR and maternal ACEs, and the paternal DERS was uncorrelated with child SR, which are surprising results in comparison to previous studies. Notably, maternal DERS scores were correlated with child externalizing and internalizing difficulties, and maternal

depression scores, which is consistent with the literature. However, it is worth highlighting that all of these measures were completed by the mothers and, therefore, potentially tap common method variance. Suggested best practices include utilizing multiple measures of the same constructs, especially multiple measures of different types (e.g., paper-and-pencil questionnaires and observed measures; Maruyama & Ryan, 2014). It would have been valuable to have multiple measures of the maternal factors, though practical limitations made this impossible. In addition, given the important impact of maternal ACEs in the current study, it would have been valuable to have paternal ACE data to determine whether fathers' adversity was as impactful on children as that of mothers.

The manner in which the maternal ACEs variable was measured is also likely a limitation of the current work. A count of ACEs was completed based on information taken from two different measures (i.e., the CTQ and the NCS-R), rather than the ACE Study Questionnaire. As a result, only seven out of a possible ten ACEs were accounted for in the current study, which may mean that the current study underestimates the impact of maternal ACEs. As well, use of the ACE Study Questionnaire has become relatively standard in research focused on ACEs and it is difficult to determine the impact of using a less standardized method (i.e., the combination of two measures), despite each of the two measures being well validated individually. Despite these concerns, results indicated that maternal ACEs were an important predictor of child outcomes, which replicates previous findings related to child externalizing difficulties specifically.

More broadly, one limitation of developmental research examining the impact of mothers and fathers is that it focuses on traditional and heteronormative ideas of what a family looks like. Although it is true that, as a field, we have less information about the

impact of fathers than mothers, we know even less about families who do not fit the mold of two parental figures who are male and female. Unfortunately, this is a limitation that is not easily rectified given that examination of all types of family structures and potential parental relationship paradigms would require significantly greater sample size than is typical in many developmental studies. Arguably, it is still worthwhile to acknowledge an awareness of bias within research.

Implications

The results indicate that maternal ACEs are an important predictor of both SR and externalizing difficulties among preschool-aged offspring. Although this is correlational rather than causal, where they occur, maternal ACEs are necessarily antecedent to a child's behavioural development, and the results fit with theoretical impacts of maternal childhood adversity. As the results held even after controlling for important covariates, maternal ACEs represent an important risk factor for children's development and well-being. As such, the presence of maternal ACEs may offer a point of intervention for families with young children. When researchers and practitioners consider the potential negative sequelae associated with ACEs, recommendations are often quickly offered regarding the importance of screening for ACEs (e.g., Watson, 2019). However, scientists have recently cautioned against routinely screening for ACEs because of lack of certainty about the costs and benefits associated with doing so (Finkelhor, 2018; Ford et al., 2019; McLennan et al., 2019). At present, there is simply not enough research associated with the impact of doing such screening. There are issues related to the impact of false positives, as well as the impact of screening when a suitable intervention is not available or even known.

The current study provides important information about a specific risk factor, maternal ACEs, that can increase the probability of children having problems with SR and externalizing difficulties. Given that the repercussions for child development can be relatively stable and persistent (e.g., Casey et al., 2011; Korhonen et al., 2018; Miettunen et al., 2014; Mischel et al., 1988), maternal ACEs are a risk factor that is certainly worthy of further research. As such, more cost-effective and efficacious intervention research for families with elevated maternal ACEs and subsequent child difficulties with SR and externalizing problems is needed. Preliminary studies of parental interventions are underway (e.g., Woods-Jaeger, Cho, Sexton, Slagel, & Goggin, 2018). The field also requires considerably more research about when and how maternal ACEs cause a negative impact on children. Once this area of research is more advanced, strategies to mitigate risk associated with maternal ACEs and bolster factors associated with resilience will be more likely to be discovered.

Although it is important not to over-interpret null results, especially in the case of a limited sample size, the current study provides some information about potential mechanisms that are unlikely to be related to the outcomes studied. Given the methodological issues involved with the maternal ER variable, it is difficult to say with certainty that maternal ER does not mediate the relationship between maternal ACEs and child SR, so this relationship will need to be re-examined in future studies. As well, given that there are relationships between maternal ACEs and child SR, between maternal ACEs and child externalizing difficulties, and between child SR and externalizing difficulties when covariates are not included, this area merits continued investigation. However, given all of the statistical and theoretical information included in the current

study, it appears more likely that child SR does not explain the relationship between maternal ACEs and child internalizing difficulties.

Lastly, despite having a very limited sample size, the current study found evidence linking fathers' abilities to manage emotion and behaviour to child SR. Studies including fathers have been slowly accumulating in the developmental literature over the past few decades, and the present study makes a contribution. Previous research has linked paternal parenting styles with child regulatory difficulties, and has shown specific links between paternal and child ER. However, this study is the first to examine SR more broadly and demonstrate that fathers may impact their offspring directly. What remains to be determined is how mothers and fathers may differentially impact children's development of SR, and future research should attempt to clarify this question. Other developmental fields have demonstrated that mothers and fathers are likely to impact their children differently. For example, fathers who challenge and play with their children who are high in social anxiety may provide a protective effect in terms of reduced anxiety, whereas mothers who care for and protect their children are more likely to have a positive impact on children (Bögels & Phares, 2008; Bögels, Stevens, & Majdandžič, 2011). As such, it is possible that mothers and fathers each impact child SR in a unique manner, and continued exploration of these constructs will be useful as we come to understand how children develop in the context of their families.

Future Directions

In addition to the future directions that are woven throughout the narrative above, there are a few remaining specific recommendations for future research that should be addressed. First, continued examination of the complex intergenerational processes that

impact child development of SR and factors related to psychopathology, including externalizing and internalizing difficulties, should be prioritized. As mentioned, it appears that maternal ACEs are important in terms of child outcomes, and future investigations should aspire to include paternal ACE data as well. As fathers have often not even been asked to participate in past research (Davison et al., 2017), it is a worthwhile pursuit to try to determine how the adversity experienced by fathers may impact their children.

Complex statistical models that are required to test intergenerational relationships require substantial sample sizes in order to be adequately powered and reliable. This will continue to be a logistical and financial challenge in developmental research. Future research may need to rely on meta-analyses or collaborations in order to combine effects and create adequate sample sizes to examine the relationships between variables.

Importantly, intergenerational studies allow us to more thoroughly examine factors that mediate, or help to explain, the impact of maternal ACEs on outcomes for children, as well as factors that moderate, or potentially buffer, the impact of maternal ACEs on children. The current study failed to identify any of these mediating factors, though there are many fruitful areas yet to be explored. Many of the studies completed thus far have focused on maternal factors that likely increase risk for children (e.g., maternal depression). However, at least one study found that parenting efficacy mediated the relationship between maternal ACEs and child social and emotional problems, and greater parenting efficacy was associated with reduced child difficulties (Treat et al., 2019). This preliminary work appears consistent with previous research that has emphasized that the impact of trauma and stress is variable and appears to impact some individuals more than others (e.g., Nurius, Green, Logan-Greene, & Borja, 2015; Seery, Holman, & Silver, 2010; Vollrath, 2001), which can be extended to the intergenerational

impact of trauma as well. Studies of children of Holocaust survivors, for example, have indicated that offspring appear more impacted when there is a cumulative effect of trauma over the course of the offspring's lifetime (Van IJzendoorn, Bakermans-Kranenburg, & Sagi-Schwartz, 2003). Though there are many variables that are likely to support resilience and adaptation in response to maternal adversity, future studies should examine whether maternal or child SR act in a protective manner. A recent review supports this view and found that several previous studies have indicated that child ER ability may function as a protective factor for children, even in the context of significant adversity (Daniel, Abdel-Baki, & Hall, 2020). Focusing on factors that support better functioning for parents and children, even in the context of parental ACEs, should continue to be a priority in terms of future research. Subsequently, well-designed intervention studies with control groups will be required in order to determine whether providing support related to these factors, or alleviating risk factors, actually improves outcomes for families.

Although the impact of maternal ACEs on child outcomes has traditionally been thought of in terms of how parenting is altered based on ACEs, recent evidence indicates that the inclusion of more biological data is necessary. A recent study found structural differences in brain anatomy among newborn babies who were born to mothers who experienced childhood maltreatment (Moog et al., 2018). The authors suggested that this result indicates that brain changes are happening prior to birth, and thus are not solely related to the social environment in which children are parented. Another recent study indicated that differences in brain activity may explain which children are more at risk of behavioural problems when they have mothers who report experiences consistent with ACEs. Specifically, frontal asymmetry, as measured by electroencephalography (EEG), indicated that five-year-old children with more right and less left frontal activity were

more at risk of behavioural problems when their mothers had been exposed to childhood trauma (van de Ven et al., 2019). These studies suggest that there is likely a biological component involved in the intergenerational link between maternal ACEs and child outcomes. It may also be worthwhile to explore the impact of biological fathers' ACEs on children's outcomes, and this is an area that has yet to be examined. As such, future research will need to include measures that can help us clarify these mechanisms. It appears likely that both biology and environment are important factors related to child development in the context of parental ACEs, and the most informative studies will likely include information about both.

Conclusions

The purpose of the present study was to investigate preschooler SR, including potential causal factors, such as maternal ACEs, maternal ER, and paternal regulatory variables, and to examine how SR may be related to child well-being, including externalizing and internalizing difficulties. This is the first known study attempting to look at these specific variables together, and to create cohesive, theory-driven models. In general, there was no support found for the mediation models proposed, but some main effects were statistically and practically significant. Maternal ACEs were identified as an important predictor of both child SR and externalizing difficulties. As well, paternal SR significantly predicted child SR in the subsample of families who completed paternal data. This study adds to the existing literature concerning determinants of SR and externalizing difficulties among preschool-aged children. As well, this study represents a significant preliminary step in further clarifying the importance of maternal ACEs for child development and well-being.

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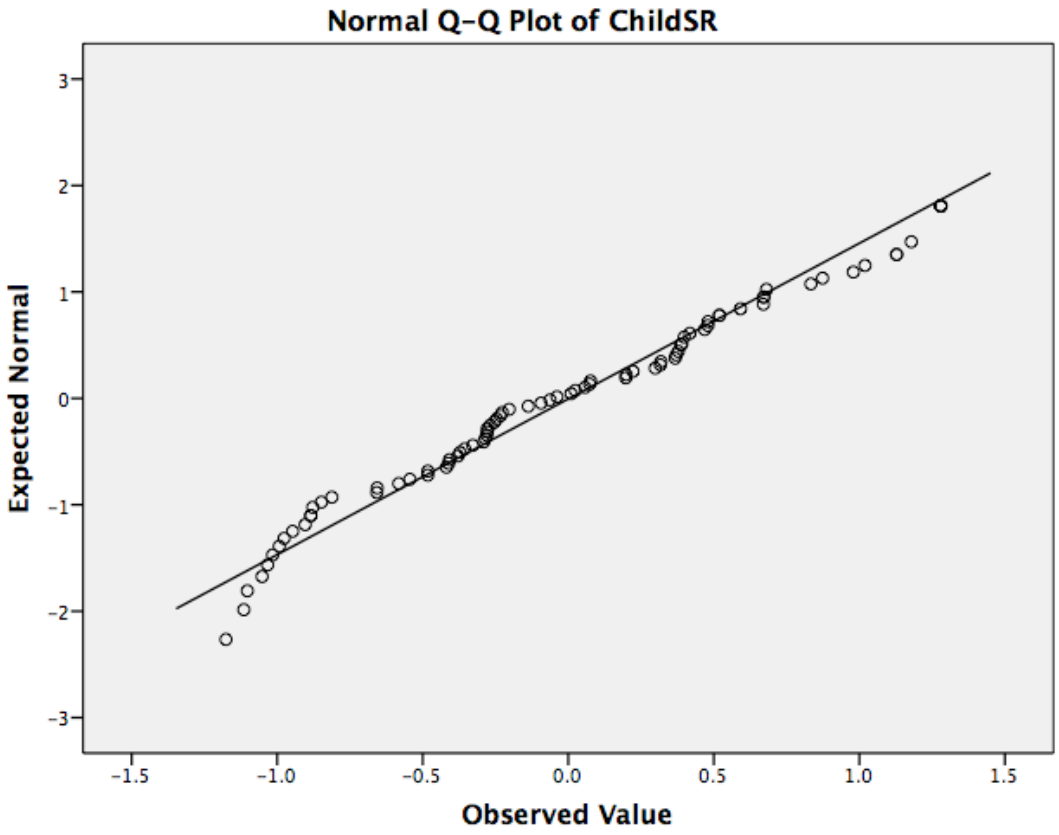
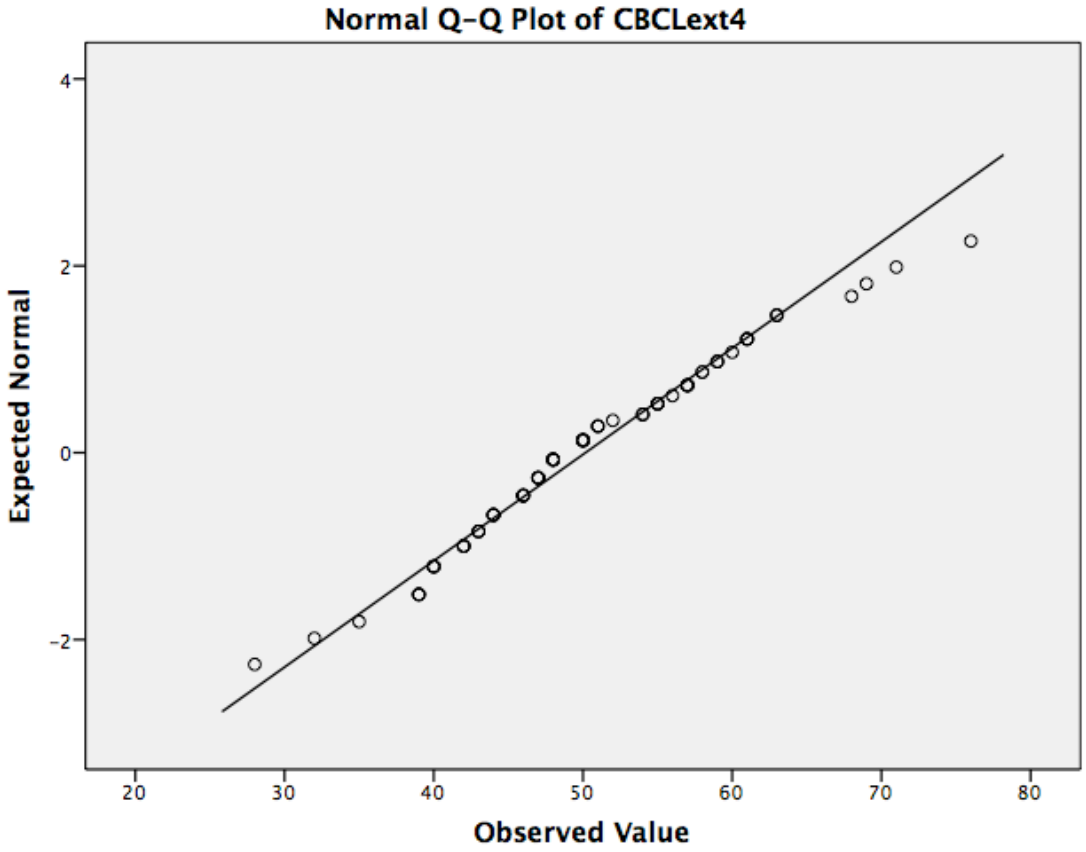
APPENDIX

Q-Q Plot for the child SR composite variable



Q-Q Plot for CBCL externalizing difficulties variable



Q-Q Plot for CBCL internalizing difficulties variable