Beyond the Child: Associations of Children's and Parents' Executive Functioning and ADHD Traits with Parenting Stress and Family Dysfunction

by

Ami Rints

A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirements for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada, 2025

Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Maria Rogers, Ph.D. Associate Professor Carleton University
Supervisor	Elizabeth Nilsen, Ph.D. Professor University of Waterloo
Internal Members	Uzma Rehman, Ph.D. Associate Professor University of Waterloo
	Jonathan Oakman, Ph.D. Associate Professor University of Waterloo
Internal External Member	Martin Cooke, Ph.D. Professor University of Waterloo

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Executive functioning, and its associated behavioural correlates of Attention-Deficit/Hyperactivity Disorder (ADHD) traits, have been associated with a number of aspects of psychosocial functioning for both children and adults. Previous work has focused largely on the associations of children's executive functioning and ADHD traits with psychosocial variables within the family unit – namely parenting stress (an individual-level factor) and general family dysfunction (a family-level factor). In contrast, the influence of parents' executive functioning and ADHD traits, and the interaction of children and parent factors, have received less attention in the research literature in predicting these psychosocial variables. Methodological limitations of the extant literature also included a relative reliance on questionnaire-report of executive functioning, leaving open questions about whether associations between executive functioning and psychosocial variables were based on true underlying deficits in executive functioning (as tapped by performance-based measures), or rather difficulties in the application of executive functioning skills in the daily context (reflected in questionnaire-based measures). Moreover, to my knowledge no work in the executive functioning literature had explored possible differences in these associations across children's developmental stages, nor had previous work focused on using non-clinical samples to allow for increased generalizability of results (with most existing work having occurred within clinical populations).

The overarching goal of my dissertation was to address these gaps by exploring associations between parents'/children's executive functioning (including both performance- and questionnaire-based measures) and ADHD traits, and psychosocial factors within non-clinically recruited families. Studies conducted with three samples were used to address these research goals. Parents of children aged 3 to 5 years (preschool-aged online sample; $N = 93$), 6 to 17 years (school-

aged online sample; $N = 113$), and 8 to 17 years (school-aged community sample; $N = 52$) were recruited.

Through completion of parent-report questionnaires (all samples), as well as computerized measures of various aspects of executive functioning (community sample), a number of findings emerged. First, weaker executive functioning in children (online preschool-aged and school-aged children) and parents (questionnaire-based; all samples), as well as a smaller working memory capacity in mothers (computer-based; school-aged community sample), were associated with higher self-reported parenting stress. The association between executive functioning and parenting stress held even after controlling for parents' general stress levels, providing evidence that this association pertains uniquely to stress associated with the parenting role. While there was limited evidence of any interaction effects between children's and parents' (questionnaire-based) executive functioning, preliminary findings from the preschool-aged online sample suggested that parents experience higher levels of parenting stress if their own executive functioning is weaker; however, if their own executive functioning is stronger, they will still experience elevated parenting stress if their child has weaker executive functioning. Second, analyses revealed that it was traits of ADHD in parents – and not their children – that were associated with parenting stress, further highlighting the importance of parent-level factors in understanding parenting stress. Third, and with respect to general family dysfunction, a different picture emerged such that this variable was primarily associated with parent-level factors including their executive functioning and ADHD traits. No evidence emerged for an association of children's executive functioning or ADHD traits with general family dysfunction. Although not a primary focus, evidence across analyses exploring both aspects of psychosocial functioning also emerged to suggest that higher levels of children's aggression was associated with worse psychosocial functioning within families. There was no

evidence to suggest that associations between executive functioning and either psychosocial variable differed based on children's developmental level. Taken together, these results have important theoretical and applied implications related to assessment methodology and understanding psychosocial functioning within families in both research and clinical settings.

Acknowledgements

This has been a very long journey filled with support and encouragement from so many people to whom I feel an incredible amount of gratitude. To the Clinical Psychology division and particularly my cohort mates who helped me learn how to be a graduate student (and to Jasmine who continued to encourage from afar long after graduation). To my amazing friends who took care of me in practical and emotional ways when it all felt too much or when I simply needed a distraction. To my work family with their constant offers of all kinds of support and reminders I can "take a hit." To Allie who made sure I could always rest easy for long stretches away from the barn knowing she was loving my horses like her own. To Teigan whose unwavering friendship, care packages and caffeine, and (at times forceful) insistence on self-care kept me going. To my mother and step-father who were always in my corner. To Jim without whom I may never have embarked upon the graduate school journey at all. And to Matthew, who came in at just the right time with his incredible understanding, care, and laughter. Thank you.

I would also like to extend my sincerest thank you to the supports at AccessAbility Services. While some faces have come and gone, Jennifer has been a consistent support and I am very appreciative of her reminders to go one step at a time and remember to breathe. I am also forever grateful to the support and invaluable guidance of my committee members. To Uzma who has been with me from the beginning with her kind, practical, and thoughtful feedback; to Dillon who provided insights that helped to shape the overall path of this thesis in an important way; and to Jonathan who stepped in with his careful review and statistical expertise. Thank you. And finally, to my supervisor, Liz – who managed to keep believing in me even when I am not sure I was able to believe in myself – this would not have happened without you and thank you does not come close.

Table of Contents

List of Figures

List of Tables

Chapter 1: General Introduction

Well-developed executive functioning is a foundational cognitive process (Miyake et al., 2000) that is associated with a broad range of important outcomes for individuals. These include, but are not limited to, improved social factors such as better communication and greater social competency (Bernier et al., 2010; Diamond, 2013; Miyake & Friedman, 2012). Research has begun to explore how executive functioning in individuals may be associated with interpersonal dynamics within families (e.g., Joyner et al., 2009; Savci et al., 2023), although less is known about these broader implications making this an important area for further research.

Two key areas need clarification. First, a particular limitation of the extant literature is that it has at times focused on the executive functioning of individuals, without simultaneously considering the executive functioning of other family members, or how the executive functioning of individuals may interact in contributing to various aspects of familial functioning. Second, it is important to note that executive functioning deficits may be more prevalent in individuals within certain populations including those with Attention-Deficit/Hyperactivity Disorder (ADHD; Willcutt et al., 2005). Resultantly, it can be difficult to ascertain whether psychosocial effects within this population may be associated more with executive functioning deficits or with the broader behavioural phenotype of this disorder. As such, an important goal for research is to parse out differences in associations between each of these respective factors and the various psychosocial factors that occur within families.

Parenting stress is one psychosocial aspect of particular interest when considering the possible role of executive functioning within families. Parenting stress is broadly defined as the stress that results when parents do not perceive themselves as having adequate resources to manage the demands of parenting (see Deater-Deckard, 2004). Importantly, the experience of stress,

including parenting stress, has a broad range of physical and psychological health consequences (DeLongis et al., 1988; Lupien et al., 2009; National Institute of Mental Health, n.d.). More specifically, parenting stress has been associated with higher rates of maternal psychopathology (e.g., Anastopoulos et al., 1992), as well as an increase in physically abusive (e.g., Whipple & Webster-Stratton, 1991) and negligent (see Morgan et al., 2002) parenting behaviours. Although correlational, such research suggests that parenting stress may have important implications for both individual and familial well-being making this an area of research with both applied and theoretical implications.

Looking more broadly at the overall well-being of the family unit, general family functioning is a second psychosocial factor of interest and refers to the manner in which the biological, psychological, and social functioning of the individual members of a family are influenced by others and their interactions within the family unit (Epstein et al., 1978). Some evidence exists to suggest that better executive functioning of individuals may predict better family functioning in clinical populations including ADHD (Downes et al., 2019; Hébert et al., 2021). Research has also indicated that better family functioning may buffer against the deleterious effects of mental illness within families, for example, by lessening the impact of parental mental illness on children's development (Wiegand-Grefe et al., 2019). To the extent that research allows us to better understand factors that may predict parenting stress and general family dysfunction, we may be better positioned to develop interventions to mitigate the risk of negative outcomes within families. Importantly, certain populations are at an elevated risk of experiencing difficulties in their psychosocial functioning including families in which neurodivergence exists (Theule et al., 2013).

The overarching aim of my program of research was to further explore factors which may contribute to elevated parenting stress levels and poorer family functioning for some families. An

important addition to the extant literature, my research explored the executive functioning and ADHD symptomatology of both children *and* their parents vis-à-vis their associations with these psychosocial factors (Deater-Deckard, 2014; Schei et al., 2016). In doing so, I endeavoured to address important methodological limitations of the extant research which have included an emphasis on exploring the associations between *child*-level factors and these psychosocial factors of interest, as well as expanding beyond reliance on questionnaire-based measures of executive functioning (Deater-Deckard, 2014) to also consider performance-based measures of these cognitive processes (McAuley et al., 2010; Toplak et al., 2013). With respect to ADHD symptomatology, my work considered behavioural *traits* of ADHD as falling along a continuum of normal behaviour, as are present to varying degrees within members of the population, while drawing upon research referencing clinical populations to provide background context for my work. Previous research has indicated a dimensional latent structure for ADHD, including symptoms of inattention and hyperactivity/impulsivity, in part because this conceptualization best captures developmental processes observed in the emergence of these symptoms, as well as correlating more significantly with associated features of ADHD including comorbid behavioural challenges (Marcus & Berry, 2011; Cuthbert, 2022). This dimensional approach is also in keeping with the position of the Research Domain Criteria (RDoC), a framework for understanding psychopathology put forth by the National Institute of Mental Health. Within this framework, "Constructs are regarded from a dimensional perspective that covers the full range from normality to varying degrees of dysfunction so as to explicate transitions from healthy to increasingly abnormal performance" (Cuthbert, 2022, p. 3).

In this first chapter, I will review background information that provides a foundation for my program of research. The next chapter will provide the methodology of three studies which

explored the association between parents' and children's executive functioning and traits of ADHD with measures of parenting stress and general family functioning. The empirical findings of my research will be presented in a chapter exploring preliminary associations between the variables of interest in the study samples, as well as five subsequent chapters corresponding to the research questions of interest to my program of research (detailed elsewhere in this thesis). In the final chapter, I provide a general discussion of the overall findings of my program of research, including a discussion of its limitations as well as the implications of my work.

The review within this chapter begins with an exploration of executive functioning, including its definition and structure, measurement issues, and associated familial and clinical considerations. I then discuss parenting stress and general family functioning, in turn, as variables of interest with respect to psychosocial functioning within families. Models of each are provided, as well as factors associated with each including reviews of the literature exploring parenting stress and general family functioning in relation to executive functioning and ADHD variables. The introduction then concludes with a more detailed overview of the aims of my program of research, as well as an outline of the additional sections of this thesis.

Of note, much of the research reviewed in the following discussion, as well as my own program of research, is cross-sectional in nature. As such, neither causality nor the direction of effects can be inferred – for example, whether parenting stress is caused by or results from deficits in executive functioning. While the extant literature is presented at times as stated by the original researchers, I am making no assumptions about directionality or causality in my interpretations of research findings, with the exception of when a longitudinal approach was taken which would allow for such inferences. Moreover, some authors have argued for and/or represented their research in a manner suggestive of a bidirectionality of effects, given the complex interplay of

individual functioning within the family unit. This bidirectionality is reflected in my summarization of the relevant research such that at times the research may reflect, for example, that children's factors influence family outcomes which may then influence children's factors, in turn.

Executive Functions: Definitions, Components, and Structure

Definitions of Executive Functioning

Broadly construed, executive functions are a set of interrelated cognitive skills that facilitate purposeful, goal-directed behaviour (Lezak, 1982) through acting as "general-purpose control mechanisms that modulate the operation of various cognitive subprocesses and thereby regulate the dynamics of human cognition" (Miyake et al., 2000, p. 50; see also Miyake & Friedman, 2012). Researchers have argued that executive functions are important to study as they are a core component of self-regulation or willpower, which have been shown to have broad and significant implications for everyday lives (Miyake & Friedman, 2012). Despite well-established improvements in executive functioning over the course of childhood (see Best & Miller, 2010, for a review; Deater-Deckard, 2014), individual differences in executive functioning abilities have been found to demonstrate some developmental stability (Miyake & Friedman, 2012; Toplak et al., 2013). For example, evidence suggests that children with better executive functioning continue to have better executive functioning (relative to children who were initially assessed as having worse executive functioning) throughout the preschool years, with group differences continuing to be evident at 17 years of age (Friedman et al., 2011).

There are definitional variations in what constitutes executive functioning across researchers (Brocki & Bohlin, 2004; Jurado & Rosselli, 2007), with a number of executive functions described and explored in research including but not limited to planning, organization,

time management, and self-regulation of emotions. Arguably, however, the three most commonly explored and "foundational" executive functions are response inhibition, working memory, and shifting (Best & Miller, 2010; Jurado & Rosselli, 2007; Miyake et al., 2000; Toplak et al., 2013). As will be discussed below, these are largely considered to be interrelated but separable cognitive skills which are associated with various other more complex cognitive skills that facilitate goal-directed behaviours in school-aged and adult populations (e.g., Miyake et al., 2000; Huizinga et al., 2006; McAuley & White, 2011).

Components of Executive Functioning

Response Inhibition. While the term "inhibition" has been used within the broader literature to refer to a constellation of inhibitory processes that emerge at different stages of development (Best & Miller, 2010), "response inhibition" refers to the ability to stop prepotent but inappropriate responses (Nigg, 2000). Importantly, this refers to the *deliberate* inhibition of dominant, automatic, or prepotent responses (Miyake & Friedman, 2012; Miyake et al., 2000). The literature commonly categorizes inhibitory tasks based on the nature of their inhibitory demands (e.g., "delay" versus "conflict" tasks; Joyce at al., 2016), with one relevant dichotomization being the distinction between *simple* and *complex* forms of response inhibition. While the former refers to simply withholding a response as required (i.e., stop action), the latter refers to holding an arbitrary rule in mind and inhibiting some prepotent/other response in favour of producing some alternative response (Best & Miller, 2010; Garon et al., 2008). Simple forms of response inhibition have been observed in the latter half of the first year of life, with early indicators of conflict resolution (i.e., holding rules in mind to inhibit prepotent responses and execute a subdominant response) evident by 2 years of age (Garon et al., 2008). Changes in the development of response inhibition are believed to be most rapid during the preschool years, with more modest linear

improvements occurring throughout adolescence and into adulthood (e.g., older children demonstrate better performance than younger children on the Stop-Signal task, which requires them to inhibit a currently activated response; adults demonstrate more apparent awareness of errors on inhibitory tasks as evidenced by their slowing on trials following errors relative to adolescents) (see Best & Miller, 2010, for a review). After controlling for processing speed, certain aspects of inhibitory control (including performance on a Stroop task) are thought to mature earlier in development while others do not reach adult-like levels until after the age of 15 years (Huizinga et al., 2006).

Working Memory. Working memory is generally defined as the ability to hold and manipulate goal-relevant information in mind (Baddeley, 1992, 1996). In his multicomponent model of working memory, Baddeley defined working memory as having two subordinate systems (the phonological loop and the visuospatial sketchpad for storing verbal and visual-spatial information, respectively), along with a central control structure or "central executive" that controls/regulates cognitive processes (or executive functions). Referring more specifically to the *updating* and *monitoring* of information in working memory (rather than its storage functions), successful performance on executive functioning tasks requires that incoming information be monitored and coded for relevance to the current task with older/irrelevant information being replaced with newer/more relevant information in working memory (Morris & Jones, 1990, as cited in Miyake et al., 2000; see also Miyake & Friedman, 2012). The central executive is believed to play a coordinating role on these tasks when multiple concurrent demands are being placed on working memory (Best & Miller, 2010; Garon et al., 2008). Working memory has been viewed as the first executive functioning component to emerge, seeing evidence of simple working memory by 6 months of age, and early forms of updating and manipulating information in working memory

with coordination by the attention system apparent by 15 months of age (Garon et al., 2008). In their review, Best and Miller (2010) cite evidence to suggest that the executive component of working memory is sufficiently developed by 6 years of age to complete more complex working memory tasks, with a linear trajectory of development observed from ages 4 to 14 years (with continued refinement throughout adolescence). Even after controlling for processing speed, research has suggested that working memory improves through early adulthood (Huizinga et al., 2006).

Shifting. Another broad concept, the term "shifting" has been used in the literature to refer to shifting back and forth between various tasks, operations, or mental sets in order to achieve goals (Miyake & Friedman, 2012; Miyake et al., 2000; Monsell, 2003). Considered a subcomponent of *cognitive flexibility*, which reflects the broader ability to adjust one's behaviour appropriate to their changing environment, set shifting refers more narrowly to switching between different features of given stimuli in order to carry out some specific instructions (Dajani & Uddin, 2015). This requires disengagement from an irrelevant task set in order to actively engage in a relevant task set (Miyake et al., 2000); however, tasks may involve various combinations of different aspects of shifting including *attentional shifting* (e.g., needing to attend to changes in rules for selecting between various aspects of stimuli to which the individual should respond) and/or *task/response/intention shifting* (e.g., responding appropriately when a rule change occurs that affects the selection of a relevant motor response). "Switch costs" reflect the slowing of response times and reduced accuracy that occur when switching demands increase (Dajani & Uddin, 2015). The various aspects of shifting are thought to develop on different trajectories, with response shifting seen as a simpler form that emerges earlier in development (Garon et al., 2008). Relatedly, performance on shifting tasks is thought to be necessarily preceded by the development

of other more basic cognitive skills. More specifically, complex shifting behaviours are reliant on the ability to maintain and update mental sets based on task feedback (working memory), as well as the ability to inhibit previously activated mental sets in order to successfully shift to a new mental set (Best & Miller, 2010; Garon et al., 2008). Although some basic shifting abilities have been noted in preschoolers (i.e., with simple response sets or when demands for inhibition are reduced in the shifting tasks; Garon et al., 2008), evidence indicates that shifting may be less developed in preschoolers than the other two foundational executive functions (Best & Miller, 2010). Garon et al. (2008) also highlight the critical role of attentional control in successful completion of more complex forms of shifting. Evidence indicates that shifting abilities may reach adult-like levels around 15 years of age even after controlling for processing speed (Huizinga et al., 2006), although this is likely contingent on the measures of shifting used (e.g., looking at measures of accuracy versus reaction time, given age-related differences in speed-accuracy trade-offs with adults being more likely to slow their responses to facilitate accurate responding than adolescents; Davidson et al., 2006, as cited in Best & Miller, 2010).

Structure of Executive Functioning

Though a number of models endeavouring to explain executive functions have been put forth in the literature (see Miyake et al., 2000), the structure of executive functioning remains elusive (Jurado & Rosselli, 2007). Various unitary models (viewing executive functioning as a singular skill) and componential models (viewing executive functioning as a set of independent components) have been proposed (Best & Miller, 2010). In the past two decades, however, the integrative "unity and diversity" framework of executive functioning put forth by Miyake and colleagues (2000; updated in 2012) has received considerable attention as addressing a number of issues identified with previous modelling. Using a latent variables confirmatory factor analysis

with young adults, their analyses focused specifically on the organization of response inhibition, working memory, and shifting, as these skills are thought to be foundational to completing more complex executive functioning tasks (Miyake et al., 2000). They found evidence that the three executive functions were only moderately correlated (with correlations ranging from .42 to .63), with the best fitting model for their data suggestive of three clearly distinguishable latent variables ("diversity") which share some underlying commonality ("unity").

Expanding on their own and others' work (e.g., Dempster & Corkill, 1999, and Zacks & Hasher, 1994, as cited in Miyake et al., 2000), an updated version of their model highlights the likely central role of response inhibition in models of executive functioning. In this updated version, the authors describe a common underlying executive functioning latent variable onto which all executive functioning tasks load, as well as two "nested" latent variables on which tasks measuring working memory and shifting also loaded. No inhibition-specific factor was included in their model, as the common executive functioning variable was perfectly correlated with the inhibition latent variable (i.e., once accounting for common executive functioning, there was no unique variance remaining for an inhibition-specific factor in their sample of college students; Miyake & Friedman, 2012).

> According to our current view, common EF is about one's ability to actively maintain task goals and goal-related information and use this information to effectively bias lower-level processing. This basic ability is necessary for all three EFs and has also been suggested as a key requirement of response inhibition (Munakata et al., 2011). In contrast, we hypothesize that the shifting-specific component reflects flexibility – ease of transitioning to new task-set representations. At present, the field is less certain about what the updating-

> specific component taps, but two candidate mechanisms are effective gating of information and controlled retrieval from long-term memory. (Miyake & Friedman, 2012, p. 11)

Taken together, their final model reflected a "common" executive functioning variable (unity) and updating- and shifting-specific factors (diversity).

Developmental Considerations. In presenting their original model, Miyake and colleagues (2000) cautioned against generalization of their model of the structure of executive functioning outside of healthy college students (e.g., to younger age groups), as while they note that there is reason to assume similarities could emerge (citing, for example, that individual differences studies with developmental populations have revealed similar correlations between executive functioning tasks as they found in their sample), further research was required to ascertain the applicability of their model to different demographics. Since that time, research has emerged in support of the rough applicability of the original unity and diversity model to other age groups, including preadolescent children and older adults (Miyake & Friedman, 2012; Huizinga et al., 2006; Rose et al., 2011; Vaughan & Giovanello, 2010), although consensus remains elusive (Brocki & Bohlin, 2004; Howard et al., 2015). For example, in earlier childhood, there is less agreement about the structure of executive functioning than in later childhood through adulthood. More specifically, research has suggested that executive functioning may reflect a singular or unitary construct earlier in development (Hughes et al., 2009; Wiebe et al., 2008; Wiebe et al., 2011). Still other authors have found evidence that integration of these skills may occur as children progress through the preschool-aged period and then become separable again later in childhood; a developmental trend that the authors argued may have been obscured in different developmental studies due to collapsing of children into broad age-bands during the preschool period (Howard et al., 2015).

In an effort to summarize the results across studies, different groups have completed reviews of the development of executive functioning in children (Best & Miller, 2010; Garon et al., 2008). As previously noted, early precursors to executive functioning are observed in the first few years of life, with periods of rapid and notable improvements throughout childhood, and to a lesser extent adolescence (Brocki & Bohlin, 2004; Huizinga et al., 2006; Jurado & Rosselli, 2007; McAuley & White, 2011). Considerable developments occur prior to age 3 years, with the emergence of basic skills required for executive functioning tasks and a developmental surge in attentional control allowing, for example, for children to hold and manipulate representations in mind, inhibit responses according to rules, and flexibly allocate attention and responses based on task demands. Further critical developments in executive functioning then occur between the ages of 3 to 5 years with the further development, integration, and utilization of more complex skills building upon the coordination of those earlier basic skills (Garon et al., 2008). Of note, the foundational skills of response inhibition, working memory, and shifting have been demonstrated to show somewhat different trajectories of development (as reviewed above).

Utilizing the unity and diversity framework, Best & Miller (2010) and Garon et al. (2008) cited mounting evidence for the presence of the three distinct factors in childhood populations, including some evidence of their intercorrelations as well as their separability even amongst preschool-aged children (Garon et al., 2008; Hughes, 1998). The differing trajectories of the foundational executive functions have been offered as support for the unity and diversity model by suggesting that "the degree of unity or diversity of [executive functioning] varies from age to age" (Best & Miller, 2010, p. 1652), with various developmental theories collectively complementing the model by proposing that common processes underlying early executive functioning development allow for approaching the structure observed in adults over time (e.g.,

maturational shifts in the development and integration of attention; see Garon et al., 2008, for a review). Rather than requiring a different model to explain the structure of executive functioning in developmental populations, the extent to which the structure of executive functioning is prevalently unitary and/or separable will change developmentally (i.e., becoming less "unitary" overtime), with differences across age groups attributable to both qualitative (e.g., development of more complex rule systems) and quantitative (e.g., increasing the strength of active representations in mind in order to override latent representations) developments in executive functioning (Best & Miller, 2010). Relatedly, some research using latent variables analysis in 6- to 24-year-olds has found that response inhibition and working memory (and processing speed) are separable abilities, with the extent to which they are separable remaining stable but with abilities showing improvements across the complete age range (though a significant amount of this improvement, particularly related to response inhibition, was found to be attributable to age-related improvements in processing speed) (McAuley & White, 2011).

Executive Functioning within Family Members

Families are thought to have an influence on executive functioning development via both genetic and environmental paths (Bernier et al., 2010; Deater-Deckard, 2014; Jester et al., 2009; Tomlinson et al., 2022). Research findings have spoken to the substantial genetic contributions to executive functioning that occur at the level of latent variables (Friedman et al., 2008; Friedman & Miyake, 2017; Tomlinson et al, 2022). Twin studies looking at performance on individual tasks have identified executive functioning task performance to have moderate heritability (estimates of .25 to .55 heritability), with the remaining variance in task performance attributable mainly to nonshared environmental factors (including measurement error). In contrast, heritability estimates were found to be considerably higher (over .75) at the level of latent variables when measurement

error is minimized through statistical analysis. In summarizing the literature, Friedman and Miyake (2012) noted that, more importantly, "substantial genetic contributions were observed at both unity and diversity levels, suggesting that separate sets of genes contribute to the variability in more general EF versus updating-specific and shifting-specific abilities…[pointing] to the complexity of the EF genetic structure" (Miyake & Friedman, 2012, p. 11).

Research in pediatric populations has also pointed to significant familial contributions to executive functioning. Looking at both mothers' and fathers' executive functioning, Jester et al. (2009) found that there was a significant moderate correlation between parents' and children's executive functioning, with opposite-sex parents showing higher correlations of executive functioning with their children versus same-sex dyads. Longitudinal research by Cuevas and colleagues (2014a, b) explored the association of children's and mothers' executive functioning, finding a modest correlation of .41 of mothers' and children's executive functioning by 24 months of age, which was stable through 48 months of age even after controlling for children's verbal abilities and mothers' education. It was argued that this moderate correlation may be, at least in part, driven by underlying associations between mothers' own executive functioning and their caregiving behaviours (Cuevas et al., 2014a). In a further exploration of the effects of genetic versus environmental (i.e., parenting) contributions to the development of executive functioning, Tomlinson et al. (2022) conducted a twin study in which they found that better executive functioning was associated with less harsh and warmer parenting, which in turn was associated with better executive functioning development within children. The authors concluded that both genetics, as well as environmental mechanisms (including harsh parenting), were associated with the intergenerational transmission of executive functioning. In discussing possible mechanisms, the authors discussed the likely complex interplay of gene-environment and child-parent

interactional dynamics within families resulting in differences in developmental outcomes, with bidirectional effects likely (e.g., parents with worse executive functioning may pass down genetic risks to their children, with children's worse executive functioning then presenting with particular demands on parenting that may then tax the executive functioning and parenting behaviours of their parents).

Thus, when investigating executive functioning in relation to family, it is important to consider the complex interplay of executive functioning within the family unit. Explanations focusing simply on the executive functioning of one individual – most often the child – are necessarily limited to the extent that they do not account for effects that may also be attributable to the executive functioning of other family members and/or an interplay of their associated executive functions. This presents an important addition of my program of research to the extant literature.

Executive Functions: Measurement Issues

A number of measurement issues have been identified in the executive functioning literature (Jurado & Rosselli, 2007), in part reflecting the lack of consensus on what constitutes executive functioning. As reviewed by Miyake and colleagues (Miyake et al., 2000; Miyake & Friedman, 2012) in advocating for adopting a latent variable approach to executive functioning research, a number of issues have emerged in the literature that have stymied efforts to achieve clarity on the structure and applications of executive functioning. These have included but are not limited to executive functioning tasks being challenged by poor reliability (e.g., at times having poor test-retest performance, with variable results based on the executive function under exploration and when retested following three/six weeks; Soveri et al., 2018). This necessarily limits the correlations that these measures will have with other measures of executive functioning

(i.e., low correlations may reflect *either* independence of underlying executive functions tapped by the individual tasks *or* low reliability of the measures themselves). Another issue involves limited construct validity for some tasks (for example, because some tasks were identified as measures of executive functioning due to performance on said tasks being linked with frontal lobe brain damage, rather than being identified based on rigorous analysis) (see also Brocki & Bohlin, 2004).

Further to this, several studies are affected by the "task impurity" problem, such that because "executive functions necessarily manifest themselves by operating on other cognitive processes, any executive task strongly implicates other cognitive processes that are not directly relevant to the target executive function" (Miyake et al., 2000, p. 52; see also Huizinga et al., 2006; Jurado & Rosselli, 2007; McAuley & White, 2011; Toplak et al., 2013). As such, scores on any executive functioning task consequently include substantial systematic measurement error (random noise in data) and systematic variance attributable to other non-executive functioning processes (e.g., articulation speed; Miyake & Friedman, 2012). In order to address these limitations, the authors argued for exploring performance on multiple tasks at the latent level (i.e., looking at variance that is shared amongst the multiple exemplar tasks for each executive skill by extracting commonalities across tasks) – and not manifest level (i.e., performance on individual tasks) – in order to extract "purer" latent variables. The authors argued that this approach allows not only for a better examination of what complex tasks likely measure, but also allows for exploring how individual executive functions relate to one another in a given sample (i.e., the "structure" of executive functioning). It is noteworthy, however, that some authors argue that the use of latent variable analysis is not uniformly the most appropriate representation of executive functioning (Camerota et al., 2020), with opponents arguing that there are issues related to latent

variable analyses. For example, some researchers have presented evidence to suggest that there tends to be very little shared variance (estimated to be approximately 4 to 16%) amongst tasks in task batteries, where correlations between individual executive functioning tasks tend to be small to moderate in magnitude (and at times non-significant) (Jurado & Rosselli, 2007). This "low level of shared variance calls into question the interpretation of the resulting latent variable, which could just as easily represent some shared, nonexecutive ability that [executive functioning] tasks draw upon (e.g., motivation, attentional capacity), rather than [executive functioning] ability per se" (Camerota et al., 2020, p. 2238; Huizinga et al., 2006). The authors argued that low correlations between executive functioning tasks, and the latent constructs derived on their basis, may obscure important individual differences. It is also the case that across samples identification of models often does not reach universal acceptance on the number of factors which provide best fit to the data in understanding the underlying structure of executive functioning. Although further discussion of this topic is outside of the scope of this dissertation, there remains work to be done by researchers to reach consensus regarding the most appropriate manner in which executive functioning effects should be estimated.

Further to this, a number of important methodological issues have challenged the development of a clear understanding of executive functioning from a developmental perspective (Best & Miller, 2010; Garon et al., 2008; Wiebe et al., 2008). One important consideration with respect to creating a developmental description of executive functioning is that due to developmental differences in abilities, tasks that are used across different age ranges are not uniform. For example, tasks used with older children and adolescents to measure executive functioning often need to be more complex to avoid ceiling effects (i.e., to ensure variability in functioning is accurately depicted, and not obscured by using tasks that are too simple that they

are well within the mastery of a high number of participants). To include such complexity, however, these tasks often tap into multiple executive functioning components (consistent with the task-impurity problem). It is unclear the extent to which these tasks measure the same constructs in younger children (though some evidence suggests that certain tasks may demonstrate good reliability and validity from childhood through early adulthood; e.g., McAuley & White, 2011), and concerns have been raised that simplification of more complex tasks to be developmentally accessible to younger children makes it difficult to know if the critical executive functioning elements have been retained (Garon et al., 2008). As such, it becomes difficult to compare performance across age ranges, as not only developmental stages but also the task demands vary across studies depending on the age of the child.

Another important issue that has arisen in the executive functioning literature is discrepancies between measured or "in-lab" executive abilities, and measures of everyday executive functioning. Empirical evidence suggests that there are two important and distinct aspects of executive functioning that should be accounted for in assessments of executive skills in research. While performance-based tasks (which comprise much of the executive functioning measures included in the research summarized above) are thought to assess executive skills under ideal conditions, informant-rated questionnaires (including parent report) may provide information about the ability to effectively apply these skills within the less-structured context of everyday life (McAuley et al., 2010; Toplak et al., 2013). Research has demonstrated that although intended to index the same broad underlying constructs, task-based versus questionnaire-based measures of executive functioning across both child and adult samples, as well as clinical (e.g., individuals with ADHD) and non-clinical samples, appear to capture different skills despite assumptions that rating scales are related to the same processes that underly performance on task-based measures

of executive functioning. Indeed, only generally small to modest correlations between the two types of measures are found (Toplak et al., 2013). Moreover, it also the case that some behaviours tapped by rating scales may not have comparable performance measures such that there may not be task-based measures to explicitly tap parallel executive functioning processes (e.g., initiation) (Toplak et al., 2013).

An important distinction between the two types of measures of executive functioning may lie in the efficiency of cognitive abilities, such that performance- or task-based measures focus predominantly on accuracy and efficiency of completing the task, while questionnaire-based measures are less focused on this and more on difficulties in effective execution of these skills in everyday tasks relevant to goal attainment (Toplak et al., 2013). It is also the case that performance-based measures occur within the context of highly structured environments that are controlled and facilitated by the examiner in order to reduce variance in performance that may be attributable to environmental factors rather than reflecting differences in executive functioning abilities. This may result in less variability in individual executive functioning performance relative to the demands of real-world functioning where less structure is provided and where observer reports will necessarily reflect some degree of variability due to environmental factors in addition to executive functioning differences (Jurado & Rosselli, 2007; Toplak et al., 2013). Moreover, research has established that task-based measures of executive functioning do not consistently relate to everyday functioning (e.g., mental health status, income), raising questions about their exclusive use within the executive functioning literature in understanding practical outcomes for individuals. In contrast, questionnaire-based measures may show stronger associations with these real-world variables including psychosocial functioning within families (see Fisher et al., 2022; Jurado & Rosselli, 2007; Tomlinson et al., 2022; Wiebe et al., 2008). Failure to distinguish between these

two approaches to measurement have made interpretations of the extant literature challenging such that it is unclear whether findings linked with deficits in executive functioning reflect true underlying executive functioning deficits (i.e., skills that may not be well-developed), or rather reflect deficits in the *application* of intact executive functioning skills.

Taken together, and as reviewed in this section, there are a number of measurement issues that continue to add complexity to the literature on executive functioning and its correlates. Given these aforementioned difficulties, my program of research focused on using a multi-method assessment of executive functioning, with tasks that have been validated for use in both child and adult populations. With respect to task-based measures of executive functioning, the associations of each respective executive function (working memory, shifting, and response inhibition) with measures of psychosocial functioning within families were examined separately. In so doing, these associations could be preliminarily explored in the absence of issues described above in relation to the derivation of composites across executive functioning tasks. This approach was selected given not only that the use of composites has been called into question (e.g., Jurado & Rosselli, 2007; Camerota et al., 2020), but also given that any derived composites may function differently across child versus adult populations to the extent that these tasks – though selected to reduce the likelihood of this possibility – may tap different skills across the lifespan. Treating tasks individually was taken as the more parsimonious approach in this preliminary exploration of the association of psychosocial family variables of interest with task-based measures of executive functioning while making no assumptions about underlying associations between the abilities measured by the various task-based measures of executive functioning used.

Executive Functions: Associations

Executive functions are thought critical for adaptive human behaviour through their influence on purposeful and thoughtful responding to novel situations and problems (see McLuckie et al., 2021, for a review). With somewhat reliable differences observed in self-regulation amongst people, difficulties with executive functioning have been associated with individual differences in a number of important domains. Amongst children, those with better executive functioning tend to experience stronger academic readiness and success, fewer difficulties with emotional regulation and reactivity (including fewer difficulties with internalizing and externalizing behaviour disorders), better social functioning (including improved communication and social skills, and less loneliness), stronger social and moral competencies, and greater verbal and nonverbal reasoning abilities (Bernier et al., 2010; Camerota et al., 2020; Cuevas et al., 2014a, b; Dajani & Uddin, 2015; Deater-Deckard, 2014; Diamond, 2013; Hébert et al., 2021; Howard et al., 2015; Huang-Pollock et al., 2009; Kim & Deater-Deckard, 2011; Laslo-Roth et al., 2021; Sarsour et al., 2011).

Amongst adults, better executive functioning has also been associated with a number of important outcomes including enhanced job success (productivity, finding and maintaining jobs, and greater earnings and prestige), lessened public safety issues (crime, reckless behaviour, and violence), better interpersonal functioning and marital harmony/less infidelity, better control of implicit biases, more resilience to stressors and better quality of life, greater creativity, and more adherence to health and fitness regimes (Bernier et al., 2010; Blum & Ribner, 2022; Cuevas et al., 2014a, b; Dajani & Uddin, 2015; Deater-Deckard, 2014; Diamond, 2013; Miyake & Friedman, 2012; Sarsour et al., 2011). Thus, executive functioning in both children and adults is associated with important aspects of functioning. In the current study, I focus specifically on the role they

play within the family domain, in particular, associations with parenting stress levels and more general family dysfunction.

Executive Functioning Development: Contributions from the Family Context

In addition to explicating positive factors for the individual that may follow from well-developed executive functioning abilities as mentioned above, research has also sought to understand familial context factors which may facilitate and/or hinder the development of executive functioning in children. A brief review of this research is being provided here as background information which – while not central to my research questions – provides important contextual information relevant to the domains of interest explored in my dissertation. Research has pointed to the importance of both macro- (i.e., cultural context, socioeconomic status) and micro- (i.e., family members, language) systems in understanding executive functioning (Sarsour et al., 2011; Zebdi et al., 2016), with executive functions thought to develop as a result of a complex interplay between children's developing brains and their external environments (Deater-Deckard, 2014; Sarsour et al., 2011; Zebdi et al., 2016). In particular, attention has been paid to the importance of parent-child interactions in understanding the development of children's executive functioning. As noted by Deater-Deckard (2014), executive functioning is thought to be transmitted across generations via the socialization and experiential opportunities that exist within parent-child relationships. "Families matter because parents regulate home environments and themselves as best they can while also supporting cognitive self-regulation and attentive behaviour in their children" (Deater-Deckard, 2014, p. 230).

Indeed, other research has sought to elucidate beneficial factors, including positive family environments, in parent-child interactions that aid in the development of children's executive functioning (Tomlinson et al., 2022; see Cuevas et al., 2014a, and Schroeder & Kelley, 2010, for

reviews). In particular, parental scaffolding – broadly defined as parental support that allows children to achieve higher levels of comprehension and skill acquisition than they would achieve on their own – has received considerable attention in the literature (see Hammond et al., 2012, for a review; Zebdi et al., 2016). In a longitudinal analysis, Hammond and colleagues (2012) found that parental scaffolding at age 2 had an indirect effect on children's executive functioning at age 4 (via children's verbal ability at age 3), while scaffolding at age 3 had a direct effect on children's executive functioning at age 4. Other factors that have been identified have included maternal sensitivity (appropriate and consistent responses to the child's signals) and mind-mindedness (using mental terms in communication), which along with parental scaffolding (subsumed under autonomy support) have been found to be associated with children's executive functioning development even after controlling for maternal education and general cognitive abilities (see Bernier et al., 2010). As discussed by Bernier and colleagues, it is thought that it is through these behaviours that caregivers act as "external regulators" (2010, p. 328) as children learn to become more self-regulating over time. These caregiving dimensions have been found to be associated with early measures of children's self-regulation as early as 18 and 26 months of age within typical family settings. Other research by Bernier and colleagues has established that parents' interactive behaviours, as well as child attachment, are associated with children's executive functioning (particularly their cognitive flexibility) (Bernier et al., 2015). Parenting that is warm, sensitive, and responsive is thought to be critical to the development of executive functioning and self-regulation in children (e.g., Bernier et al., 2012; Hammond et al., 2012).

Further evidence for the importance of family environment and parenting practices in the development of executive functions in typically-developing children (aged 5 to 12 years) came from Schroeder & Kelley (2009; 2010) who found that various subdomains of family environment

including family organization, parental support, and parental limit setting, were associated with different aspects of children's executive functioning. For example, the extent to which parents were receiving greater supports was associated with better planning/organization, working memory, and inhibition in children (i.e., parents who receive their *own* emotional and practical support may be better able to support their own children, meet their parenting responsibilities, and turn attention to modelling an organized family environment), while parental limit setting was associated with better emotional control, inhibition, shifting, and monitoring (perhaps with limits aiding children in their learning about appropriate behaviour). The authors concluded that the results of their study pointed to the importance of a positive family environment and parenting practices in the optimal development of executive functioning in typically-developing children. Other factors including responsive (i.e., emotionally and verbally sensitive) and warmer parenting, access to enrichment activities, and companionship amongst family members have also been associated with improved executive functioning amongst children (Sarsour et al., 2011; Tomlinson et al., 2022).

Within the interpersonal context, it is argued that each individual has a reaction to others' behaviours, which in turn influences the first individual's development – with executive functioning potentially serving to either strengthen or lessen the effect of the other person's behaviour on one's own. For example, research by Deater-Deckard and colleagues (Deater-Deckard et al., 2012; Deater-Deckard et al., 2010) has suggested that mothers' executive functioning may moderate the association between maternal negativity and children's negative behaviour. In one study, children with more challenging behaviour relative to their siblings were observed to receive greater maternal negativity but *only* amongst mothers with a smaller working memory capacity (Deater-Deckard et al., 2010). Other research has indicated that associations

between negative parenting behaviours and children's executive functioning may increase over time. Cuevas and colleagues (2014b) found that although children's executive functioning was linked with maternal executive functioning (but not negative caregiving behaviours) at age 24 months, both maternal executive functioning *and* negative parenting behaviours (intrusiveness, negative affect, arousal-inducing physical stimulation, and failure to provide attentive responses) accounted for unique variance in children's executive functioning (above maternal education and child verbal ability) by the time children were 36 months of age. The results of the study also suggested that maternal executive functioning may have an indirect effect on children's executive functioning via maternal caregiving behaviours, such that the link between maternal executive functioning and children's executive functioning was at least partially mediated by associated variations in caregiving behaviours when children were 36 and 48 months of age. Notably, these findings were observed within a non-adverse family context in this study, which provided further evidence of the critical role of maternal executive functioning for regulating maternal caregiving behaviours even in more typical household environments. These findings were similar to those of Deater-Deckard et al. (2012) who found that the link between higher levels of child problem behaviours and harsher caregiving responses was more likely amongst mothers with weaker executive functioning. In the latter study, however, it was noted that these findings were contingent on the degree of *household chaos* (noisiness, crowdedness, lack of routines) in the family. More specifically, the authors found that maternal executive functioning minimized harsh parenting in the context of challenging child behaviour (particularly in mothers with weaker executive functioning, and more moderately in mothers with stronger executive functioning) in *calm* or more predictable environments. In contrast, the regulatory effect of mothers' executive functioning was not found in more chaotic environments, where there was a moderate correlation between child

behaviour and harsh parenting *regardless* of mothers' executive functioning. One argument is that when broader family contexts are more challenging – such as when families exist within more chaotic households – this may tax parents' capacities for regulating their own emotions during difficult situations. This may, in turn, impact parenting behaviours and parent-child interactions – thus having an indirect effect on children's development (Deater-Deckard et al., 2012).

While positive family environments and parenting practices appear to foster healthy executive functioning development in children (Deater-Deckard, 2014; Schroeder & Kelley, 2009, 2010), a growing body of research points to the deleterious effects of adverse environments on children's cognitive development. Factors including child maltreatment (abuse, neglect), violence, stress, poor physical care (sleep, exercise), loneliness, and low socioeconomic status (with associated risks for poor nutrition, toxin exposure, and chronic stress; Jester et al., 2009) have all been associated with possible impairments in executive functioning (Deater-Deckard, 2014; Zebdi et al., 2016). For example, research with typically-developing children has suggested that while lower socioeconomic status predicts weaker executive functioning outcomes for children (with respect to inhibitory control, cognitive flexibility, and working memory), weaker executive functioning – particularly in the domains of inhibitory control and cognitive flexibility – may be more likely in children from single-parent homes relative to children from homes with two parents (even when families are of similarly low socioeconomic status) (Sarsour et al., 2011). Parental responsivity (emotional and verbal sensitivity to the child), opportunities for enrichment activities, and family companionship (parental involvement in child activities leading to mutual enjoyment) were also found to mediate the association between family socioeconomic status and children's inhibitory control and working memory. Alongside findings related to parenting behaviours, stress and negative affectivity in parents have also been established as playing important mediational

roles between environmental factors and children's executive functioning (see Zebdi et al., 2016; Deater-Deckard, 2014).

Together, these findings illustrate the likely interaction of various external environmental factors on children's developing cognition and provide important contextual background for the variables of interest to this program of research. Of note, while an extensive consideration of a broad range of these environmental factors fell outside of the scope of my dissertation, this literature speaks to the importance of considering the complex interplay of factors within and between family members in understanding their functioning. My program of research has endeavoured to do this through simultaneously exploring interactions between children's and parents' cognitive and behavioural traits, while also controlling in analyses for the environmental variable of single-parent status. It will be important for future research to more fully examine the role of the broader micro- and macro-level environmental factors that may impact the association of children's and parents' executive functioning abilities in understanding the psychosocial functioning of families.

Executive Functions: Clinical Populations

Given that the majority of research exploring the role of executive functioning in family processes has occurred in the context of clinical disorders with known executive functioning deficits, as well as the fact that a main focus of my work is understanding the role of traits of ADHD in psychosocial functioning for families, a discussion of clinical populations is relevant to provide a basis for my research questions. Deficits in executive functioning have been documented in and/or associated with a number of clinical conditions (Cuevas et al., 2014a; Deater-Deckard, 2014; Diamond, 2013; Jester et al., 2009; Sarsour et al., 2011; Toplak et al., 2013; Zebdi et al., 2016), including anxiety and depression, addictions, obsessive-compulsive disorder,

schizophrenia, behavioural disorders and conduct problems, and personality disorders, with some authors arguing that this may be because stressful life events lead to temporary negative effects on neuropsychological functioning (see Zebdi et al., 2016).

Most relevant to this thesis are executive functioning deficits observed within populations of individuals with Attention-Deficit/Hyperactivity Disorder (ADHD), which is a common disorder of development characterized by atypical levels of inattentive and hyperactive-impulsive behaviours (American Psychiatric Association, 2013). Consistent with current conceptualizations of ADHD which suggest that ADHD traits fall along a continuum with the diagnosis reserved for individuals who exhibit these traits at excessively high levels (e.g., Larsson et al., 2012; Levy et al., 1997), my studies emphasize an analysis of symptoms of ADHD as *traits* in the broader population (rather than focusing on diagnostic categorizations of individuals). Importantly, the broader disorder phenotype includes deficits in various other domains including executive functions (Willcutt et al., 2005). Of note, these deficits have been observed across measures of various different executive skills (e.g., response inhibition: Lipszyc & Schachar, 2010; working memory: Martinussen et al., 2005), and in both clinical and community samples (Willcutt et al., 2005). Weaker performance on both performance-based tasks as well as questionnaire-based measures of executive functioning have been observed in individuals with ADHD (Toplak et al., 2013).

Indeed, theories of executive functioning suggest that these deficits may underpin several of the behavioural symptoms present in ADHD (see McLuckie et al., 2021, for a review), with meta-analytic studies identifying that while deficits in executive functioning may not be causal in all cases of ADHD, they are an important neuropsychological factor in presentations of this condition (Willcutt et al., 2005). In children with ADHD there is some evidence to suggest that

they are more likely to struggle with specific subcomponents of executive dysfunction rather than more global deficits (e.g., working memory; Schreiber et al., 2014). Particular attention has been paid to deficits in the areas of inhibitory control and working memory, with lesser evidence identifying impairments in shifting abilities (cognitive and behavioural; see McLuckie et al., 2021).

Also relevant to this thesis are observations of the high rates of comorbid behavioural and emotional difficulties, including oppositionality, defiance, and anger, that are estimated to affect upward of 50% of children with ADHD (August et al., 1999, as cited in McLuckie et al., 2021). Difficulties with behavioural regulation in childhood have been found to be associated with weaker executive functioning coupled with greater emotional reactivity, evident as early as preschool-age (e.g., being easily provoked to anger; Deater-Deckard, 2014). Relatedly, longitudinal evidence exists to suggest that greater demands being placed on children to self-regulate as they age may have an influence on the development of behavioural problems in children when there is a disconnect between newly expected levels of self-regulation and the degree to which children's executive functioning is adequately developed to meet these demands (Wang et al., 2012).

Moreover, psychosocial variables have also been specifically associated with executive functioning in children with ADHD, although the extent to which executive dysfunction is implicated continues to warrant further exploration. As reviewed by Huang-Pollock et al. (2009), there is mixed evidence suggesting that there are small to moderate predictive effects of executive functioning on parent- and teacher-reported social competence of children with ADHD or children who are at risk of psychopathology more generally. In their own examination, they found that although executive functioning did not mediate the relationship between ADHD and parent or teacher reports of social adjustment (including social skills and peer acceptance), approximately

half of the variance in the association between ADHD status and children's ability to detect subtle verbal cues and remember conversations during an in-vivo conversation task was explained by executive functioning. Children's executive functioning was not found to mediate the association between ADHD traits and the number of prosocial, hostile, or on-topic statements made by these youth. Taken together, this evidence suggests that social skills deficits in ADHD may not be fully accounted for by executive functioning difficulties, although there may be a role of these cognitive abilities in the production of some of the social skills difficulties experienced by this population (Huang-Pollock et al., 2009).

Taken together, these results suggest that when looking at psychosocial factors for these individuals it is important to disentangle effects that are accounted for by executive functioning from those accounted for by traits of ADHD. With this consideration in mind, an important methodological strength of my dissertation is the simultaneous measurement and exploration of the effects of both executive functioning and ADHD traits within the same studies.

In the next section, I will provide an overview of one of the main areas of foci, namely, the amount of stress experienced by parents specific to their parenting role (i.e., parenting stress). This information will provide background information for my specific research questions relating to the amount to which individual differences in parenting stress are accounted for by executive functioning and/or traits of ADHD in both children and adults.

Parenting Stress

Parenting stress is broadly defined as the stress that results when parents perceive themselves as having insufficient resources to manage the demands of parenting (Deater-Deckard, 2004). Although stress related to the parenting role is a relatively common and normative experience to which most parents can relate (Deater-Deckard, 1998), it is widely accepted that

there are differences in challenges of child rearing and the levels of stress that each parent experiences (see Park et al., 2022). For example, statistics from the United States suggest that a subset of individuals, with estimates as high as 13%, may experience *significantly elevated* levels of parenting stress (Raphael et al., 2010). In addition, research has suggested that differences in parenting stress across parents tend to be moderately stable. For example, in a four-year longitudinal study, Deater-Deckard and colleagues found that mothers who were highest in parenting stress at the beginning of their study were most likely to have elevated levels of parenting stress at follow-up (Deater-Deckard et al., 1996). It is also the case, however, that individual differences in parenting stress and trajectories of changes in parenting stress levels may exist, such that while there may be overall decreases in parenting stress over time (see Park et al., 2022, for a review), initial parenting stress levels as well of rates of change over time may vary by mother.

There are several implications for individual well-being, child development, and clinical considerations that are associated with elevated levels of parenting stress. Although several studies are correlational in nature, thereby making it difficult to determine the direction of effects, research has suggested that parenting stress may be associated with a number of downstream negative factors including elevated rates of psychopathology in parents (Anastopoulos et al., 1992), escalations in behavioural problems in youth (Lin & Chang, 2002, as cited in Anderson, 2008), increased family conflict (Moore et al., 2007, as cited in Anderson, 2008), and decreased quality of parent-child relationships (Abidin, 1992, and Rodgers, 1998, as cited in Theule et al., 2013). In addition, some correlational evidence suggests that elevations in parenting stress levels may be associated with less desirable parenting behaviours, including more physically abusive behaviours (e.g., Whipple & Webster-Stratton, 1991), as well as more negligent parenting styles (see Morgan et al., 2002). Of note, however, not all parents who experience high stress levels demonstrate

dysfunctional parenting behaviour with factors including parental expectations and negative attributions about children's behaviour, selective attention to negative aspects of behaviour, decreased tolerance for children's negative behaviour, and coping and other resources available to parents all possibly influencing observed relationships between parenting stress and parenting behaviours (see Morgan et al., 2002, for a review). Relatedly, other researchers have suggested that higher rates of parenting stress may result in parents inadvertently ignoring positive child behaviour, overreacting to negative child behaviours, and/or responding inconsistently to children's behaviour – which may result in an intensification of child behavioural issues which, in turn, may increase the parenting stress experienced (Anastopoulos et al., 1992). Further concerns have also been advanced related to an association between parenting stress and reduced expressions of warmth/affection, harsh disciplinary methods, increased child-directed hostility, inconsistencies in parenting behaviour, and/or withdrawal from parenting, which may "promote further increases in child emotional and behavioral problems, such as aggression, noncompliance, anxiety, and chronic sadness" (Deater-Deckard, 2004, pp. 7-8).

In addition, research has also established that parenting stress is a strong predictor of children's emotional and behavioural well-being, and may also have important implications for children's development (see Deater-Deckard, 2004, for a review; Park et al., 2022). In particular, some research has suggested that parenting stress is a particularly strong predictor of children's social competence in early childhood (Anthony et al., 2005). Longitudinal research on maternal stress in Korean mothers of children tracked from age 3 to 7 years has suggested that increases in maternal parenting stress over time may be associated with poorer school adjustment (including classroom behaviours, positive approaches to learning, and child-peer and child-teacher relationships) at age 7 years (Park et al., 2022). In addition, some evidence suggests that parenting

stress in parents of adolescents may be associated with negative biases in parents' perceptions of the child – with related effects on their reporting of other factors including youths' behavioural problems and social skills deficits (Anastopoulos et al., 1992; Anderson, 2008). Furthermore, research by Kazdin and colleagues (Kazdin, 1995, 1997, and Kazdin & Whitley, 2003, as cited in Theule et al., 2013) suggests that parents who experience extreme levels of parenting stress may be less able to implement or participate effectively in interventions to assist their children. These latter two findings suggest that parenting stress levels may have important implications for parents' abilities to participate effectively in both the assessment and treatment of children's behavioural and emotional difficulties (Theule et al., 2011).

In summary, parenting stress is associated with a number of important outcomes for children and youth. As such, better understanding the factors which relate to elevated levels of parenting stress experienced by parents is crucial to understanding how to best support parents in their role in order to enhance positive outcomes for youth.

Models of Parenting Stress

Throughout the literature, a number of models have been proposed to explain the manifestation and correlates of parenting stress. Central to several of these models is the notion of a "balancing act between the parents' perceptions of the demands of [the parenting] role and access to available resources for meeting these demands" (Deater-Deckard, 2004, p. 5). Arguably the most widely tested theory of parenting stress (Deater-Deckard, 2004), the Parent-Child-Relationship (P-C-R) Stress theory posits that overall parenting stress results from stress that arises in three different domains – including factors related to the child/child's behaviour, factors internal to the parent, and factors related to the parent-child relationship. Proposed by Abidin (1990, 1992, and 1995, as cited in Deater-Deckard, 2004), it is expected that elevations in overall parenting stress

levels will be associated with elevations in parenting stress in each of these respective domains. Of note, the P-C-R Stress theory is bidirectional in its characterization of the effects of family members' behaviours on each other – positing that parent factors will influence the child, and that child factors will likewise influence the parent.

> Accordingly, if a child's emotional and behavioral difficulties increase over time, parenting stress is likely to increase, the result being a promulgation of problems in parenting and child well-being. At the same time, the parent's own difficulties in mental health and functioning (e.g., depression, anxiety, substance abuse) can lead to problems in parenting and resulting increases in child emotional and behavioral problems, which in turn can further increase levels of parenting stress. Although this parenting stress mechanism unfolds over time and involves both the parent and the child, the adult's stress reaction to the demands of parenting is a key causal factor that propels the process forward. Accordingly, as parenting stress increases, the quality of parenting will deteriorate and the child's emotional and behavioral problems will increase. As parenting stress decreases, parenting will improve and so will the child's emotional well-being. (Deater-Deckard, 2004, p. 8)

Of note, although mostly correlational studies, the P-C-R Stress theory has received strong support within the literature (see Deater-Deckard, 1998, 2004), and measures based on this model have been successfully used to assess parenting stress levels in parents of children across typical to atypical development (Deater-Deckard, 2004).

Factors Associated with Increased Parenting Stress

Although there is a growing body of evidence linking parenting stress with various other factors, there continues to be a considerable amount of inconsistency in the literature. That is, while

several factors have been associated with increases in parenting stress by one or more research groups, other researchers have failed to replicate the findings. In addition, it is also the case that several of the variables that have been identified as having an association with parenting stress have been explored only in a few studies or within specialized samples. Further, and as previously indicated, the majority of studies examining parenting stress have been carried out using cross-sectional and correlational designs. Taken together, these findings make it difficult to draw conclusions about causality and/or the generalizability of the results beyond the study samples. With these cautions in mind, however, several factors have been identified as being associated with parenting stress, including factors at the level of the parent, child, and parent-child relationship. A brief summary of parent, child, and parent-child relationship factors related to parenting stress is provided here for background, following which a more detailed summary of the findings related to the constructs of interest – namely executive functioning and ADHD traits – is provided with key gaps in the literature identified.

Parent Factors. Several parent-level factors have been associated with elevated levels of parenting stress, including:

- Mental Health: Psychopathology within mothers, most notably depressive and anxiety-related symptoms, are associated with more parenting stress (e.g., Anastopoulos et al., 1992).
- Gender: Mothers are often found to report higher levels of parenting stress than fathers – although this result is inconsistent and should be interpreted within the context of a literature that has placed little emphasis on the roles and experiences of fathers (e.g., Theule et al., 2013; Morgan et al., 2002).

- Parental Attributions of Children's Behaviour: Parenting stress is higher when parents attribute children's problematic behaviour as either being outside of the parents' control and/or fully within the control of the child (e.g., in populations of children with intellectual disabilities: Hassall et al., 2005; in populations of children with ADHD: Bromley Little, 1998; Harrison & Sofronoff, 2002).
- Self-Efficacy: Feelings of reduced self-efficacy may be associated with higher parenting stress, such that improvements in parental self-efficacy have been associated with reductions in parenting stress in families of children with disruptive behavioural challenges (Bloomfield & Kendall, 2012).
- Quality of Social Supports: Reduced presence of social supports, and their perceived helpfulness, may be associated with greater parenting stress levels in families of children with developmental, neuropsychological, and intellectual disabilities (Åsberg et al., 2008; Deater-Deckard, 1998; Hassall et al., 2005; Plant & Sanders, 2007; McCleary, 2002, as cited in Theule et al., 2013; Theule et al., 2011).
- Parenting Practices: More authoritarian and controlling parenting practices amongst parents of children with ADHD have been associated with increased levels of parenting stress, with authors hypothesizing this may be in response to parents' negative reactions to children's behaviour (Yousefia et al., 2011). In contrast, research with other clinical groups, including children with developmental delays, suggests that higher parenting stress levels are associated with more moderate and responsive authoritative parenting, perhaps as a result of this style of parenting placing more demands on parents (Woolfson & Grant, 2006). Less warm and cognitively engaging parenting behaviours have also been associated with higher levels of parenting stress (Baker & Iruka, 2013).

- Life Stressors: Higher levels of parenting stress have also been associated with various other life stressors including single-parent status, low socioeconomic status, poor maternal physical health, and the presence of various other life stressors (see Morgan et al., 2002, for a review; Anastopoulos et al., 1992; Anderson, 2008; Theule et al., 2011).

Child Factors. In addition, several child-level factors have also been associated with elevations in parenting stress, including:

- Developmental and Neuropsychological Conditions: Elevated levels of parenting stress have been observed in parents of children with ADHD, Autism Spectrum Disorders, and intellectual and developmental disabilities (e.g., Anastopoulos et al., 1992; Epstein et al., 2008; Hassall et al., 2005; Morgan et al., 2002; Plant & Sanders, 2007; Theule et al., 2011; Theule et al., 2013; Wolf et al., 1989; Woolfson & Grant, 2006).
- Externalizing Behaviours: Difficulties with externalizing behaviours, most notably conduct disorder-related behaviours, aggression, and oppositionality, have been found to predict parenting stress above and beyond the variance explained by ADHD in samples where comorbidity exists (Anastopoulos et al., 1992; Theule et al., 2013).
- Chronic Illness: Parents of children with chronic illness, including for example cerebral palsy, cancer, and congenital heart disease, have reported higher levels of parenting stress (Goldberg et al., 1990; Park et al., 2012; Patel et al., 2013; Ribeiro et al., 2013; Uzark & Jones, 2003).
- Gender: Some studies have reported that parents of daughters report lower levels of parenting stress (e.g., Theule et al., 2013).

- Age: Some research evidence suggests that parenting stress levels go down as children age due to resultant reductions in parental vigilance required for managing children's behaviour with developmental changes, reduced behavioural problems following the preschool-aged years, and/or increased abilities of parents to adjust their parenting practices over time (see Park et al., 2022).
- Executive Dysfunction: Discussed more fully in the **Executive Functions and Parenting Stress** section below, preliminary evidence (primarily from clinical populations) suggests that elevated levels of parenting stress are found in parents of children with executive functioning deficits (Epstein et al., 2008; Graziano et al., 2011; Joyner et al., 2009; McLuckie et al., 2021; Patel et al., 2013).

Parent-Child Relationship Factors. Finally, a number of factors at the level of the parent-child relationship have been associated with elevations in parenting stress, including:

- Family Conflict: Higher levels of family conflict, specifically parent-child discord, are associated with higher parenting stress (Anderson, 2008; Kolko & Kazdin, 1993, as cited in Joyner et al., 2009).
- Home Learning Stimulation: Higher parenting stress is associated with less stimulation within the home, which is negatively associated with children's early academic achievements (Baker & Iruka, 2013).
- Parental Involvement: Parents who perceive themselves as being less involved in their children's lives report higher levels of parenting stress (Anderson, 2008).
- Parenting Practices: Parents who engage in less sensitive and less optimal parenting practices, including higher rates of harsh discipline, lack of appropriate guidance,

rejecting behaviours, and unrealistic expectations of their children, experience higher levels of parenting stress (see Park et al., 2022).

- Problem-Solving Abilities: Reduced parent-child problem solving abilities may be associated with higher levels of parenting stress, such that some preliminary evidence indicates that enhancing parent-child problem-solving processes in families of children with disruptive behavioural issues may result in decreases in maternal parenting stress (Epstein & Saltzman-Benaiah, 2010).

Adopting a closer lens to my variables of interest, in the next two sections I outline the literature relevant to understanding the associations between parenting stress and both ADHD and executive functioning.

Parenting Stress: Associations with ADHD and/or Externalizing Behaviour Disorders

Although there is some debate within the literature about specific factors associated with parenting stress, a growing body of evidence suggests that higher levels of parenting stress are fairly consistently observed in parents of children with ADHD, perhaps due – at least in part – to the burden of daily hassles these parents are more likely to face (see McLuckie et al., 2021).

With a recognition of the need to explore child, parent, and contextual factors in understanding parenting stress, Theule et al. (2011) carried out a study examining predictors of parenting stress as a function of children's ADHD symptoms (and oppositional behaviours), parents' ADHD symptoms, and contextual factors including parental education, social support, and marital status. Although limiting their examination only to parent-domain parenting stress, this study was an important addition to the literature such that it considered *traits* (versus diagnoses) of ADHD in both children and parents who were recruited from typically-developing as well as

clinical samples, and also incorporated teacher reports of children's ADHD traits and oppositionality to address concerns related to using parent report as a measure of all key variables. Preliminary analyses revealed that higher levels of parent-reported parenting stress were associated with more traits of ADHD in children (when rated by both parents *and* teachers), more self-reported traits of ADHD in parents, *parent*- (but not teacher-) rated oppositionality in children, having single parent status, and poorer ratings by parents of their own social supports. Hierarchical regression analyses were then conducted entering child-level variables as control variables in the first step, with more teacher-rated ADHD traits in children (but not children's gender or teacher-rated oppositionality) emerging as a significant predictor of parenting stress. When parents' ADHD traits and contextual variables were entered into analyses in the second step, more ADHD traits in parents and lower levels of social supports were associated with more parent-domain parenting stress, with the overall model explaining 34% of the total variance in parent-domain parenting stress when using *teacher* ratings of ADHD traits and oppositionality in children.

When the analyses were replicated using *parent* ratings of children's ADHD traits and oppositional behaviours, the total variance explained in parenting stress was 39% with children's oppositional behaviours also emerging as a significant predictor in the first step. Interestingly, when the authors reversed the order of the steps in the analysis using teacher ratings of children's behaviour, they found that child factors no longer predicted parent-domain parenting stress after controlling for parent and contextual factors highlighting the importance of parent-level factors in understanding parenting stress. Finally, in a moderation analysis, the authors found no evidence of a significant interaction between teacher-reported symptoms of ADHD in children and parents' self-reported ADHD symptoms. In discussing the implications of their work, the authors highlighted that, given that parental ADHD traits were the strongest predictor of parenting stress

in their study along with lower perceived social supports, interventions aimed at supporting families in these areas may help to reduce parenting stress and its associated outcomes for families (e.g., parents' participation in interventions for children).

While this work presented an important contribution to the literature, in an effort to address existing inconsistencies in the ADHD/parenting stress literature, Theule and colleagues (2013) conducted a meta-analytic review of both published and unpublished studies that examined parenting stress amongst parents of children with ADHD. The results of this meta-analysis indicated that parents of children with ADHD self-report significantly higher levels of parenting stress than parents of typically-developing children (overall parenting stress effect size: $d = 1.80$, parenting stress associated with parent factors: $d = 0.90$, parenting stress associated with child factors: $d = 2.12$), with more severe symptoms (both inattentive and hyperactive-impulsive) being associated with higher levels of parenting stress. Parenting stress levels were significantly increased in the presence of comorbid conditions in their children, particularly externalizing and oppositional behaviours. This is consistent with findings by Anastopoulos et al. (1992) that children's oppositional behaviour accounts for a significant proportion of variance in parenting stress levels. In addition, while mothers and fathers of children with ADHD were found to report similar levels of parenting stress associated with *parent*-specific factors, mothers tended to report higher overall levels of parenting stress, as well as higher levels of parenting stress associated with *child*-specific factors (e.g., child behaviour). Parental depressive symptoms were also found to be predictive of *parent*-level parenting stress (although the authors noted this may to some extent reflect overlap in items used to assess parental depression and parenting stress, respectively, across studies). Finally, although child gender was found to be a significant moderator of parenting stress (with parents of daughters with ADHD reporting lower levels of stress than parents of sons with

ADHD), other factors including children's age and various methodological variables (e.g., parenting stress measures and diagnostic criteria used to establish groups across studies) were not found to account for the observed associations between ADHD and parenting stress.

Despite these informative results, however, there is still a need for further research to better understand the elevated rates of parenting stress observed in this population. Indeed, Theule et al. (2013) note several limitations to the extant literature related to parenting stress and ADHD. Specifically, the authors note a need for future research to focus on elucidating the mechanisms and underlying factors which account for this association, including an examination of cognitive factors. In addition, they note that additional factors at the level of the parent (e.g., parental ADHD) and parent-child relationship need to be explored, given the relative focus on child-level predictors to date. Additional research expanding the age range of children under consideration to those over 12 years of age and utilization of alternate measures of parenting stress was also recommended. These limitations have been addressed in my program of research by including measures of parents' and children's traits of ADHD, measures of their respective executive functioning (both questionnaire-based and task-based), and using a measure of parenting stress that to my knowledge has not been utilized in other studies of parenting stress within this population. The latter has allowed for an expansion of the age range of child participants to 17 years of age.

Parenting Stress: Associations with Executive Functions

There is a relative dearth of research on the association between executive functioning and parenting stress, with studies that are available focusing predominantly on the executive functioning of children (and not their parents). Moreover, this research has focused on exploring the association between executive functioning and parenting stress within various clinical populations where higher levels of executive dysfunction are observed relative to the general

population (Epstein et al., 2008; Graziano et al., 2011; Joyner et al., 2009; Patel et al., 2013). For example, in a sample of children with Asperger syndrome aged 5 to 12 years, Epstein et al. (2008) found that elevated parenting stress levels in mothers were significantly correlated with weaker executive functioning in their children. Looking at parenting stress amongst parents of pediatric cancer survivors following central nervous system (CNS) directed treatment, Patel and colleagues (2013) found that both parent-reported questionnaires and direct measures of working memory were associated with unique variance in overall levels of self-reported parenting stress, even after controlling for various socio-demographic variables, life stressors, and other clinical factors that can influence parenting stress levels.

Studies have also examined the relationship between parenting stress and children's executive functioning in samples of children with ADHD. Joyner and colleagues (2009) found that higher executive dysfunction in children, measured via two parent-report questionnaires, was associated with higher self-reported parenting stress levels; however, no association was found between teacher ratings of children's executive functioning and parent-reported parenting stress. In another study, Graziano and colleagues (2011) found that higher self-reported parenting stress levels were associated with more hyperactive-impulsive (but not inattentive) symptoms of ADHD in children, and that this association was explained – at least in part – by parental perceptions of children's comorbid characteristics including executive dysfunction. In a more recent study (McLuckie et al., 2021), parent- and teacher-reported executive functioning were explored in a sample of parents with ADHD-diagnosed children aged 5 to 12 years. The results of the study indicated that approximately half of the variance in child-related parenting stress (as measured via parent-report) was accounted for by *parent*- but not teacher-reported difficulties in both behavioural and metacognitive aspects of children's executive functioning (particularly difficulties

in the areas of shifting, inhibition, and emotional control). In contrast, only behavioural aspects of executive functioning (specifically emotional control) were associated with any unique variance in parenting stress when executive functioning was measured via teacher report. The authors indicated that these results were consistent with previous research demonstrating that parents of children with ADHD are particularly distressed by associated features of oppositionality, aggression, and defiance in their children (e.g., Anastopoulos et al., 1992), and that these traits are associated with executive dysfunction related to emotional control and regulation. In contrast, little variance in parenting stress attributable to parent-level factors was explained by children's executive functioning when measured via parent-report (with no unique variance in parent-related parenting stress explained by teacher-report of children's executive functioning). Taken together, the results of these studies demonstrate an association between children's executive functioning – particularly when measured via parent-report – and parenting stress amongst parents of children with ADHD (McLuckie et al., 2021).

In a related literature which reflects a more bidirectional nature of effects (i.e., such that parenting stress may also influence children's executive functioning, and not just vice versa), there has been an emphasis placed on understanding the effects of parenting stress on children's cognitive development in non-clinical samples. Longitudinal designs have been utilized to overcome limitations inherent to cross-sectional and/or correlational designs which comprise much of the extant literature in this domain. For example, in a sample of mothers and fathers, de Cock and colleagues (2017) found a negative indirect effect of parental bonding on parent-reported executive functioning in children, with poorer parental bonding leading to higher levels of parenting stress which in turn contribute to weaker executive functioning in children. In a longitudinal analysis of mothers in Korea, Park et al. (2022) found that higher initial levels of

maternal parenting stress and an increase in parenting stress over time (tracked over a four-year period beginning when children were 3 years old) predicted weaker executive functioning performance in children at age 7 (on measures of planning/organization, and attention/concentration).

Taken together, these results have hinted at the potential role of children's executive functioning in understanding heightened levels of parenting stress amongst certain populations in which executive functioning deficits exists. My program of research adds to this literature in a number of ways. First, my studies serve to further elucidate these associations, with an additional examination of the executive functioning of parents, as well as interactions in parents' and children's executive functioning, to attempt to better understand the association of executive functioning with parenting stress. Second, my studies extend the research to examine the association between executive functioning and parenting stress across a broader range of executive skills (i.e., by looking at a non-clinical community sample). Finally, executive functioning will also be assessed via task-based measures with both children and parents, where the extant literature has relied almost exclusively on questionnaire-based measures. All of these present important contributions to the current body of research on this topic.

In addition to parenting stress, another psychosocial factor that occurs within the family unit is family functioning, which presents another important domain of exploration in my program of research.

Family Functioning

A multifaceted concept, family functioning refers to the functioning of the overall family unit, encompassing the organization, structure, roles, and affective involvement of all members. Referred to as the general climate or health/pathology of the family, it includes aspects of

interactions and relationships between all family members (including communication, and behavioural regulation) (Moen et al., 2016; Savci et al., 2023; Tolou-Shams et al., 2018). An important element of family functioning is sense of coherence, which refers to the family's overall capacity to cope with stressful life situations. Paralleling the model of parenting stress informing my program of research, it has been posited that parents who self-report a strong sense of coherence in their family may be more likely to positively reflect on the challenges of parenthood and to have greater confidence in the availability of resources for managing familial demands (Moen et al., 2016).

Models and Associated Factors of Family Functioning

Developed with clinical applications in mind, the McMaster Model of Family Functioning (Epstein et al., 1978) emphasizes a continuum of family functioning ranging from healthy to pathological. Derived from a systems view of family, wherein the functioning of individuals and smaller subsystems (including dyads) is couched within the functioning of larger systems (i.e., extended family, religion), it is argued that understanding the various individual parts of the family cannot occur without considering the structure and organization of the family unit, as well as transactional patterns between family members. The social, psychological, and biological functioning of all members is thought to develop within and be maintained by the family unit. For example, the behavioural functioning of the individual is assumed to be influenced by system rules (both implicit and explicit), as well as the behaviour of other system members; resultantly, the modification of pathological behaviours in individuals is argued to occur via the modification of the family-level processes that led to their development and maintenance.

In order to capture the complexity of the family system, the McMaster Model of Family Functioning suggests a multidimensional approach to elucidating factors at play in determining

overall family functioning. More specifically, the model highlights six key domains that factor into overall functioning, including problem-solving, communication, roles, affective responsiveness, affective involvement, and behavioural control. *Problem-solving* refers to the family's ability to adaptively resolve problems in a manner that allows for effective family functioning (including instrumental problems such as finances and affective problems related to feelings). *Communication* refers to verbal exchanges of information between family members related to instrumental and affective matters, and is categorized based on the clarity of information (clear/masked) and the extent to which it is directly/indirectly communicated to the intended recipient. *Roles* are defined as established/repetitive patterns of behaviour via which family functions are achieved (including meeting necessary instrumental and affective needs, as well as more peripheral everyday functions). The manners in which roles are allocated, with consideration given to the appropriateness of the role to the member, and whether members are held accountable for the effective execution of their roles are also factored into assessments of family functioning. *Affective responsiveness* refers to family members' abilities to provide qualitatively and quantitatively appropriate responses to a variety of affective stimuli and situations. *Affective involvement* refers to the extent to which family members demonstrate an interest in and value the activities/interests of other family members while still maintaining boundaries, ranging from a complete lack of involvement to a psychological state of "symbiotic involvement" in which boundaries become so significantly blurred that individuals cannot be differentiated from one another. Finally, *behavioural control* refers to the acceptable standards of behaviour for each family member in the family unit, and the manner in which behavioural control is exerted (in a rigid, flexible, or laissez-faire manner, or chaotically switching between these styles).

General family functioning is defined as the overall summary of these various family processes, with poorer family functioning characterized by less efficient and effective problem-solving, more masked and indirect styles of communication, inappropriate role delegation and inadequate execution of roles, restricted emotional range and poorer quantity and quality of affective responses, unhealthy boundaries around affective involvement with others (i.e., with healthy functioning characterized as empathetic engagement with others via focusing on the importance of a situation *to the other* family member), and unreasonable standards and less optimal styles of behavioural control (i.e., with flexible styles typically associated with better family functioning) (Epstein et al., 1978; Young et al., 2013). Thus, similar to parenting stress, family functioning is associated with a number of important variables for youth. As such, understanding the factors that are associated with healthy versus unhealthy family functioning is crucial for improved developmental outcomes.

Consistent with the parenting stress literature, the family functioning literature has also identified a number of parent-, child-, and parent-child relationship-level factors associated with family functioning (Moen et al., 2016). The following factors represent background contextual information, where a more in-depth discussion of associations between executive functioning and ADHD traits and their relevance to general family functioning will follow.

Parent Factors. Parent-level factors associated with poorer general family functioning include:

- Well-being: Lower levels of parental well-being (e.g., happiness, satisfaction, and subjective rewards of life) are related to worse general family functioning (Moen et al., 2016).

- Emotional Distress and Psychopathology: Higher levels of emotional distress/pathology, including depression and anxiety, are associated with worse family functioning (see Tolou-Shams et al., 2018, for a review; Moen et al., 2016).
- ADHD Status: Parents with ADHD report a weaker sense of coherence, as well as poorer family functioning relative to parents without ADHD, which may reflect associated challenges with creating organization and cohesiveness within the home (Moen et al., 2015).
- Age: Higher parental age may be related to greater general family dysfunction (Moen et al., 2015).
- Gender: Although consistent gender differences have not been found, some evidence suggests that mothers report more general family dysfunction than fathers potentially as a result of mothers' greater involvement in parenting in families of children with ADHD (Moen et al., 2015).
- Relationship Status: Single-parent/non-cohabiting parents report poorer sense of coherence (a correlate of general family functioning; Moen et al., 2015), while interparental conflict may be associated with greater levels of general family dysfunction (parents of children with ADHD; Savci et al., 2023).

Child Factors. In addition, some child-level factors have also been associated with poorer family functioning, including:

- Mental Health: Worse mental health status of children (e.g., bipolar disorder) has been associated with poorer general family functioning per adolescent report (Schei et al., 2016; Young et al., 2013).

- ADHD: General family dysfunction has been related to ADHD status in children (Savci et al., 2023; Young et al., 2013), especially when children are unmedicated (Moen et al., 2015, 2016) or when comorbid with other conditions (Schei et al., 2016; though the extent to which this latter was the case varied by informant with parents' reports being less affected by comorbidity status; discussed further below).
- Externalizing Behaviour: Greater family dysfunction has been reported in families of children with behavioural or conduct problems (Moen et al., 2015; Schei et al., 2016).
- Executive Dysfunction: Weaker executive functioning in children has been associated with worse general family functioning (Downes et al., 2019, but see Savci et al., 2023) (discussed further below).
- Health Status: Poorer family functioning may be found within families of children with significant health issues (e.g., sickle cell anemia; Downes et al., 2019).
- Gender: Research on general family functioning within families of children with ADHD has provided some evidence for gender differences, such that worse affective involvement scores (one subdomain of general family functioning) have been reported in families of girls with ADHD versus boys (Savci et al., 2023).

Parent-Child Relationship Factors. A number of factors at the level of the parent-child relationship and family level have also been associated with poorer family functioning including:

- Behavioural Oversight: Poorer overall behavioural control (Thompson et al., 2003, as cited in Downes et al., 2019; Savci et al., 2023) and monitoring of behaviour by parents in high-risk youth populations (Tolou-Shams et al., 2018) have been associated with worse general family functioning.

- Household Disorganization: Worse general family functioning has been found in households in which greater disorganization exists (Moen et al., 2015; Savci et al., 2023).
- Conflict: Greater conflict between family members has been associated with poorer overall family functioning (Savci et al., 2023; Tolou-Shams et al., 2018).
- Children's Disclosures to Parents: Poorer family functioning has been associated with parental perceptions of less disclosure from their children (i.e., children being less willing to share information and/or parents being less adept at soliciting it amongst families with high-risk court-involved youth; Tolou-Shams et al., 2018).
- Access to Supports: Poorer general family functioning has been related to less access to community health services including parent training, and subjective experiences of worse social support (Moen et al., 2015, 2016; Öztürk et al., 2019; Savci et al., 2023);
- Sense of Coherence/Coping: Worse family functioning has been associated with worse sense of coherence within families, as well as a reduced capacity for coping with stressful life circumstances (Moen et al., 2015).
- Interactions of Children's and Parents' Mental Health: Some evidence suggests that the association between parent and child psychological problems may be mediated by family dysfunction (see Tolou-Shams et al., 2018).

More pertinent to my variables of interest, the next two sections outline the literature relevant to understanding associations between general family functioning, and ADHD and executive functioning in turn.

Family Functioning: Family Members with ADHD and/or Externalizing Behaviour Disorders

Cross-culturally, worse family functioning has been reported amongst families of children with ADHD (Moen et al., 2015, 2016; Savci et al., 2023; Young et al., 2013). This interaction has been suggested to result from a combination of *child effects* (i.e., child's ADHD symptoms), *parent effects* (i.e., parenting stress, and parents' own ADHD and/or other mental health status), *comorbid problems and symptom severity* (particularly disruptive behaviours in children), and *elevated marital conflict* often observed amongst parents in whom ADHD is present in themselves or their children (see Savci et al., 2023).

In an exploration of factors associated with poorer family functioning in families of children with ADHD, Moen and colleagues (2015, 2016) used the Family Assessment Device as a self-report measure of overall family functioning (Epstein et al., 1983). In their studies, they found that parents with their own ADHD reported poorer family functioning, while parents of *unmedicated* children with ADHD were more likely to report more psychological distress, poorer well-being, weaker sense of coherence, and poorer family functioning relative to parents of *medicated* children with ADHD. The authors suggested that fewer symptoms of ADHD may lead to more predictability and less conflict in family life, with associated benefits for family functioning. When the contributions of various factors were explored simultaneously within regression models, parent-related factors including parental age, psychological distress, and well-being, were found to explain the most variance in general family functioning, while child factors including medication status and receiving supports from specialist health services also emerged as significant predictors. Better family functioning was associated with younger parental age, lower psychological distress in parents, higher parental well-being, less problematic child behaviour, and

perceived supports from community health services (Moen et al., 2015, 2016), with 46.2% of the variance in family functioning explained by these variables. These results are consistent with research from other groups which has also pointed to the potentially greater role of parent-level factors in predicting family functioning (e.g., Schroeder & Kelley, 2009) beyond the effects of child-level factors.

Extending to other clinical groups, Young et al. (2013) explored general family functioning in families of adolescents with bipolar disorder, ADHD, or typical development. Although they cautioned that parent-report may also be beneficial, citing parent-child disagreements on aspects of family functioning being commonly observed, the researchers utilized adolescent self-report of their constructs of interest. The researchers found that general family functioning, as well as the specific subdomain of roles, were worse in both clinical groups relative to the typically-developing controls, while effective family problem solving was also noted to be impaired amongst the bipolar disorder group. The authors reviewed evidence to suggest that worse family functioning in the clinical groups may be associated with other family variables observed in the clinical groups including poorer maternal warmth, less expressed emotion, more conflict and parental hostility/tension, and more family stress (amongst families of youth with bipolar disorder), as well as general psychosocial impairments, more dysfunctional parent-child interactions, more conflict, less organization, more negative parenting practices, impaired marital relationships between parents, and increased parental divorce rates (amongst families of youth with ADHD). Factors found in both populations included difficulties in parent-child relationships related to limit setting, parental hostility, mutual warmth, marital problem solving, and parental agreements on child rearing. These results highlight the complex interplay of factors within families, operating within and between individuals, that may be associated with general family functioning for the broader

family unit. In another self-report study of youth with ADHD, Schei et al. (2016) found that adolescents with ADHD and comorbid conduct and emotional difficulties reported significantly lower quality of life and family functioning relative to adolescents with ADHD with only one or neither of these comorbidities. In contrast, parents of these youth reported they experienced a higher quality of life when their adolescents had ADHD without any comorbidities, but that the families experienced a similar level of worse family functioning regardless of comorbidity status.

Research has also been conducted to better understand factors influencing poorer family functioning in other high-risk populations in order to effect meaningful and practical changes for these individuals. For example, in their exploration of associations between psychological distress, family dysfunction, and parenting practices (including parent-child communication and parental monitoring) in families of court-ordered youth at risk of sexually transmitted infections due to risky sexual behaviours, Tolou-Shams and colleagues (2018) found that parents' poorer mental health was directly associated with worse family functioning, and indirectly associated with poorer parental monitoring through its effects on general family functioning. They did not find evidence of a direct association between parent mental health and parenting practices (which was noted to be inconsistent with the broader literature), but parents with worse mental health endorsed worse family functioning, which was in turn associated with perceived less disclosure from their adolescents. The authors concluded that directly assessing parental mental health may be effective in improving parent-child relationships and other family processes that will support healthier outcomes for youth, for example, by improving parents' abilities to monitor, communicate, and interact with their children, while also reducing family conflict.

Citing evidence from the parenting stress literature more specifically, Savci et al. (2023) noted that ADHD symptoms in children can affect a variety of facets of family functioning via

"complex and bidirectional relationships" (p. 2). Various possible explanatory mechanisms were offered, including parental perceptions of their own inadequacies with respect to maintaining rules/cohesion, and increasing use of negative parenting styles in their interactions resulting in an exacerbation of the problems amongst children with ADHD and consequent parental stress (Anastopoulos et al., 2009, as cited in Savci et al, 2023). Possible mechanisms including communication failures and breakdowns of family roles due to parents' own stress and psychopathology, parental disagreements about children's ADHD, and possible reductions in family access to social supports (due to reduced opportunities for social participation amongst family members) were also cited.

Although speaking to potential child- and parent-level factors that relate to family functioning, there is a need for further simultaneous exploration of the potential contributions of both parents' and children's ADHD traits within the context of a singular study. Related to the below section, it will also be important for these associations to be explored in contrast to associations of *executive functioning* with family functioning, as these relations may be conflated within studies in which these factors are not explored separately. My dissertation has addressed these limitations by including simultaneous measures of parents' and children's ADHD traits and their executive functioning vis-à-vis their associations with general family dysfunction.

Family Functioning: Associations with Executive Functions

Given the negative effects of weaker executive functioning on various facets of social functioning, researchers have also explored the potential role of associations between executive functioning and various parenting practices as possible explanatory mechanisms for this association (see Savci et al., 2023). For example, parent training has been associated with better general family functioning in families of children with ADHD (with its associated executive

functioning deficits), as well as improvements in the specific subdomains of problem solving, communication, roles, affective sensitivity, and behavioural control (Öztürk et al., 2019; Savci et al., 2023). In their exploration of the effects of ADHD and executive functioning on family functioning, Savci et al. (2023) indexed executive functioning by extracting a number of variables from performance on a Stroop task (selective and focused attention, response inhibition, interference control, and information processing speed), while the Family Assessment Device was used as the measure of family functioning. Contrary to expectations, the authors did not find an association of children's executive functioning, as measured, and family dysfunction in their sample of youth with ADHD. The authors recommended that the contributions of different facets of executive functioning in families of children with ADHD be explored using a variety of neuropsychological tasks. Addressing this methodological limitation, in addition to questionnaire-based measures of executive functioning, my program of research also utilized multiple task-based measures of executive functioning with both children and parents.

Associations between executive functioning and general family functioning have also been explored in medical samples with known executive functioning deficits. Downes and colleagues (2019) explored the association between biomedical and environmental factors including family functioning and socioeconomic status to elucidate the association between executive functioning and family functioning in a small sample of preschool-aged children with sickle cell anemia. Focusing on using family functioning to predict (rather than be predicted by) children's executive functioning, the researchers relied on both parent-report and lab-based measures of executive functioning (cognitive flexibility including working memory, goal setting, attentional control including inhibitory control, and information processing), as well as a parent-report measure of family functioning (there defined as a positive family environment, measured with the Family

Environment Scale, encompassing measures of cohesion, expressiveness, active/recreational, organization, and the inverse of conflict and control). Inclusion of the family functioning measure explained an additional 18.2% of the variance in children's general executive functioning abilities (beyond the effects of biomedical markers of disease severity and hospitalizations), with a more positive family environment emerging as the strongest predictor of better general executive functioning in children (defined as the average score across all individual lab-based measures of executive functioning). Looking at individual domains of executive functioning, family functioning emerged as a significant predictor of performance-based estimates of cognitive flexibility and attentional control (but not of goal-setting). Of note, the authors cautioned about the need for exploration of the bidirectionality of the results, such that while family functioning may affect children's executive functioning development, children's executive functioning may also affect the overall functioning of the family. Speaking to this possible direction of effect, Fisher and colleagues (2022) explored the effects of intervention as a moderator of changes in executive functioning (as measured via parent- and adolescent-report) in a sample of adolescents who had experienced traumatic brain injuries (TBIs). During the course of online family problem-solving therapy for these families, there were greater improvements in executive functioning over time in families of older adolescents, as well as those residing in homes in which better general family functioning was reported.

Finally, in related areas, researchers have also found a positive association between executive functioning and various factors associated with more positive family functioning. These include better executive functioning for children in the areas of cognitive flexibility and working memory when stronger family alliance is present in triadic interactions between parents and child (i.e., the extent to which exchanges are well coordinated and balanced) (Hébert et al., 2021). In

another study, Blum and Ribner (2022) explored the association between expressed emotions (the "emotional temperature" of the family, or parents' attitudes and feelings toward their children) and children's executive functioning. Parents were asked to provide their thoughts, feelings, and attitudes toward their 14-month-old children, and their responses were coded for critical comments, emotional over-involvement, and the quality of the parent-child relationship. Children's executive functioning was measured in the domains of inhibition, working memory, and cognitive flexibility. Although there were some broad consistencies, different patterns of results emerged for mothers versus fathers such that there was a negative association between fathers' criticisms and children's inhibition, as well as *some* evidence of a negative association between fathers' emotional over-involvement and children's working memory. A different pattern emerged for mothers, such that a positive association was found between mothers' relationship quality and children's working memory.

Taken together, these findings suggest that better family functioning may be associated with stronger executive functioning – at least in the child – making this an important area of further investigation. My program of research will add to the literature by simultaneously exploring parents' and children's executive functioning, via both questionnaire- and task-based measures of executive functioning within the context of the same samples, to enhance our understanding of factors which may be associated with better/worse family functioning in normative samples.

Overall Aim of the Program of Research

Existing literature on executive functioning has established associations between weaker executive functioning and various psychosocial factors for individuals, with more recent research exploring how individual differences in executive functioning may also interact with the individual's broader environments and others within them. Given the ongoing and formative social

interactions that occur within families, the current program of research endeavoured to explore the association of children's and parents' executive functioning with psychosocial variables at the individual (parenting stress) and broader family unit (general family functioning) levels. These associations were explored across two online studies with mothers and fathers of children at different developmental stages, namely, preschool (aged 3 to 5 years; Study 1) and school-age (aged 6 to 17 years; Study 2). Seeking to understand how associations may differ when task-based measures of executive functioning were used (versus parent report), I also conducted an in-lab study with mothers and their children aged 8 to 17 years (school-aged community sample; Study 3).

With respect to parenting stress, the theoretical model informing my program of research suggests that factors at the level of the parent, child, and parent-child relationship contribute to parents' stress associated with the parenting role (Abidin, 1990, 1992, and 1995, as cited in Deater-Deckard, 2004). While existing research has found associations between weaker executive functioning in children and higher levels of parenting stress, research to date has not *simultaneously* explored and controlled for the association of parents' own executive functioning with parenting stress. My program of research also addresses other limitations of the executive functioning/parenting stress literature including expanding the age range under consideration to explore differences in observed associations based on children's developmental stage. Another important methodological contribution of this program of research is expanding beyond questionnaire-only measures of executive functioning to including task-based measures of executive functioning (Study 3), to provide a preliminary exploration of how various subcomponents of *measured* executive functioning may relate to psychosocial factors within families.

Similarly, and related to broader family functioning, my work expands on extant literature which has explored the association between family members' executive functioning and general family functioning. While some evidence exists to suggest that children's weaker executive functioning may be associated with worse family functioning, the research is limited and characterized by similar limitations as outlined with respect to parenting stress above (e.g., not including measures of parents' own executive functioning, or considering the measurement of executive functioning more broadly). With respect to both parenting stress and general family functioning, my program of research also adds to the literature by exploring associations between executive functioning and psychosocial factors within families in the context of community samples. In contrast, most research to date has focused on various clinical samples, including individuals with ADHD, with accompanying deficits in executive functioning. Moreover, the literature on these psychosocial variables has focused primarily on correlates of children's behavioural presentations and has provided only limited simultaneous exploration of the association between parents' *own* ADHD symptoms and parenting stress or general family functioning. The results of my program of research will serve to add to these literatures which may have important implications for informing assessment and intervention practices in clinical populations.

More specifically, across the three studies, my research aimed to explore the following research questions:

Questions related to executive functioning and parenting stress:

- *Does child and/or parent executive functioning relate to parenting stress? Is there an interactive effect wherein the association between children's executive functioning and*

parenting stress *depends on the executive functioning of the parent?* (Explored separately using parent-reported questionnaire and task-based measures of executive functioning.)

- *Do these patterns vary dependent on the specific component of executive functioning under consideration (working memory, switching, or response inhibition)?*

I predicted that both additive as well as synergistic interaction effects would occur, such that weaker executive functioning in either children or parents would be associated with elevations in parenting stress, with the highest levels of parenting stress reported in families where weaknesses in both the parent's and the child's executive functioning were identified.

Questions related to ADHD traits and parenting stress:

- *Do child and/or parent ADHD traits relate to parenting stress? Is there an interactive effect wherein the association between children's ADHD traits and* parenting stress *depends on parents' own ADHD traits?*

I again predicted that both additive as well as synergistic interaction effects would occur, such that more ADHD traits in either children or parents would be associated with elevations in parenting stress, with the highest levels of parenting stress reported in families where both parent and child were identified as having more traits of ADHD.

Questions related to executive functioning and general family dysfunction:

- *Does child and/or parent executive functioning relate to overall levels of family dysfunction? Is there an interactive effect wherein the association between children's executive functioning and* general family functioning *depends on the executive functioning of the parent?* (Explored

separately using parent-reported questionnaire and task-based measures of executive functioning.)

Based on preliminary evidence from the extant literature, I predicted that both additive and synergistic interaction effects would emerge. I predicted that weaker executive functioning in either parent or child would be associated with worse family functioning overall, with the worst family functioning found within parent-child dyads wherein both family members experience weaknesses in their executive functioning.

Questions related to ADHD traits and general family dysfunction:

- *Do child and/or parent ADHD traits relate to general family dysfunction? Is there an interactive effect wherein the association between children's ADHD traits and* general family functioning *depend on parents' own ADHD traits?*

I predicted that worse family functioning would be found amongst families in which either the child or the parent presented with more traits of ADHD. I also expected to find a synergistic interaction such that the worst family functioning would be found amongst families in which both the child and the parent experienced more traits of ADHD.

Questions related to developmental differences in the association between executive functioning and parenting stress/general family dysfunction (supplemental analysis):

- *Does the association between children's (and/or parents' executive functioning) and family factors (including parenting stress levels and general family functioning) differ at various stages of children's development?*

As a preliminary exploration which has been included as a supplemental analysis, I broadly predicted that there may be some differences observed in the association between executive functioning and psychosocial variables at the family level based on the child's level of development and dependent on the psychosocial variable of interest. As this was an exploratory endeavour, my hypotheses are speculative in nature. For example, it was expected that worse executive functioning in older children may be associated with more parenting stress in parents, given greater parental expectations for youth to manage more aspects of their day-to-day routine without necessary parental involvement. While these may be developmentally-appropriate expectations for teenaged-children, but outside of the capacity of a youth in which executive functioning deficits are present, this may result in possibly heightened stress for parents when their children are unable to meet their expectations or when parents view themselves as not having the resources to compensate for their older children's self-regulatory deficits as they are required to function increasingly independently outside of the home environment. In contrast, parents of younger children with executive functioning deficits may view it as more age-appropriate and normative to take on a more regulatory role in their younger children's lives, such that difficulties in younger children's self-regulation are perceived as more easily managed and/or are less likely to result in heightened stress for parents because parents perceive themselves as having the resources to cope with these additional demands. Where weaknesses exist in parents' own executive functioning, however, it may be that parenting stress levels are static across children's developmental stage to the extent that parents – regardless of children's developmental stage and needs – may feel greater parenting stress levels with any additional cognitive demands placed on them. With respect to general family functioning, it may be that any executive functioning deficits

– in either the parent or the child – result in strain on the overall family unit, such that there may be no differences which emerge across developmental stages.

These research questions were explored across three studies in which different samples completed measures of the variables of interest (detailed in the **Methods** section, below).

In the following chapters, explicit research questions are defined and analyzed across each of the three study samples. In Chapter 2, I provide descriptions/methodology of each of the three respective studies completed. In Chapter 3, I provide the results of preliminary analyses exploring associations between the variables of interest to my program of study. In Chapter 4, I provide empirical results related to the first research question, namely the association between children's and parents' executive functioning and parenting stress. Chapter 5 provides the results pertaining to the second research question which explored the association between children's and parents' ADHD traits and parenting stress. In Chapter 6, I provide results of the analyses exploring the association between executive functioning and parenting stress using computerized measures of executive functioning (with separate analyses of children's and parents' working memory, switching, and response inhibition). Chapter 7 provides the summary of empirical results exploring the associations of executive functioning (questionnaire-based and computer-based) and ADHD traits of both children and parents with the psychosocial variable of general family functioning. In Chapter 8, I present the results of supplementary analyses exploring whether the association between children's and/or parents' executive functioning and parenting stress levels/general family dysfunction differ at various stages of children's development. In the final chapter, I provide an overview of the results of my program of research pertaining to the research questions, while also

discussing the theoretical and clinical implications relating to both parenting stress and general family functioning.

Chapter 2: Methods

Section summary: This chapter provides a description of each of the three studies that I conducted for my dissertation. For each respective study, I provide information about the participants including sample demographics, as well as a discussion of the procedure and measures used.

Preschool-Aged Online Sample (Study 1)

This study was conducted to explore the association between variables of interest within families of preschool-aged children.

Participants

Mothers and fathers of children aged 3 to 5 years were recruited through Amazon Mechanical Turk (MTurk) to participate in this study[1]. One-hundred and twenty-seven parents initiated the study questionnaire. Data from 32 participants were removed from analyses (18 due to significant missing data on key measures, 10 due to having children whose age was outside of the recruited age range, two due to missing data on single parent status, and three due to unresolvable errors with the children's date of birth that made ascertainment of their age not possible). The final sample size was $N = 93$, and was comprised of 66.7% mothers ($M_{age} = 30.60$ years, $SD = 5.17$ years, range = 22-45 years) and 33.3% fathers ($M_{age} = 33.29$ years, $SD = 6.22$ years, range = 21-51 years). Household income for the responding parent was reported as follows: 5.4% was below $19999, 12.9% was between $20000-39999, 21.5% was between $40000-59999, 22.6% was between $60000-79999, 16.1% was between $80000-99999, and 21.5% of participants

[1] Research on the use of MTurk workers for completing psychological research has found these samples to be somewhat more diverse than other internet samples and considerably more so than undergraduate research participants thereby enhancing confidence in the generalizability of results to the broader population (Buhrmester et al., 2011). The same researchers also explored the quality of data provided by MTurk workers and concluded that data provided by MTurk workers met or exceeded the quality of data provided by more traditional samples. However, it is also the case that concerns have been raised about the use of data collected through MTurk in more recent years, and since collection of data for my program of research occurred (see **General Discussion**).

reported household incomes over $100000. Participants were also asked to report on the highest level of education completed by each of the biological parents. Education levels reported for biological mothers were as follows: 3.2% completed secondary school, 17.2% completed some community or technical college, 15.1% completed community or technical college, 14.0% completed some university or teacher's college, 34.4% completed university or teacher's college, and 16.1% had completed post-graduate studies (e.g., medical school, PhD). Education levels reported for biological fathers were as follows: 1.1% education unreported, 2.2% completed elementary school, 4.3% completed some secondary school, 9.7% completed secondary school, 19.4% completed some community or technical college, 4.3% completed community or technical college, 9.7% completed some university or teacher's college, 37.6% completed university or teacher's college, and 11.8% completed post-graduate studies.

In order to capture a broad range of behaviours, parents were asked to focus on one eligible child about whose behaviour they were most concerned in completing their questionnaire responses (37.6% daughters; M_{age} = 51.74 months, *SD* = 10.37 months, range = 36-71 months). Per parent report of their children's ethnicity, the sample was predominantly White/European (81.7%; 11.8% Black/African, 6.3% Other, 5.4% Hispanic, 3.2% Chinese, 2.2% West Indian, 1.1% East Indian, and 1.1% Aboriginal; note: Participants were invited to indicate identification with more than one ethnic group).

Procedures

Recruitment. All participants were recruited through MTurk and were residents of the United States. MTurk workers self-selected into a brief pre-screening survey asking about household demographic information. Based on the pre-screening, eligible participants were contacted via direct messaging through the MTurk interface. Eligibility criteria included being the

biological parent of at least one child between the ages of 3 to 5 years, who resided primarily in the respondent's home (i.e., at least 60% of the time). Participants were excluded from participating in this study if they had already participated in the study involving parents of older children aged 6 to 17 years (Study 2).

Process. Questionnaires were administered online through Qualtrics. Participants were asked to read the information letter and provide their informed consent to participate in the study taking up to 45 minutes. All questionnaires were standardized or well-validated within the research literature as measures of their respective constructs and were administered in a fixed order. All participants received $0.25USD for their participation in the pre-screening survey. Parents who participated in the current study were paid an additional $4.00USD for their participation. This study was approved through the Office of Research Ethics at the University of Waterloo.

Materials[2]. Participants were asked to complete eight questionnaires for the purpose of the study.

Parenting Stress. The Parental Stress Scale (PSS; Berry & Jones, 1995) was used as an index of parental stress levels. This 18-item scale asked parents to indicate level of agreement with statements assessing perceptions and feelings related to parenting experiences. For example, parents were asked to rate the extent to which they agreed with statements such as "I am happy in my role as a parent" and "The major source of stress in my life is my child(ren)." Factor analysis by the scale authors revealed a four-factor structure, with items tapping into reward, stressors, lack of control, and satisfaction associated with the parenting role. Items were rated on a 5-point scale ranging from (1) Strongly Disagree to (5) Strongly Agree, with higher scores reflecting greater levels of parenting stress. A total score, summing responses across all items, was used for these

[2] Of note, all measures used in the three studies reported here were part of larger studies (Appendix A). Only those measures used for the purpose of this dissertation are discussed further in each respective Materials subsection.

analyses to provide an estimate of overall parenting stress. Converging evidence suggests that when used this way, the PSS is a reliable and valid measure of parenting stress, with internal reliability estimates exceeding .83 (Berry & Jones, 1995; Zelman & Ferro, 2018). Consistent with the extant literature, the scale demonstrated good internal consistency in the current sample (Cronbach's alpha = .88).

General Family Functioning. A modified 18-item version of the Family Assessment Device (FAD; Epstein et al., 1983) was used to assess parents' perceptions of their family's general functioning. For example, parents were asked to rate the extent to which they agreed with statements such as "Planning family activities is difficult because we misunderstand each other" and "We don't get along well together." Participants rated items on a 4-point scale ranging from (1) Strongly Agree to (4) Strongly Disagree, with higher scores reflective of greater levels of impairment. The total raw score of the 12 items comprising the general family functioning (GFF) subscale was used in analyses. These items were selected by the scale developers to provide a summary measure of overall family health/pathology related to six broad domains of family functioning (problem solving, communication, roles, affective responsiveness, affective involvement, and behaviour control) reflected in the McMaster Model of Family Functioning (Epstein et al., 1983; Cooke et al., 2015). Research has indicated good validity and reliability for the GFF, including good internal consistency (Cronbach's alpha = .86; Byles et al., 1988). The 12-item general family functioning subscale demonstrated excellent internal consistency within this sample (Cronbach's alpha = .93).

Children's Executive Functioning. Participants completed the Ratings of Everyday Executive Functioning (REEF; Nilsen et al., 2017) questionnaire as a measure of children's executive functioning. Designed for use with preschool-aged children, the 76-item REEF asks

parents to rate their children on a 4-point scale ranging from (0) Is Not Able to (3) Always or Almost Always on the extent to which their children demonstrate behaviours indicative of age-appropriate executive functioning in their everyday lives. For example, parents were asked to rate the extent to which their children are able to "Follow instructions to a game without needing repeated directions" and "Wait for a reasonable period of time when asked to do so by an adult." The REEF has demonstrated excellent psychometric properties, including strong internal consistency (Cronbach's alpha = .97; Nilsen et al., 2017). The total raw score across all items was used in analyses as a measure of children's executive functioning with higher scores reflective of *better* executive functioning[3]. Cronbach's alpha for the full scale was .96, reflecting excellent internal consistency in this sample.

Children's ADHD. The Strengths and Weaknesses of ADHD-symptoms and Normal-behaviours (SWAN) Rating Scale (Swanson et al., n.d.) is a parent-filled questionnaire/symptom checklist that measures traits associated with ADHD as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013). Each item is scored on a 7-point scale ranging from (+3) Far below average to (-3) Far above average, with higher scores (i.e., far below average) reflecting greater levels of difficulty relative to same-aged peers. For example, parents were asked to rate their children relative to their peers on their ability to "Give close attention to detail and avoid careless mistakes" and "Sit still (control movement of hands/feet or control squirming)." The overall internal consistency of the SWAN is excellent (Cronbach's alpha = .95; Lakes et al., 2012). Cronbach's alpha in the current sample was .96. The total average item score across eighteen items reflecting symptoms of inattention and hyperactivity-impulsivity

[3] While higher scores on the REEF reflect *better* functioning, higher scores on all other measures reflect *worse* functioning. For example, a higher score on the REEF indicates that children possess better developed executive functioning skills, while a higher score on the BDEFS-CA reflects more poorly developed executive functioning/more executive *dys*function.

was used as a measure of children's ADHD traits, while the total average item score across the eight items assessing oppositional behaviour was used to control for these behaviours in analyses. Each of these variables had excellent internal consistency within the current sample, with Cronbach's alphas of .94 and .93, respectively.

Parents' Executive Functioning. Parents' executive functioning was assessed using the Barkley Deficits in Executive Functioning Scale – Short Form: Self Report (BDEFS-SR; Barkley, 2011). This questionnaire asked parents to complete 20 items reflective of their own executive functioning abilities. Items cover five domains including self-management to time, self-organization/problem-solving, self-motivation, self-restraint, and self-regulation of emotions. Items are rated on a 4-point scale ranging from (0) Did not apply to me at all to (3) Applied to me very much, or most of the time. A recent exploration of the factor structure of the Short Form found evidence of a general factor supporting the use of the overall scale as a measure of executive functioning (Clauss et al., 2021). The BDEFS-SR possesses good psychometric proprieties, with strong internal consistency for the 20-item overall scale (Cronbach's alpha = .92; Barkley, 2011). Total raw scores on this measure were used in the analyses, with higher scores reflective of greater levels of executive impairment. The 20-item scale demonstrated excellent internal consistency in this sample (Cronbach's alpha = .95).

Parents' ADHD. Parents' ADHD was assessed using the Conners Adult ADHD Rating Scale – Self Report Short Version (CAARS-SR; Conners et al., 1999). Participants completed 26 items assessing their own ADHD traits and associated behaviours on a 4-point scale ranging from (0) Not at all/Never to (3) Very Much/Very Frequently. Total raw scores on the 15 items comprising the Inattention/Memory, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscale were summed and used in analyses as an index of parental ADHD. The CAARS-SR possesses

good psychometric properties and good internal consistency, with Cronbach's alpha estimates for the various subscales at or above .80 (Conners et al., 1999; Amador-Campos et al., 2014). Internal consistency in the current sample was good, with Cronbach's alpha = .93 for the overall questionnaire and .89 for the 15 items comprising the parental ADHD variable.

Background Questionnaire. Background information about the child and their family was extracted from a parent-completed background questionnaire that was developed for the study. Information obtained included developmental information, health history, family composition, and household demographics. Information from the background questionnaire was used to characterize the study sample, as well as to examine and control for various background factors in analyses.

Parents' Emotional Distress. The Depression Anxiety Stress Scale 21 (DASS-21; Lovibond & Lovibond, 1995) provided an overall estimate of participants' emotional distress by asking parents to report on their experience of symptoms associated with depression, anxiety, and stress. Seven items measure each of these constructs, respectively, by having respondents rate the applicability of each item on a 4-point scale ranging from (0) Did not apply to me at all to (3) Applied to me very much, or most of the time. Cross-cultural research has demonstrated strong psychometric properties for the DASS-21 (e.g., Thiyagarajan et al., 2022), with an overall Cronbach's alpha of .96. Cronbach's alpha in the current sample was .96, consistent with the literature. The total raw score on the Stress subscale was used to control for parents' general stress level in some analyses, with higher scores reflecting greater levels of difficulty. Sample items from this subscale include "I tended to over-react to situations" and "I found it difficult to relax." The 7-item Stress subscale demonstrated excellent internal consistency in the present sample (Cronbach's alpha = .90, consistent with reliability estimates of .89 in the extant literature [Thiyagarajan et al., 2022]).

School-Aged Online Sample (Study 2)

This study was conducted to address the same questions as addressed in the first study (Preschool-Aged Online Sample), but with an older sample of children.

Participants

Mothers and fathers of children aged 6 to 17 years were recruited through MTurk to participate in this study. One-hundred and twenty-eight parents initiated the study questionnaire. Data from seven participants were removed from analyses due to significant missing responses on key measures, and eight participants were removed due to having children who fell outside of the recruited age range. The final sample size was $N = 113$, and was comprised of 72.6% mothers (M_{age} = 37.81 years, SD = 6.72 years, range = 25-54 years) and 27.4% fathers (N = 112 M_{age} = 40.07 years, SD = 7.40 years, range = 25-62 years). Household income for the responding parent was reported as follows: 3.5% fell below $19999, 21.2% fell between $20000-39999, 23.0% fell between $40000-59999, 24.8% fell between $60000-79999, 12.4% fell between $80000-99999, and 15.0% of participants reported household incomes over $100000. Participants were also asked to report on the highest level of education completed by each of the biological parents. Education levels reported for biological mothers were as follows: 2.7% completed some secondary school, 16.8% completed secondary school, 23.0% completed some community or technical college, 12.4% completed community or technical college, 6.2% completed some university or teacher's college, 27.4% completed university or teacher's college, and 11.5% had completed post-graduate studies (e.g., medical school, PhD). Education levels reported for biological fathers were as follows: 6.2% completed some secondary school, 27.4% completed secondary school, 15.9% completed some community or technical college, 10.6% completed community or technical

college, 13.3% completed some university or teacher's college, 17.7% completed university or teacher's college, and 8.8% completed post-graduate studies.

In an effort to tap into a broad range of children's behaviours, parents were asked to focus on the behaviour of one child about whose behaviour they were most concerned in completing their questionnaire responses (47.8% daughters; M_{age} = 136.87 months, *SD* = 42.36 months, range = 73-215 months). Per parent report of their children's ethnicity, the sample was predominantly White/European (85.0%; 13.3% Hispanic, 7.1% Black/African, 1.8% Other, 0.9% Chinese, 0.9% East Indian, 0.9% Japanese, and 0.9% Middle Eastern; note: Participants were invited to indicate identification with more than one ethnic group).

Procedures

Recruitment. The same procedures for recruitment through MTurk were used as for Study 1. Eligibility criteria for an invitation to participate in the current study included being the biological parent of at least one child between the ages of 6 to 17 years, who resided primarily in the respondent's home (i.e., at least 60% of the time). Participants were excluded from participating in this study if they had already participated in Study 1 involving parents of younger children aged 3 to 5 years.

Process. Questionnaires were administered online through Qualtrics. Participants were asked to read the information letter and provide their informed consent to participate in the study taking up to 50 minutes. All questionnaires were standardized or well-validated within the research literature as measures of their respective constructs, and were administered in a fixed order. All participants received $0.25USD for their participation in the pre-screening survey. Parents who then participated in the current study received an additional $6.00USD for their participation. This study was approved through the Office of Research Ethics at the University of Waterloo.

Materials. Participants were asked to complete eight questionnaires for the purpose of the study. Measures for Study 2 were the same as for Study 1, with the exception of measures of children's executive functioning and ADHD traits. For those measures used in Study 1, additional details regarding their psychometric properties can be found in the Methods sections for that study (above).

Parenting Stress. The 18-item Parental Stress Scale (PSS; Berry & Jones, 1995) was used as an index of stress associated with the parenting role. Consistent with psychometric research, the scale demonstrated good internal consistency in the current sample (Cronbach's alpha = .88).

General Family Functioning. The 12-item General Family Functioning Scale from the modified version of the Family Assessment Device administered (FAD; Epstein et al., 1983) was used to examine parents' perceptions of their family's general functioning. This subscale demonstrated excellent internal consistency within this sample (Cronbach's alpha = .95), exceeding estimates from the psychometric literature.

Children's Executive Functioning. Children's executive functioning was assessed using the Barkley Deficits in Executive Functioning Scale – Children and Adolescents: Short Form (BDEFS-CA; Barkley, 2012). Parents rated their children on a 4-point scale from (1) Never or Rarely to (4) Very Often reflecting the extent to which they demonstrate 20 behaviours indicative of executive dysfunction (with items assessing self-management to time, self-organization, self-restraint, self-motivation, and self-regulation of emotion). The 20-item scale has demonstrated good psychometric properties, with strong internal consistency (Cronbach's alpha = .95; Barkley, 2012). Total raw scores were used in analyses, with higher scores reflecting greater levels of executive impairment. This scale demonstrated excellent internal consistency within this sample (Cronbach's alpha = .97).

Children's ADHD. The Conners 3 – Parent Short Form (Conners 3-P; Conners, 2008) was used to assess the presence of symptoms associated with ADHD in children. This questionnaire is comprised of 43 items which assess the presence of ADHD traits and other behaviours on a 4-point scale ranging from (0) Not At All True to (3) Very Much True, as well as two qualitative questions asking about parents' perceptions of their children's behaviour. The Conners 3-P has been found to have generally strong psychometric properties, with estimates of internal consistency for most scales exceeding .72 (Conners, 2008; Izzo et al., 2019). Cronbach's alpha was .94 for the overall 43-item scale in the current sample, reflecting strong internal consistency. Raw scores were tallied across the 11 items comprising the inattentive and hyperactive-impulsive dimensions (with higher scores reflecting greater levels of impairment) as the variable representing children's ADHD. Raw scores on the aggression subscale were used to control for oppositional behaviours that can be comorbid with ADHD. Cronbach's alpha was .94 for the derived ADHD variable (reflecting excellent internal consistency), while Cronbach's alpha for the aggression subscale was .85 (reflecting good internal consistency exceeding estimates of lower reliability in the extant literature [e.g., Cronbach's alpha = .47 in Izzo et al., 2019]).

Parents' Executive Functioning. Parents' executive functioning was estimated using the Barkley Deficits in Executive Functioning Scale – Short Form: Self Report (BDEFS-SR; Barkley, 2011). The 20-item scale demonstrated excellent internal consistency in this sample (Cronbach's alpha = .91) consistent with estimates from the literature.

Parents' ADHD. The Conners Adult ADHD Rating Scale – Self Report Short Version (CAARS-SR; Conners et al., 1999) was used to assess symptoms associated with ADHD in parents. The total raw score across 15 items assessing Inattention/Memory,

Hyperactivity/Restlessness, and Impulsivity/Emotional Lability demonstrated good internal consistency in the current sample (Cronbach's alpha = .84).

Background Questionnaire. Background information about the child and their family was obtained using a parent-completed background questionnaire that was developed by the researchers. Information was used to characterize the study sample, and to control for some background factors in analyses.

Parents' Emotional Distress. The seven items comprising the Stress subscale of the 21-item Depression Anxiety Stress Scale 21 (DASS-21; Lovibond & Lovibond, 1995) were used to control for parents' general stress levels in some analyses. Consistent with internal consistency estimates from the literature, the DASS-21 demonstrated strong internal consistency in the current sample (Cronbach's alpha = .94 for the overall questionnaire, and .88 for the 7-item Stress subscale).

School-Aged Community Sample (Study 3)

This study – completed with a sample of school-aged children and their mothers from the community – explored the same questions as those explored in the preceding two studies with online samples, in addition to including computerized task-based measures of executive functioning. Mothers were selectively sampled for this study given that the broader research literature cites that mothers often continue to assume primary caretaking responsibilities cross-culturally (e.g., Cuevas et al., 2014a, b; Park et al., 2022).

Participants

Biological mother-child dyads with children aged 8 to 17 years were recruited from the local community to participate in this two-part study. Fifty-six dyads initiated participation in at least one part of the study. Data from four participants were removed from analyses (one due to

the child withdrawing consent, one due to the child being outside of the designated age range, one due to the child being adopted by the mother given that the study was focused on biological child-parent dyads, and one due to failure to complete the questionnaires). The final sample size for questionnaire completion was $N = 52$ mothers ($M_{age} = 42.92$ years, $SD = 5.00$ years, range = 35-55 years). All but one of the mothers also reported on demographic information for biological fathers ($N = 51$ fathers: $M_{age} = 44.25$ years, $SD = 5.43$ years, range = 37-59 years). The following household income was reported for the mothers' households: 7.7% fell between $40000-59999, 13.5% fell between $60000-79999, 9.6% fell between $80000-99999, and 69.2% of participants reported household incomes over $100000. Participants were also asked to report on the highest level of education completed by each of the biological parents. Education levels reported for biological mothers were as follows: 1.9% completed secondary school, 3.8% completed some community or technical college, 11.5% completed community or technical college, 5.8% completed some university or teacher's college, 42.3% completed university or teacher's college, and 34.6% had completed post-graduate studies (e.g., medical school, PhD). Education levels reported for biological fathers were as follows: 3.8% completed some secondary school, 7.7% completed secondary school, 1.9% completed some community or technical college, 25.0% completed community or technical college, 1.9% completed some university or teacher's college, 44.2% completed university or teacher's college, and 15.4% completed post-graduate studies.

In an effort to survey a broad range of children's behaviours, parents were asked to focus on the behaviour of one child about whose behaviour they were most concerned in completing their questionnaire responses (59.6% daughters; $M_{age} = 138.17$ months, $SD = 28.91$ months, range = 97-198 months). Per parent report of their children's ethnicity, the sample was predominantly

White/European (94.2%; 3.8% Aboriginal, 1.9% Hispanic, 1.9% West Indian, and 1.9% Other; Note: Participants were invited to indicate identification with more than one ethnic group).

Procedures

Recruitment. Potential participants were recruited through three databases maintained by research labs in the Department of Psychology at the University of Waterloo (Child and Adolescent Clinical Research Group, Child and Adolescent Neuropsychology Lab, and Cognitive Development Lab), as well as through the local community (school and community flyers, and in-person recruitment at a parent-teacher conference night and local farmers market). Eligibility criteria included being biologically-related mother-child dyads, with children aged 8 to 17 years who resided primarily in the home of their biological mothers (i.e., at least 60% of the time). Participants self-identified as being fluent at reading and speaking English, and as not having any significant uncorrected visual, hearing, or physical impairments that would interfere with answering questionnaires, watching visual stimuli on a computer screen, or pressing computer keys. Mothers who indicated that either they or their child had diagnoses of ADHD were asked to disclose the use of stimulant medication by either themselves or their child (n = 1 mother, and n = 2 children), though it is unclear from the data recorded whether medication was taken on the day of testing.[4]

Process. This study was comprised of two phases. In the first, mothers completed a series of online questionnaires which were administered through Qualtrics. Mothers were asked to read the information letter and provide informed consent to participate in the study. Completed as part of a broader research project, a subset of participants completed a more in-depth series of fifteen

[4] Parents for the in-lab study were asked to consider their own/children's behaviour when not under the influence of any prescribed medications that influence behaviour (e.g., for ADHD). Online samples were asked to note medication status. However, medication status was not controlled for in analyses as given the low rates of usage reported, it was deemed unlikely to be relevant to the research questions.

questionnaires[5], which required up to 1 hour and 45 minutes. The remainder of participants completed a smaller series of eleven questionnaires which required up to 1 hour of their time.

In the second phase, the mother-child dyads were scheduled to participate in an in-lab visit that required approximately 1 hour and 30 minutes. Mothers and children were asked to provide their written consent to participate in the study. Mothers and children were then taken to separate rooms, where they completed computerized and non-computerized tasks in a standardized order to assess their executive and general cognitive functioning[6].

Mothers received a $10 gift card for completing the online questionnaires. Mothers and children each received an additional $10 gift card for completing the in-lab visit. This study was approved through the Office of Research Ethics at the University of Waterloo.

Materials. Participants were asked to complete eight questionnaires for the purpose of the study. Additional details regarding the questionnaires and their psychometric properties can be found in the Methods for Studies 1 and 2.

Parenting Stress. The 18-item Parental Stress Scale (PSS; Berry & Jones, 1995) was used to estimate parenting stress. The estimate of internal consistency in the current sample was consistent with reliability reported in the literature (Cronbach's alpha = .84).

General Family Functioning. A modified 18-item version of the Family Assessment Device (FAD; Epstein et al., 1983) was administered, and a 12-item subscale was used to assess parents' perceptions of their general family functioning. A strong estimate of internal consistency

[5] A subset of mothers was also asked to approach two other adults (i.e., the child's teacher, and a partner, friend or family member of the mother) to provide observer reports via paper questionnaires of the children's and mothers' behaviours, respectively. A subset of children also completed self-report questionnaires of symptoms associated with anxiety and depression. This data was not analyzed for the current dissertation.

[6] The two-version subtest of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) including Vocabulary and Matrix Reasoning was completed by some in-lab participants, while others completed only the Matrix Reasoning subtest. These data were not included in the current dissertation.

in this sample was consistent with psychometric data reported in the extant literature (Cronbach's alpha = .90).

Children's Executive Functioning. Children's executive functioning was assessed using the 20-item parent-rated Barkley Deficits in Executive Functioning Scale – Children and Adolescents: Short Form (BDEFS-CA; Barkley, 2012). The scale demonstrated excellent internal consistency in the current sample (Cronbach's alpha = .95).

Children's ADHD. The Conners 3 – Parent Short Form (Conners, 2008) was used to assess symptoms associated with ADHD in children, with the total raw score on 11 items measuring inattention and hyperactivity-impulsivity used in analyses. Raw scores on the aggression subscale were also used to control for oppositional behaviours in children. Consistent with the results in Study 2, the internal reliability for the overall 43-item measure (Cronbach's alpha = .93) and the derived estimate of ADHD (Cronbach's alpha = .95) were strong in this sample, and internal reliability was also good for the aggression subscale (Cronbach's alpha = .83).

Parents' Executive Functioning. Parents' executive functioning was assessed using the Barkley Deficits in Executive Functioning Scale – Short Form: Self Report (BDEFS-SR; Barkley, 2011). The 20-item scale demonstrated excellent internal consistency in this sample (Cronbach's alpha = .90) consistent with psychometric properties in the literature.

Parents' ADHD. Fifteen items from the Conners Adult ADHD Rating Scale – Self Report Short Version (CAARS-SR; Conners et al., 1999) were used to estimate symptoms associated with ADHD in parents. This index of ADHD demonstrated good internal consistency in the present sample (Cronbach's alpha = .85).

Background Questionnaire. Mothers completed the same background information questionnaire as used in the previous studies, with information used to characterize the sample and control for relevant variables in analyses.

Parents' Emotional Distress. The 7-item Stress subscale of the Depression Anxiety Stress Scale 21 (DASS-21; Lovibond & Lovibond, 1995) was used to control for parents' general stress levels in some analyses. Similar to the psychometric literature, this subscale demonstrated good internal consistency in the present sample (Cronbach's alpha = .85).

Executive Functioning. Mothers and children completed identical task-based measures of executive functioning assessing working memory, switching, and response inhibition. An understanding of and ability to complete task requirements was established through the use of demonstration and practice items prior to task items administration. This practice was repeated, as needed, on the working memory and switching tasks to ensure (in particular) that the task demands were suitable to the child participants. For the response inhibition task, item difficulty was based on performance via dynamic tracking to ensure that the difficulty level was appropriate to the ability of the participant. Similar tasks have been used to measure executive functioning across child and adult populations in other research (e.g., working memory: Yaple & Arsalidou [2018] and Yaple et al. [2019]; switching: Cepeda et al. [2000] and Reimers & Maylor [2005]; response inhibition: Bedard et al., 2002).

Working Memory Task. A computerized 2-back measure of visual-spatial working memory (e.g., McAuley & White, 2011) was used as an index of working memory. On each trial, a geometric design appeared at a spatial location on the screen. Participants indicated whether or not the location was the same as that presented two trials before via a speeded keypress response (pressing either the d or the l keys; trained on 12 practice trials with feedback, and repetition of

instructions and practice as needed). To be successful on this task, participants had to hold in mind and continually update the location of the stimulus presented two trials prior, while simultaneously making and executing a decision about the match of the location. Participants held previous locations of stimuli in mind while making decisions about those locations relative to the newly presented location, requiring both holding and updating of information in mind throughout the duration of the task. Ninety-six trials were presented. A measure of discriminability (d prime) was used as an estimate of working memory and was calculated as the difference between z-score transformations of hits less false alarms (Haatveit et al., 2010). Scores were reverse coded to be consistent with other measures of executive functioning in which higher positive scores reflected weaker executive functioning. A total $N = 46$ mother-child pairs completed the working memory task.

Switching Task. Participants completed a computerized measure of mental flexibility that used an abbreviated alternating runs paradigm (e.g., Cepeda et al., 2000). The paradigm consisted of three blocks. Block 1 consisted of 24 trials in which participants quickly responded via trained key press to the location of the stimulus (left or right side of screen by pressing the d or the l keys, respectively; trained on ten practice trials), and Block 2 consisted of 24 trials in which participants quickly responded to the identity of the stimulus (one of two geometric designs; trained on ten practice trials). Block 3 consisted of 72 mixed trials in which participants quickly alternated between location or identity judgment every two trials, with a central cue (a picture of an arrow when required to respond based on location, and a picture of a question mark when required to respond based on identity) signaling the appropriate response set. Responses were indicated via speeded key press using the d and l keys, and were trained on ten practice trials with feedback and optional repetition of instructions and practice as needed. Within each block, a response initiated

the next trial up until 2.5 seconds after the stimulus had appeared. Trials were separated by a variable interval of 300-600 ms, with errors indicated by a tone. Switch cost, reflecting the slowing of response times and reduced accuracy that occur when switching demands increase (Dajani & Uddin, 2015), was computed within Block 3 as the difference between mean correct RT for trials on which a switch did and did not occur, with higher scores reflecting poorer switching. A total of $N = 46$ mother-child pairs completed the task-based measure of switching.

Response Inhibition. Participants completed a computerized measure of response inhibition that used identical stimuli and response modality as the switching task described above. In this version of the stop-signal task (Logan & Cowan, 1984), participants made a speeded keypress response depending on the identity of the stimulus (i.e., one of two geometric designs), but were required to stop or withhold the initiated response when they heard an auditory stop tone (i.e., the stop signal). Timing of the stop signal was determined using a dynamic tracking algorithm, such that participants were able to successfully inhibit their response on 50% of stop trials. Participants were presented with 128 trials over four blocks (following training on 12 trials, instructions could be verbally clarified but there was no option to repeat the computerized instructions and practice; participants already had significant practice with response mappings for go trials as they were identical to the previously completed switching task). Stop signal cues were presented on 25% of all trials. Stop signal time was calculated as the difference between mean correct RT to respond to the stimuli and mean stop-signal delay, wherein a higher score reflected weaker response inhibition. Previous research has established the SSRT as a reliable measure of inhibitory control across development (e.g., Congdon et al., 2012). Data from two mother-child pairs from the sample were eliminated due to errors in data on the task-based measure of response inhibition, resulting in data from $N = 44$ pairs being included in analyses.

Chapter 3: Preliminary Analyses

Section summary: This chapter presents preliminary analyses which were conducted to ascertain if expected associations between the variables emerged prior to conducting more advanced analyses related specifically to the research questions (provided in subsequent chapters). Correlations between all proposed control variables, as identified in the extant literature, and partial correlations exploring the association between key variables of interest while controlling for the influence of the identified control variables, were examined. Correlations, partial correlations, and descriptive statistics are presented in the current chapter. The alpha level for statistical significance was set at $p < .05$ for all analyses; however, marginal findings ($p < .10$) are mentioned when the analysis is specific to the research questions I seek to address. Due to power issues related to small sample sizes discussed elsewhere, I also examined 95% confidence intervals from the school-aged online sample (the largest sample which achieved adequate power, and in which there can be the most confidence in the estimates) to determine if the point estimates from the correlational analyses for the two smaller samples (preschool-aged online and school-aged community samples) fell within those intervals. Where these point estimates fell within the range of statistically significant estimates from the school-aged online sample, I have also interpreted those estimates as reflecting a similar pattern of results even if statistical significance was not achieved. Although there can be less confidence in results in which statistical significance was not obtained, this approach was taken so as not to obscure potential associations that may have practical relevance and which can be assessed in future research.

Preliminary Analyses

Scores for analyses were examined for statistical outliers by exploring standardized values. Values that exceeded 3*SD* from the mean were winsorized to 3*SD*. The number of questionnaire

scores that were winsorized in each of the respective samples are reported in Appendix B. Given the possibility that outliers on computerized tasks could reflect extraneous factors including distraction or other types of errors, a conservative approach for identifying statistical outliers on the computerized measures of executive functioning was taken. Specifically, outliers on the computerized tasks were identified at the trial level and deleted prior to creating summary measures of each respective construct.

Control Variables

Proposed control variables were identified based on their associations with parenting stress in the extant literature. These included children's age (in months), children's gender (0 = girl, 1 = boy), children's aggression levels (preschool-aged sample: average item score on SWAN ODD subscale; school-aged samples: total raw score on Conners 3 Aggression subscale), and single parent status (0 = not a single parent, 1 = single parent).[7] Descriptive statistics and intercorrelations amongst the control variables are presented in Tables 1 through 3 for each of the study samples.

Preschool-aged online sample. In the preschool-aged online sample, there was a positive association between children's gender and aggression such that aggressive behaviours were more likely to be reported by parents of boys, $r(91) = .26$, $p = .013$.

School-aged online sample. In the school-aged online sample, there was a significant negative association between children's aggression levels and single parent status with higher levels of children's aggression being reported by parents who did not report having single parent status, $r(111) = -.22$, $p = .021$. Although not statistically significant, there was also a trend-level

[7] Parents' general stress levels were also controlled for in some analyses to ascertain whether the pattern of results differed if accounting for overall stress levels. Parents' general stress levels were quantified as parents' total raw scores on items measuring Stress on the DASS-21. These analyses will be reported in subsequent chapters.

association between children's age and gender, suggesting that boys were older than girls in this sample, $r(111) = .17$, $p = .067$.

School-aged community sample. In the school-aged community sample, there were positive associations between children's age and children's gender, $r(50) = .35$, $p = .012$, with boys older than girls. There was also a positive association between children's age and single parent status, with single parent status being reported more by parents of older children, $r(50) = .40$, $p = .004$.

Table 1

Descriptive Statistics and Correlations for Control Variables in Preschool-Aged Online Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
1. Child Age	51.74	10.37	—			
2. Child Gender [a]	—	—	.00	—		
3. Child Aggression	-.22	1.07	.01	.26*	—	
4. Single Parent [a]	—	—	-.08	.06	.04	—

Note. $N = 93$ for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale (higher score reflects worse functioning). Single Parent = single parent status (0 = not a single parent, 1 = a single parent).

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

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

Table 2

Descriptive Statistics and Correlations for Control Variables in School-Aged Online Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
1. Child Age	136.87	42.36	—			
2. Child Gender [a]	—	—	.17[t]	—		
3. Child Aggression	1.53	2.52	-.01	.14	—	
4. Single Parent [a]	—	—	-.11	-.07	-.22*	—

Note. $N = 113$ for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale (higher score reflects worse functioning). Single Parent = single parent status (0 = not a single parent, 1 = a single parent).

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

[t]$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3

Descriptive Statistics and Correlations for Control Variables in School-Aged Community Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
1. Child Age	138.17	28.91	—			
2. Child Gender [a]	—	—	.35*	—		
3. Child Aggression	1.49	2.29	.04	.08	—	
4. Single Parent [a]	—	—	.40**	.20	.22	—

Note. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale (higher score reflects worse functioning). Single Parent = single parent status (0 = not a single parent, 1 = a single parent).

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

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

Correlations between the proposed control variables and the key variables of interest are presented in Tables 4 through 7 for each of the three samples.

Preschool-aged online sample. In the preschool-aged sample, children's age was correlated with children's executive functioning such that younger children were reported as having weaker executive functioning, $r(91) = .28$, $p = .007$. Having younger children was also associated with more general family dysfunction, $r(91) = -.28$, $p = .007$. There was a trend-level association between children's gender and executive functioning such that parents of boys tended to report weaker executive functioning in their children, $r(91) = -.19$, $p = .064$. Higher levels of parent-reported aggression in children were associated with higher levels of ADHD traits in children, $r(91) = .77$, $p < .001$, weaker executive functioning in children, $r(91) = -.58$, $p < .001$, and higher levels of parent-reported parenting stress, $r(91) = .22$, $p = .031$. Although there is less certainty due to being underpowered in this sample, a comparison of point estimates from this sample and the confidence intervals from the school-aged online sample (below) also suggested that higher levels of aggression in children was associated with greater levels of general family dysfunction in families with preschool-aged children, $r(91) = .16$, $p = .138$.

School-aged online sample. In the school-aged online sample, children's age was correlated with children's ADHD traits, such that younger children were reported as having more ADHD-associated behaviours, $r(111) = -.24$, $p = .010$. Parents of boys were more likely to report higher levels of their own ADHD traits, $r(111) = .21$, $p = .024$. Children's aggression levels had a significant positive association with children's ADHD traits, such that higher levels of aggression were reported by parents who also reported higher levels of ADHD-associated behaviours in their children, $r(111) = .40$, $p < .001$. Higher levels of parent-reported aggression in children were also associated with weaker executive functioning in their children, $r(111) = .52$, $p < .001$, higher

parent-reported parenting stress levels, $r(111) = .37$, $p < .001$, and greater levels of general family dysfunction, $r(111) = .32$, $p = .001$. Finally, parents who reported having single parent status reported less parenting stress, $r(111) = -.24$, $p = .010$.

School-aged community sample. In the school-aged community sample, parents of boys were more likely to report higher levels of ADHD traits in their children, $r(50) = .29$, $p = .036$. Higher levels of parent-reported aggression in their children were associated with all key variables of interest, including higher levels of ADHD traits in children, $r(50) = .60$, $p < .001$, weaker executive functioning in children, $r(50) = .67$, $p < .001$, higher levels of parents' own self-reported ADHD traits, $r(50) = .52$, $p < .001$, and parents' weaker executive functioning, $r(50) = .31$, $p = .025$. Children's higher aggression levels were also associated with higher levels of parent-reported parenting stress levels, $r(50) = .47$, $p < .001$, and greater levels of general family dysfunction, $r(50) = .33$, $p = .017$. Although there is less certainty due to being underpowered in this sample, a comparison of point estimates from this sample and the confidence intervals from the school-aged online sample also suggested that parents who reported having single parent status reported less parenting stress, $r(50) = -.07$, $p = .616$.

As shown in Table 7, children's age was also negatively correlated with computerized measures of children's response inhibition, $r(42) = -.51$, $p < .001$, and children's working memory, $r(44) = -.52$, $p < .001$, such that younger children were more likely to have weaker inhibitory control and a smaller working memory capacity.

Table 4

Descriptive Statistics and Correlations with Control Variables for Key Variables in Preschool-Aged Online Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
Child ADHD	-.67	1.84	-.01	.13	.77***	.00
Child EF	163.72	28.43	.28**	-.19[t]	-.58***	.05
Parent ADHD	13.95	7.73	-.10	-.13	.11	.05
Parent EF	35.08	11.93	-.14	-.17	.05	-.02
Parenting Stress	42.05	10.54	-.07	-.03	.22*	.02
Family Dysfunction	20.68	6.83	-.28**	.04	.16	.03

Note. $N = 93$ for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = total average item score on SWAN Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on REEF (in contrast to all other measures, *lower* scores reflect worse executive functioning). Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on Child Aggression, Child ADHD, Parent ADHD, Parent EF, Parenting Stress, and Family Dysfunction all reflect worse functioning.

Table 4 (continued)**.**

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 5

Descriptive Statistics and Correlations with Control Variables for Key Variables in School-Aged Online Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
Child ADHD	9.97	8.32	-.24*	.06	.40***	-.06
Child EF	40.55	15.49	-.01	.12	.52***	-.02
Parent ADHD	10.31	6.69	.02	.21*	.13	-.05
Parent EF	29.94	8.58	-.06	.11	.11	-.04
Parenting Stress	39.24	10.51	-.04	.09	.37***	-.24**
Family Dysfunction	20.23	7.00	.10	.09	.32**	-.09

Note. $N = 113$ for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on BDEFS-CA. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures (Child Aggression, Child ADHD, Child EF, Parent ADHD, Parent EF, Parenting Stress, and Family Dysfunction) reflect worse functioning.

Table 5 (continued)**.**

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

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

Table 6

Descriptive Statistics and Correlations with Control Variables for Key Variables in School-Aged Community Sample

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
Child ADHD	8.14	7.74	.05	.29*	.60***	-.03
Child EF	38.00	13.37	.06	.18	.67***	.13
Parent ADHD	9.23	6.31	-.17	-.09	.52***	.12
Parent EF	29.38	8.39	-.07	-.17	.31*	.07
Parenting Stress	37.42	8.89	-.20	-.05	.47***	-.07
Family Dysfunction	20.47	5.90	.19	-.20	.33*	.01

Note. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on BDEFS-CA. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures (Child Aggression, Child ADHD, Child EF, Parent ADHD, Parent EF, Parenting Stress, and Family Dysfunction) reflect worse functioning.

Table 6 (continued)**.**

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

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

Table 7

Descriptive Statistics and Correlations with Control Variables for Key Variables in School-Aged Community Sample (Computerized Measures of EF)

Variable	*M*	*SD*	Child Age	Child Gender [a]	Child Aggression	Single Parent [a]
Child WM	0.00	1.99	-.52***	-.23	.16	-.23
Child Switching	34.57	79.30	-.04	-.06	.01	.20
Child RI	362.63	105.57	-.51***	-.22	.15	-.14
Parent WM	0.00	1.99	.12	.09	-.09	-.15
Parent Switching	69.57	84.52	.24	-.07	-.07	-.02
Parent RI	299.75	50.02	.16	.24	-.00	.06

Note. $N = 52$ for the overall school-aged community sample. Valid $N = 44$ for measure of Response Inhibition (RI = SSRT on Stop-Signal Response Inhibition task), and $N = 46$ for measures of Working Memory (WM = d prime on 2-back Working Memory task) and Switching (Switching = Switch Cost RT on Switching task). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Higher scores on all measures (Child Aggression, Child WM, Child Switching, Child RI, Parent WM, Parent Switching, and Parent RI) reflect worse functioning.

[a] Point-biserial correlations are reported for correlations between continuous and categorial variables.

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

Associations Between Variables of Interest (Bivariate and Partial Correlations)

Bivariate correlations and partial correlations controlling for children's age, children's gender, children's aggression levels, and single parent status are presented in Tables 8 through 13, for each of the respective samples. Partial correlations are discussed in the text, with both bivariate and partial correlations presented in the tables. Given the emergence of statistically-significant associations between control variables and key variables of interest in some or all of the samples (see Tables 4 through 7), each of the proposed control variables were entered into all analyses addressing the main research questions. This decision was further supported with an examination of the multiple correlation coefficients (R) between the *set* of control variables and each respective key variable of interest across the samples. To determine the R-values, multiple regression analyses were conducted with each of the six key variables of interest (children's ADHD, children's executive functioning, parents' ADHD, parents' executive functioning, parenting stress levels, and general family dysfunction) as the dependent variables predicted by the set of proposed control variables (children's age, children's gender, children's aggression levels, and single-parent status). Results of these analyses are detailed below, with the set of control variables predicting children's ADHD traits, children's executive functioning, and general family functioning across all three samples, as well as predicting parenting stress levels across the two school-aged samples (online and community) and parents' ADHD traits in the community sample.

In the preschool-aged online sample, an examination of the multiple correlations of the complete set of four control variables and each respective variable of interest revealed that the control variables were significant predictors of children's ADHD, $R(91) = .77$, $p < .001$, children's executive functioning, $R(91) = .65$, $p < .001$, and general family dysfunction, $R(91) = .32$, $p = .049$. Main effects were found for children's aggression, with higher aggression levels associated with

more ADHD traits in children, β = .79, $p < .001$, and weaker executive functioning in children, β = -.57, $p < .001$; and children's age, with younger age associated with weaker executive functioning in children, β = .29, $p < .001$, and higher levels of general family dysfunction, β = -.28, $p = .007$. The multiple correlations did not achieve statistical significance for predicting parents' ADHD traits, $R(91) = .23$, $p = .317$, parents' executive functioning, $R(91) = .24$, $p = .254$, or parenting stress levels, $R(91) = .25$, $p = .210$, in this sample.

In the school-aged online sample, the set of control variables were significant predictors of children's ADHD traits, $R(111) = .47$, $p < .001$, children's executive functioning, $R(111) = .53$, $p < .001$, parenting stress levels, $R(111) = .41$, $p < .001$, and general family dysfunction, $R(111) = .34$, $p = .011$. Main effects were found for children's age, with more traits of ADHD observed in younger children, β = -.25, $p = .006$; children's aggression levels, with higher levels of aggression in children associated with more traits of ADHD traits in children, β = .40, $p < .001$, weaker executive functioning in children, β = .54, $p < .001$, higher levels of parents' self-reported parenting stress, β = .33, $p < .001$, and greater levels of general family dysfunction, β = .31, $p = .001$; and a trend-level association between single-parent status and parenting stress, with not being a single parent associated with higher self-reported parenting stress levels, β = -.17, $p = .059$. The multiple correlations were not statistically-significant for predicting parents' ADHD traits, β = .24, $p = .179$, or parents' executive functioning, β = .17, $p = .558$, in this sample.

Finally, in the school-aged community sample, the set of control variables significantly predicted children's ADHD traits, $R(50) = .68$, $p < .001$, children's executive functioning, $R(50) = .69$, $p < .001$, parents' ADHD traits, $R(50) = .57$, $p = .001$, parenting stress levels, $R(50) = .53$, $p = .004$, and general family dysfunction, $R(50) = .50$, $p = .009$. Main effects were found for children's gender such that parents of boys were more likely to report their children as having more traits of

ADHD, β = .28, p = .017, while parents of girls reported greater levels of general family dysfunction, β = -.31, p = .025; children's aggression levels, with higher parent-reported aggression in children associated with more traits of ADHD in children, β = .63, p < .001, weaker executive functioning in children, β = .67, p < .001, more self-reported traits of ADHD in parents, β = .52, p < .001, higher parent-reported parenting stress levels, β = .50, p < .001, and greater levels of general family dysfunction, β = .37, p = .006. There was also a trend-level effect of single parent status and children's ADHD, such that not having single-parent status was associated with more parent-reported traits of ADHD in their children, β = -.24, p = .050. The multiple correlations were not significant for the prediction of parents' executive functioning, $R(50)$ = .37, p = .132, in this sample.

Preschool-aged online sample (partial correlations)

Consistent with the extant literature regarding executive functioning and ADHD, after controlling for the control variables in the preschool-aged online sample, having more ADHD traits in children was associated with weaker executive functioning in children, $r(87)$ = -.34, p = .001. Weaker executive functioning in children was also associated with more ADHD traits in parents, $r(87)$ = -.24, p = .023, and weaker executive functioning in parents $r(87)$ = -.25, p = .016. Having more ADHD traits in parents was associated with their own weaker executive functioning, $r(87)$ = .86, p < .001. Although there is less certainty in these results due to low power in this sample, a comparison of point estimates from this sample and the confidence intervals from the school-aged online sample (below) further suggested that having more ADHD traits in children was associated with more ADHD traits in parents, $r(87)$ = .17, p = .110, and worse executive functioning in parents, $r(87)$ = .13, p = .230.

More specific to the first research question, weaker executive functioning in both children, $r(87) = -.30$, $p = .004$, and parents, $r(87) = .59$, $p < .001$, was associated with higher levels of parent-reported parenting stress. Relevant to the second research question, more ADHD traits in parents was associated with higher levels of parent-reported parenting stress, $r(87) = .55$, $p < .001$. Although failing to achieve statistical significance, a comparison with the confidence intervals for these analyses in the school-aged online sample further suggested that more ADHD traits in children was also associated with higher levels of parenting stress in parents, $r(87) = .10$, $p = .355$, although there is less certainty in this result. Related to the third research question, weaker executive functioning in parents was associated with higher levels of general family dysfunction, $r(87) = .40$, $p < .001$. Related to the fourth research question, more ADHD traits in parents was also associated with more general family dysfunction, $r(87) = .38$, $p < .001$. Finally, in this sample, there was an association between the two psychosocial family factors such that higher parent-reported parenting stress was associated with higher parent-reported general family dysfunction, $r(87) = .54$, $p < .001$.

School-aged online sample (partial correlations)

After controlling for the control variables in the school-aged online sample, more ADHD traits in children was associated with weaker executive functioning in children, $r(107) = .79$, $p < .001$, more ADHD traits in parents, $r(107) = .37$, $p < .001$, and weaker executive functioning in parents, $r(107) = .25$, $p = .010$. Weaker executive functioning in children was associated with more ADHD traits in parents, $r(107) = .34$, $p < .001$, and weaker executive functioning in parents, $r(107) = .32$, $p < .001$. More ADHD traits in parents was associated with parents' own weaker executive functioning, $r(107) = .79$, $p < .001$.

Related to the first research question, weaker executive functioning in children, $r(107) = .35$, $p < .001$, and parents, $r(107) = .38$, $p < .001$, was associated with higher levels of parent-reported parenting stress. Relevant to the second question, more ADHD traits in both children, $r(107) = .21$, $p = .027$, and parents, $r(107) = .37$, $p < .001$, were associated with more parent-reported parenting stress. Related to the third research question, weaker executive functioning in parents was associated with more general family dysfunction, $r(107) = .37$, $p < .001$. Related to the fourth research question, having more ADHD traits in parents was also associated with greater levels of general family dysfunction, $r(107) = .31$, $p = .001$. Finally, consistent with the preschool-aged sample, higher levels of parenting stress reported by parents was associated with more general family dysfunction, $r(107) = .40$, $p < .001$.

School-aged community sample (partial correlations)

After controlling for the control variables in the school-aged community sample, more ADHD traits in children was associated with weaker executive functioning in children, $r(46) = .75$, $p < .001$. Children's weaker executive functioning was also associated with weaker executive functioning in parents, $r(46) = .31$, $p = .033$. More ADHD traits in parents was associated with parents' own weaker executive functioning, $r(46) = .88$, $p < .001$. Although there is less certainty in these results due to low power in this sample, a comparison of point estimates from this sample and the confidence intervals from the school-aged online sample (above) further suggested that having more ADHD traits in children was associated with more ADHD traits in parents, $r(46) = .25$, $p = .085$, and worse executive functioning in parents, $r(46) = .28$, $p = .059$. Weaker executive functioning in children was also associated with more traits of ADHD in parents, $r(46) = .20$, $p = .167$.

Related to the first research question, weaker executive functioning in parents was associated with higher levels of parent-reported parenting stress, $r(46) = .33$, $p = .022$. Relevant to the second research question, more ADHD traits in parents was associated with higher parenting stress levels, $r(46) = .36$, $p = .011$. Although failing to achieve statistical significance, a comparison with the confidence intervals for these analyses in the school-aged online sample further suggested that more ADHD traits in children was also associated with higher levels of parenting stress in parents, $r(46) = .17$, $p = .250$, although there is less certainty in this result. Relevant to the third research question, weaker executive functioning in parents was associated with greater levels of general family dysfunction, $r(46) = .47$, $p < .001$, and related to the fourth question, more ADHD traits in parents was associated with greater levels of general family dysfunction, $r(46) = .46$, $p < .001$. Finally, consistent with the previous two samples, higher parent-reported parenting stress was associated with higher parent-reported general family dysfunction, $r(46) = .52$, $p < .001$.

To summarize across the different samples, when controlling for children's age, gender, and aggression levels, and single parent status, there is preliminary evidence supporting the notion that both worse child and parent executive functioning relate to increases in parenting stress. There is also preliminary evidence to suggest that more ADHD traits in children and, possibly to a greater extent, parents relate to increased parenting stress levels. Evidence also emerged to suggest there is an association between weaker executive functioning in parents, as well as more ADHD traits in parents, and greater levels of general family dysfunction. These analyses also revealed an association between parenting stress levels and general family dysfunction, such that higher parenting stress levels were reported by parents who also reported more general family dysfunction.

These patterns of association between executive functioning and the two psychosocial factors of interest were also examined using task-based measures of executive functioning with the computation of partial correlations using computerized measures of children's and parents' executive functioning, including working memory (Table 11), switching (Table 12), and response inhibition (Table 13). Computerized measures of executive functioning are reported separately as sample sizes varied across the tasks (due to elimination of data from two dyads on the response inhibition task). Relative to results obtained when executive functioning was measured via parent-report, across all three computerized measures of executive functioning there were no longer significant associations between parents' executive functioning with children's executive functioning, parents' own self-reported ADHD traits, or parent-reported general family dysfunction, *p*s > .05. Changes to the overall patterns of results for samples associated with each of the respective computerized measures of executive functioning are reported here with additional details available in the corresponding tables.

Working memory (partial correlations). After controlling for the control variables in the school-aged community sample, higher levels of ADHD traits in children were associated with children's weaker working memory, $r(40) = .37$, $p = .017$. Relevant to the first research question, a smaller working memory capacity in parents was associated with higher parent-reported levels of parenting stress, $r(40) = .36$, $p = .019$. Related to the third research question, there was no longer an association between parents' executive functioning as measured via the working memory task and overall general family dysfunction.

Switching (partial correlations). After controlling for the control variables in the school-aged community sample, there was no longer an observed association between children's ADHD traits and their own executive functioning as measured via the switching task. Related to the first

and third research questions, there were no longer associations between parents' executive functioning as measured via the switching task and either parenting stress levels or overall general family dysfunction.

Response inhibition (partial correlations). After controlling for the control variables in the school-aged community sample, higher levels of ADHD traits in children were associated with children's own weaker response inhibition, $r(38) = .32$, $p = .045$. In contrast to the larger sample, associations also emerged between higher levels of ADHD traits in children and parents, $r(38) = .45$, $p = .004$, and children's weaker response inhibition with higher levels of ADHD traits in their parents, $r(38) = .42$, $p = .007$. Related to the first research question, when measured via performance on the response inhibition task, there was no longer an association between parents' executive functioning and parenting stress levels. Related to the third research question, there was also no longer an association between parents' executive functioning as measured via the response inhibition task and overall general family dysfunction.

Taken together, when measured via computerized tasks, fewer associations were found between executive functioning and the psychosocial family factors of interest. With respect to the first research question, only smaller working memory capacity in parents (but not children) emerged as having a significant association with greater parenting stress levels. There were no associations between parenting stress and either response inhibition or switching task performance. Related to the third research question, there was also no longer evidence of an association between parents' executive functioning (measured via all computerized tasks) and general family dysfunction.

In subsequent chapters, the research questions are examined more thoroughly in that both child and parent traits are examined in tandem within regression analyses.

Table 8

Bivariate and Partial Correlations Between Key Variables in Preschool-Aged Online Sample

Variable	Child ADHD	Child EF	Parent ADHD	Parent EF	Parenting Stress	Family Dysfunction
Child ADHD	—	*-.61***	*.20*	*.13*	*.24**	*.13*
Child EF	-.34**	—	*-.26**	*-.25**	*-.37****	*-.28***
Parent ADHD	.17	-.24*	—	*.87****	*.56****	*.39****
Parent EF	.13	-.25*	.86***	—	*.59****	*.41****
Parenting Stress	.10	-.30**	.55***	.59***	—	*.55****
Family Dysfunction	.01	-.16	.38***	.40***	.54***	—

Note. $N = 93$ for the preschool-aged online sample. Bivariate correlations are presented above the diagonal in italics. Child ADHD = total average item score on SWAN Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on REEF (in contrast to all other measures, *lower* scores reflect worse executive functioning). Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on Child ADHD, Parent ADHD, Parent EF, Parenting Stress, and Family Dysfunction all reflect worse functioning.

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

Table 9

Bivariate and Partial Correlations Between Key Variables in School-Aged Online Sample

Variable	Child ADHD	Child EF	Parent ADHD	Parent EF	Parenting Stress	Family Dysfunction
Child ADHD	—	*.80***	*.37***	*.28***	*.33***	*.18*
Child EF	.79***	—	*.36***	*.32***	*.45***	*.22**
Parent ADHD	.37***	.34***	—	*.79***	*.38***	*.33***
Parent EF	.25*	.32***	.79***	—	*.39***	*.38***
Parenting Stress	.21*	.35***	.37***	.38***	—	*.46***
Family Dysfunction	.09	.07	.31**	.37***	.40***	—

Note. $N = 113$ for the school-aged online sample. Bivariate correlations are presented above the diagonal in italics. Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on BDEFS-CA. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 10

Bivariate and Partial Correlations Between Key Variables in School-Aged Community Sample

Variable	Child ADHD	Child EF	Parent ADHD	Parent EF	Parenting Stress	Family Dysfunction
Child ADHD	—	*.84***	*.42***	*.32**	*.40***	*.29**
Child EF	.75***	—	*.45****	*.39***	*.37***	*.35**
Parent ADHD	.25	.20	—	*.87****	*.53****	*.48****
Parent EF	.28	.31*	.88***	—	*.42***	*.52****
Parenting Stress	.17	.09	.36*	.33*	—	*.51****
Family Dysfunction	.22	.24	.46***	.47***	.52***	—

Note. $N = 52$ for the school-aged community sample. Bivariate correlations are presented above the diagonal in italics. Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child EF = total raw score on BDEFS-CA. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 11

Bivariate and Partial Correlations Between Key Variables in School-Aged Community Sample (Computerized Measure of Working Memory)

Variable	Child ADHD	Child WM	Parent ADHD	Parent WM	Parenting Stress	Family Dysfunction
Child ADHD	—	*.27*	*.42***	*.11*	*.40***	*.29**
Child WM	.37*	—	*.02*	*-.10*	*.07*	*-.07*
Parent ADHD	.30	-.18	—	*.05*	*.53****	*.48****
Parent WM	.14	-.04	.15	—	*.29*	*.27*
Parenting Stress	.16	-.12	.36*	.36*	—	*.51****
Family Dysfunction	.26	-.04	.47**	.30	.46**	—

Note. $N = 52$ for the overall school-aged community sample with valid $N = 46$ for computerized measure of Working Memory. Bivariate correlations are presented above the diagonal in italics. Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child WM = d prime on 2-back Working Memory task (higher scores reflect worse functioning). Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent WM = d prime on 2-back Working Memory task (higher scores reflect worse functioning). Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 12

Bivariate and Partial Correlations Between Key Variables in School-Aged Community Sample (Computerized Measure of Switching)

Variable	Child ADHD	Child Switching	Parent ADHD	Parent Switching	Parenting Stress	Family Dysfunction
Child ADHD	—	*-.19*	*.42***	*.02*	*.40***	*.29**
Child Switching	-.19	—	*-.02*	*.12*	*-.12*	*-.23*
Parent ADHD	.30	-.05	—	*-.02*	*.53****	*.48****
Parent Switching	.07	.16	.02	—	*-.21*	*.03*
Parenting Stress	.16	-.09	.36*	-.23	—	*.51****
Family Dysfunction	.26	-.22	.47**	-.11	.46**	—

Note. $N = 52$ for the overall school-aged community sample with valid $N = 46$ for computerized measure of Switching. Bivariate correlations are presented above the diagonal in italics. Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child Switching = Switch Cost RT on Switching task (higher scores reflect worse functioning). Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent Switching = Switch Cost RT on Switching task (higher scores reflect worse functioning). Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 13

Partial Correlations Between Key Variables in School-Aged Community Sample (Computerized Measure of Response Inhibition)

Variable	Child ADHD	Child RI	Parent ADHD	Parent RI	Parenting Stress	Family Dysfunction
Child ADHD	—	*.18*	*.42***	*-.04*	*.40***	*.29**
Child RI	.32*	—	*.45***	*-.13*	*.16*	*-.09*
Parent ADHD	.45**	.42**	—	*-.20*	*.53****	*.48****
Parent RI	-.23	-.02	-.17	—	*-.29**	*.05*
Parenting Stress	.28	.03	.32*	-.30	—	*.51****
Family Dysfunction	.30	-.02	.47**	.10	.46**	—

Note. $N = 52$ for the overall school-aged community sample with valid $N = 44$ for computerized measure of Response Inhibition. Bivariate correlations are presented above the diagonal in italics. Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Child RI = SSRT on Stop-Signal Response Inhibition task (higher scores reflect worse functioning). Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parent RI = SSRT on Stop-Signal Response Inhibition task (higher scores reflect worse functioning). Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Chapter 4: Results for Research Question 1

This section will address the first research question: *How do both children's and parents' executive functioning relate to parenting stress, and importantly, is there an interactive effect wherein the association between children's executive functioning and parenting stress depends on the executive functioning of the parent?* Hierarchical regression analyses were completed to examine the extent to which children's and parents' executive functioning were associated with parents' self-reported parenting stress levels.

The results of the hierarchical regressions will be presented below for each of the respective samples (detailed in Tables 14 through 16). All control variables were entered simultaneously in the first step. Children's and parents' executive functioning were entered simultaneously in the second step, and their interaction were entered in the third step. Across all regressions throughout my dissertation, associations of control and/or key independent variables with the dependent variables were interpreted at the highest step achieving statistical significance. Across all regression analyses, I also compared β coefficients from the school-aged online sample (the largest sample which achieved adequate power, and in which there can be the most confidence in the estimates) with the β coefficients from the two smaller samples to determine if the coefficients from the smaller samples differed by less than/equal to an absolute value of .03. When this was the case, I have also interpreted those estimates as reflecting a similar pattern of results as the school-aged online sample even if statistical significance was not achieved in either of the two smaller samples. Although a lack of statistical significance limits confidence in the conclusions that can be drawn from such results, this approach was taken so as not to obscure potentially relevant results that can be assessed in future research.

For each sample, there is an added analysis wherein parents' general stress levels were entered alongside the control variables to determine whether the findings from the main analyses could be attributed to parents' general stress levels rather than stress specific to the parenting role; however, the main analyses used for interpretation are the analyses without general stress added as a control variable. The chapter concludes with a summary of the results across samples as pertain to the first research question.

Preschool-Aged Online Sample

Entering the control variables in the first step did not explain a significant amount of variance in parenting stress, $R^2 = .06$, $p = .201$; however, when children's and parents' executive functioning were entered in the second step, there was a significant increase in the variance explained (change in $R^2 = .35$, $p < .001$), together accounting for 41.2% of the total variance in parenting stress. Weaker executive functioning in parents was associated with greater parenting stress, $\beta = .55$, $p < .001$, while weaker executive functioning in children emerged as a trend-level predictor of higher parenting stress levels, $\beta = -.21$, $p = .071$. Adding the two-way interaction of children's and parents' executive functioning in the third step resulted in only a trend-level increase in the variance explained in parenting stress levels (change in $R^2 = .02$, $p = .088$). Although this step was not statistically significant, and thus caution must be exercised in interpreting these results, this interaction was probed further given its direct relevance to the research question under exploration. As depicted in Figure 1, weaker executive functioning in both children, $\beta = -.23$, $p = .043$, and parents, $\beta = .50$, $p < .001$, predicted greater parenting stress. Further visual examination of the interaction suggested that when parents' executive functioning was weaker, the association of parents' executive functioning with parenting stress did not vary considerably as a function of children's executive functioning; however, when parents' executive functioning was stronger,

having a child with weaker executive functioning was associated with higher levels of parenting stress.

Controlling for Parents' General Stress Levels in the Preschool-Aged Online Sample

When parents' general stress levels were controlled in the model at Step 1, the pattern of results was generally the same as without this variable with some exceptions. In the first step, the control variables now accounted for a significant amount of variance in parenting stress, accounting for a total of 28.5% of the variance in parenting stress levels, $p < .001$. The addition of children's and parents' executive functioning in the second step was again significant, together explaining a total of 42.2% of the variance in parenting stress (change in $R^2 = .14$, $p < .001$). In this step, weaker executive functioning in parents was associated with greater parenting stress, $\beta = .44$, $p < .001$, while weaker executive functioning in children emerged as a trend-level predictor of higher parenting stress levels, $\beta = -.22$, $p = .056$. The addition of the two-way interaction of children's and parents' executive functioning was no longer marginally significant (change in $R^2 = .02$, $p = .109$).

School-Aged Online Sample

In the first step of the regression, inclusion of the control variables in the model accounted for 16.9% of the variance in parenting stress, $p < .001$. When children's and parents' executive functioning were entered in the second step, there was a significant increase in the variance explained by the model, change in $R^2 = .17$, $p < .001$, accounting for 33.6% of the total variance in parenting stress. Not being a single parent was a significant predictor of greater levels of parenting stress, $\beta = -.20$, $p = .019$, while key to my research question, weaker executive functioning in both children, $\beta = .28$, $p = .006$, and parents, $\beta = .27$, $p = .002$, also predicted more self-reported parenting stress. However, adding the two-way interaction of children's and parents'

executive functioning in the third step did not result in a significant increase in the variance explained in parenting stress (change in $R^2 = .01$, $p = .160$).

Controlling for Parents' General Stress Levels in the School-Aged Online Sample

A similar pattern of results emerged when parents' general stress levels were controlled in the first step alongside the other control variables. When entered in the first step, the control variables together accounted for 22.7% of the variance in parenting stress ($p < .001$). The addition of children's and parents' executive functioning in the second step again resulted in a significant increase in the variance explained in parenting stress (change in $R^2 = .11$, $p < .001$), explaining a total of 33.8% of the variance. Weaker executive functioning in both children, $\beta = .27$, $p = .007$, and parents, $\beta = .24$, $p = .019$, as well as not having single parent status, $\beta = -.19$, $p = .024$, were significant predictors of more parenting stress in both models. There was no significant increase in the variance explained in parenting stress with the inclusion of the two-way interaction between children's and parents' executive functioning (change in $R^2 = .01$, $p = .152$).

School-Aged Community Sample

In the first step of the regression, the control variables accounted for a significant proportion of the variance in parenting stress, together accounting for 27.8% of the variance in parenting stress ($p = .004$). Higher aggression levels in children were associated with greater parenting stress, $\beta = .50$, $p < .001$.

When children's and parents' executive functioning were entered in the second step, there was a trend-level increase in the variance explained in parenting stress (change in $R^2 = .08$, $p = .074$). Although this step was not statistically significant and thus the results must be interpreted with caution, this analysis achieved regression coefficients similar in magnitude to the estimates achieved within the school-aged online sample. More specifically related to my research question,

weaker executive functioning in adults was associated with higher levels of parenting stress, β = .31, p = .029, while higher levels of aggression in children were also associated with greater parenting stress, β = .42, p = .016; however, there was no main effect for children's executive functioning, nor was there an increase in the variance explained in parenting stress when the two-way interaction of children's and parents' executive functioning was entered in the third step of the regression (change in R^2 = .04, p = .104).

Controlling for Parents' General Stress Levels in the School-Aged Online Sample

The pattern of results was generally similar with some differences when parents' general stress levels were controlled for in the first step of the regression. The inclusion of children's and parents' executive functioning in the second step no longer resulted in a marginally significant increase in the variance explained in parenting stress (change in R^2 = .01, p = .649), with only the first step of the regression remaining significant and explaining 35.3% of the variance in parenting stress (p = .001). There were significant main effects of children's aggression levels, β = .40, p = .004, and parents' general stress levels, β = .30, p = .025, such that higher levels of parenting stress were reported by parents who reported higher levels of aggression in their children and higher levels of general stress for themselves. Marginal results no longer suggested a possible main effect of parents' executive functioning after controlling for parents' general stress levels.

General Summary

Analyses using data from the *online* school-aged sample suggested that children's weaker executive functioning is a significant predictor of higher parenting stress levels, while trend-level evidence from the preschool-aged online sample suggested a similar pattern of results. These results were consistent across the online samples (preschool-aged and school-aged) even when parents' general stress levels were controlled in the model. Analyses of data collected across *both*

online samples additionally suggested that parents who self-reported having weaker executive functioning report higher levels of parenting stress. As with children's executive functioning, these results again remained in both *online* samples after controlling for parents' general stress levels, suggesting that both children's and parents' executive functioning may uniquely predict parenting stress regardless of parents' general stress levels. Consistent with this, while the step including children's and parents' executive functioning in the model predicting parenting stress failed to achieve statistical significance in the school-aged community sample, the magnitude of the regression coefficient predicting parenting stress with parents' executive functioning from this sample was similar to that of the school-aged online sample. This suggests that weaker executive functioning in parents may also be associated with more parenting stress in the school-aged community sample.

Examining the interaction of children's and parents' executive functioning in predicting parenting stress, preliminary findings from the preschool-aged sample suggested that parents with weaker executive functioning experience higher levels of parenting stress regardless of their children's executive functioning. There was a trend-level interaction effect that emerged, however, such that parents of children with weaker executive functioning reported higher levels of parenting stress even when their own executive functioning abilities were stronger. The lowest levels of parenting stress were reported by parents whose own and whose children's executive functioning abilities were stronger.

Unlike other samples and contrary to hypotheses, effects of weaker executive functioning in children did not emerge in the school-aged community sample and were only marginally present in the preschool-aged online sample. In addition, when parents' general stress levels were included in the model in the school-aged community sample, the magnitude of the regression coefficient of

parents' weaker executive functioning predicting parenting stress was no longer comparable to the estimate from the school-aged online sample. It is possible, however, that this latter effect is attributable to the relatively smaller size of the community sample ($N = 52$) such that inclusion of parents' general stress levels in the first step may have absorbed too much variance in the model to allow for other effects to be detected. Also contrary to hypotheses, the interaction of children's and parents' executive functioning did not emerge as a significant predictor of parenting stress across all samples (with only a trend-level effect in the preschool-aged sample).

While not part of the main research focus, various control variables also emerged as significant predictors of parenting stress. These included higher reported levels of children's aggression in the community sample, and not having single parent status in the school-aged online sample.

Table 14

Hierarchical Regression Results Predicting Parenting Stress with Executive Functioning in Preschool-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.06	.06
Constant	47.54***	36.05	59.03	5.78			
Child Age (Months)	-0.07	-0.28	0.14	0.11	-.07		
Child Gender	-2.09	-6.68	2.51	2.31	-.10		
Child Aggression	2.45*	0.36	4.53	1.05	.25*		
Single Parent	0.19	-6.78	7.16	3.51	.01		
Step 2						.41	.35***
Constant	38.56***	28.66	48.46	4.98			
Child Age (Months)	0.07	-0.11	0.25	0.09	.07		
Child Gender	-0.00	-3.78	3.78	1.90	.00		
Child Aggression	0.74	-1.34	2.82	1.05	.08		
Single Parent	1.24	-4.39	6.87	2.83	.04		
Child EF	-0.08^t	-0.16	0.01	0.04	-.21^t		
Parent EF	0.48***	0.33	0.64	0.08	.55***		
Step 3						.43	.02^t
Constant	38.00***	28.19	47.82	4.94			
Child Age (Months)	0.08	-0.10	0.26	0.09	.08		
Child Gender	0.43	-3.34	4.19	1.90	.02		
Child Aggression	0.79	-1.27	2.84	1.03	.08		
Single Parent	0.20	-5.50	5.89	2.87	.01		
Child EF	-0.09*	-0.17	-0.00	0.04	-.23*		
Parent EF	0.44***	0.29	0.60	0.08	.50***		
Child EF x Parent EF	0.01^t	-0.00	0.01	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; *EF* = executive functioning. *N* = 93 for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on REEF (in contrast to all other measures, *lower* scores reflect worse executive functioning). Parent EF = total raw score on BDEFS-SR. Parenting Stress = total

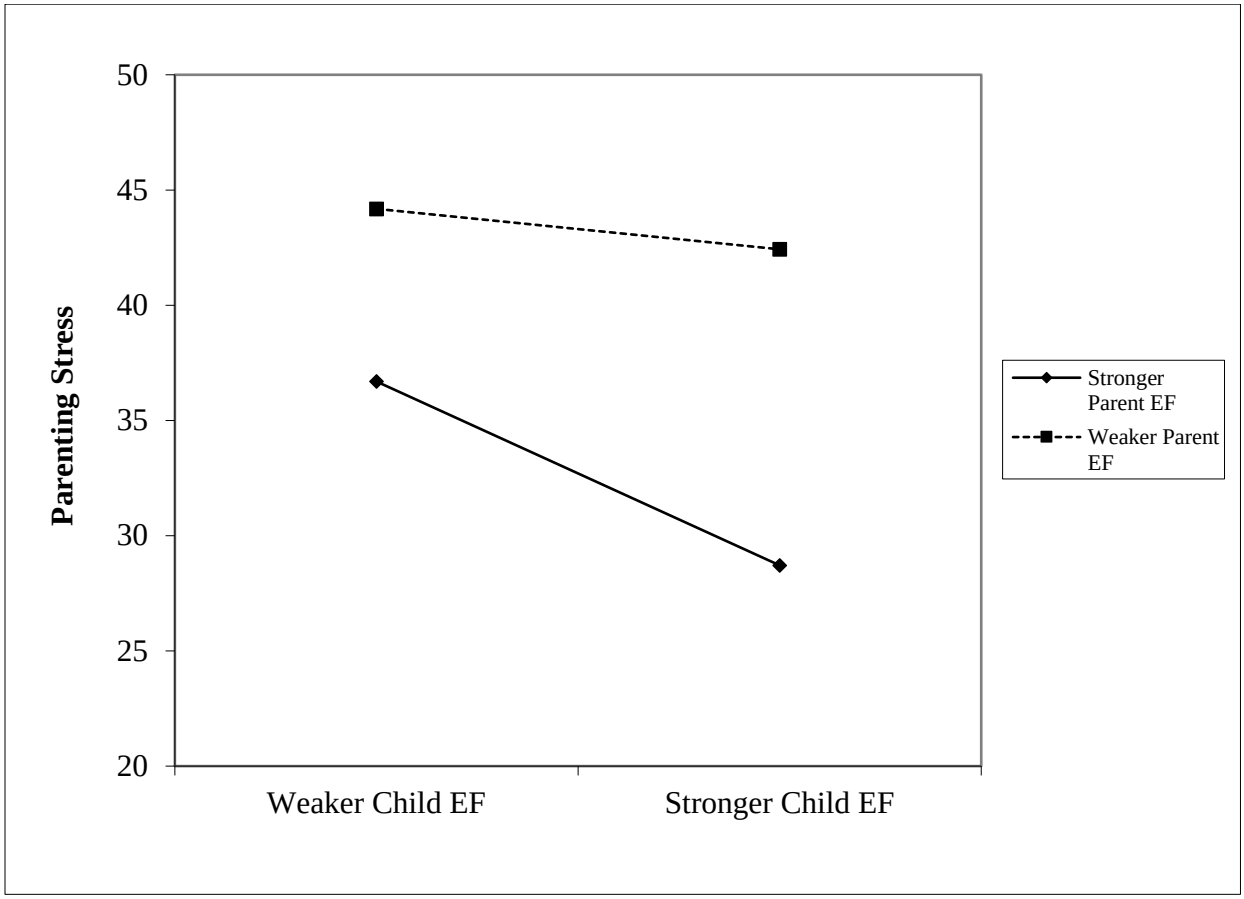
Table 14 (continued)**.**

raw score on Parental Stress Scale. Higher scores on Child Aggression, Child ADHD, Parent ADHD, Parent EF, and Parenting Stress all reflect worse functioning.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Figure 1

Children's and parents' executive functioning predicting parenting stress levels.



Note. Given that scores on the measures of executive functioning (EF) were treated continuously, the convention of using values falling +/- one standard deviation from the mean as representing weaker/stronger EF were used here for illustrative purposes.

Table 15

Hierarchical Regression Results Predicting Parenting Stress with Executive Functioning in School-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.17	.17***
Constant	39.41***	32.87	45.96	3.30			
Child Age (Months)	-0.01	-0.06	0.03	0.02	-.06		
Child Gender	0.81	-2.93	4.54	1.89	.04		
Child Aggression	1.37***	0.62	2.12	0.38	.33***		
Single Parent	-5.19^t	-10.57	0.19	2.71	-.17^t		
Step 2						.34	.17***
Constant	40.30***	34.32	46.28	3.02			
Child Age (Months)	-0.01	-0.05	0.03	0.02	-.03		
Child Gender	-0.10	-3.49	3.30	1.71	-.01		
Child Aggression	0.65	-0.15	1.45	0.40	.16		
Single Parent	-5.88*	-10.77	-0.98	2.47	-.20*		
Child EF	0.19**	0.06	0.32	0.07	.28**		
Parent EF	0.33**	0.13	0.54	0.10	.27**		
Step 3						.35	.01
Constant	40.39***	34.44	46.34	3.00			
Child Age (Months)	-0.01	-0.05	0.03	0.02	-.03		
Child Gender	0.26	-3.15	3.68	1.72	.01		
Child Aggression	0.66	-0.14	1.45	0.40	.16		
Single Parent	-5.34*	-10.27	-0.41	2.49	-.18*		
Child EF	0.19**	0.06	0.32	0.07	.28**		
Parent EF	0.35***	0.15	0.56	0.10	.29***		
Child EF x Parent EF	-0.01	-0.02	0.00	0.01			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 113 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

$^t p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 16

Hierarchical Regression Results Predicting Parenting Stress with Executive Functioning in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.28	.28**
Constant	42.35***	30.54	54.15	5.87			
Child Age (Months)	-0.05	-0.14	0.03	0.04	-.18		
Child Gender	-0.17	-4.96	4.63	2.38	-.01		
Child Aggression	1.94***	0.95	2.94	0.50	.50***		
Single Parent	-3.68	-12.91	5.55	4.59	-.11		
Step 2						.36	.08^t
Constant	41.96***	30.41	53.51	5.73			
Child Age (Months)	-0.05	-0.14	0.03	0.04	-.17		
Child Gender	0.94	-3.91	5.78	2.41	.05		
Child Aggression	1.61*	0.32	2.91	0.64	.42*		
Single Parent	-4.19	-13.15	4.77	4.45	-.13		
Child EF	-0.01	-0.24	0.22	0.12	-.02		
Parent EF	0.32*	0.04	0.61	0.14	.31*		
Step 3						.40	.04
Constant	41.75***	30.41	53.08	5.63			
Child Age (Months)	-0.04	-0.13	0.04	0.04	-.14		
Child Gender	0.49	-4.30	5.28	2.38	.03		
Child Aggression	1.71*	0.43	2.98	0.63	.44*		
Single Parent	-5.38	-14.29	3.53	4.42	-.16		
Child EF	-0.01	-0.24	0.21	0.11	-.02		
Parent EF	0.38*	0.09	0.67	0.14	.36*		
Child EF x Parent EF	-0.02	-0.04	0.00	0.01			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 52 for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning. $^t p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Chapter 5: Results for Research Question 2

I had initially intended to run hierarchical regression analyses to understand whether the association between children's/parents' executive functioning and parents' self-reported parenting stress levels varied based on the presence of ADHD-related behaviours; however, due to the high correlations between measures of ADHD and executive functioning in the current samples (*r*s ranging from -.34 [for the preschool-aged sample, lower scores on the measure of executive functioning reflect worse executive functioning] to .88, with all *p*s equal to or less than .001; see Chapter 3), interpretation of interaction effects involving ADHD and executive functioning would be difficult. As such, the effect of ADHD on parenting stress was explored independent of the effects of executive functioning with this section serving to answer the following: *How do both children's and parents' ADHD traits relate to parenting stress, and is there an interactive effect wherein the association between children's ADHD traits and parenting stress depends on parents' own ADHD traits?*

The results of the hierarchical regressions will be presented below for each of the respective samples (detailed in Tables 17 through 19). All control variables were entered simultaneously in the first step, while children's and parents' ADHD traits were entered simultaneously in the second step, and the interaction of their ADHD traits was entered in the third step. The regression results at Step 1 for each of the samples are the same as those presented in Chapter 4, so will not be detailed in this chapter (though they are restated in the tables of model results presented here). Instead, results will be reported from Step 2 onward given that these steps are pertinent to this particular research question. For each sample, there is again an added analysis wherein parents' general stress levels were entered alongside the control variables to determine whether parents' general stress levels accounted for the findings from the main analyses rather than stress specific

to the parenting role. The chapter concludes with a summary of results across samples as pertains to the second research question.

Preschool-Aged Online Sample

When children's and parents' ADHD traits were entered in the second step, there was a significant increase in the amount of variance explained by the model, change in $R^2 = .28$, $p < .001$, accounting for 34.2% of the total variance in parenting stress. Relevant to the research question, more ADHD traits in parents predicted higher levels of parenting stress, $\beta = .54$, $p < .001$; however, children's ADHD traits did not emerge as a significant main effect. In addition, adding the two-way interaction of children's and parents' ADHD traits did not result in a significant increase in the variance explained in parenting stress, change in $R^2 = .01$, $p = .261$.

Controlling for Parents' General Stress Levels in the Preschool-Aged Online Sample

The pattern of results remained similar when children's and parents' ADHD traits were added in the second step, with a significant increase in the variance explained by the model (change in $R^2 = .08$, $p = .006$), together accounting for 36.6% of the total variance in parenting stress. Parents' ADHD traits remained a significant predictor of parenting stress, $\beta = .40$, $p = .001$, while parents' general stress levels also emerged as a trend-level predictor in the model, $\beta = .22$, $p = .072$. There was no significant increase in the variance explained with the addition of the two-way interaction of children's and parents' ADHD traits in the third step (change in $R^2 = .01$, $p = .320$).

School-Aged Online Sample

When children's and parents' ADHD traits were entered in the second step, there was a significant increase in the variance explained by the model (change in $R^2 = .12$, $p < .001$), together accounting for 28.7% of the total variance in parenting stress. Relevant to my research question, higher levels of ADHD traits in parents, $\beta = .31$, $p < .001$, predicted more self-reported parenting

stress. Higher levels of parent-reported aggression in their children, β = .26, p = .006, and not having single-parent status, β = -.17, p = .048, were also significant predictors of more parenting stress. There was no main effect of children's ADHD traits, nor did the addition of the two-way interaction of children's and parents' ADHD traits in the third step result in a significant increase in the variance explained in parenting stress (change in R^2 = .01, p = .189).

Controlling for Parents' General Stress Levels in the School-Aged Online Sample

The pattern of results for the second and third steps remained similar. Adding children's and parents' ADHD traits in the second step again resulted in a significant increase in the variance explained in parenting stress, explaining a total of 28.8% of the variance in parenting stress (change in R^2 = .06, p = .014). There was no significant increase in variance when the two-way interaction of children's and parents' ADHD traits was added in the third step (change in R^2 = .01, p = .208). Higher levels of parents' ADHD traits, β = .28, p = .016, remained a significant predictor of parenting stress, along with higher levels of parent-reported aggression in children, β = .25, p = .008. Not having single-parent status remained a trend-level predictor of higher levels of parenting stress, β = -.17, p = .057.

School-Aged Community Sample

When children's and parents' ADHD traits were entered in the second step, there was a significant increase in the variance explained in parenting stress, change in R^2 = .10, p = .035, accounting for a total of 37.8% of the variance in parenting stress. Related to the research question, higher levels of self-reported ADHD traits in parents were predictive of higher levels of parenting stress, β = .35, p = .021. When looking at the magnitude of the coefficient relative to the school-aged online sample, higher levels of parent-reported aggression in children were also predictive of higher levels of parenting stress in this sample although statistical significance was not achieved

in this sample requiring caution in interpreting the results, β = .26, p = .124. Finally, there was no significant increase in total variance explained when the two-way interaction of children's and parents' ADHD traits was entered in the third step (change in R^2 = .01, p = .368).

Controlling for Parents' General Stress Levels in the School-Aged Community Sample

The pattern of results differed when parents' general stress levels were controlled for in the first step. Only the first step of the regression was significant, accounting for a total of 35.3% of the variance in parenting stress, $p < .001$. Higher levels of children's aggression, β = .40, $p < .001$, and parents' higher general stress levels, β = .30, p = .004, emerged as significant main effects. There was no longer an increase in the variance explained in parenting stress when children's and parents' ADHD traits were entered in the second step (change in R^2 = .03, p = .300), nor was there an effect when the interaction of children's and parents' ADHD traits was added in the third step (change in R^2 = .01, p = .500). Parents' ADHD traits no longer predicted unique variance in parenting stress after controlling for parents' general stress levels in the model, β = .23, p = .238.

General Summary

Analyses suggested that, across *all* samples, parents who self-reported higher ADHD traits reported higher levels of parenting stress. These results remained across both *online* samples (preschool-aged and school-aged) even when parents' general stress levels were also included in the model, suggesting that ADHD traits in parents uniquely predict parenting stress irrespective of parents' general stress levels. This is also noteworthy given that these effects emerged with the simultaneous inclusion of children's ADHD traits – that is, higher levels of ADHD traits in parents predicted greater parenting stress above and beyond children's ADHD traits. However, when parents' general stress levels were included in the model in the school-aged *community* sample, parents' ADHD traits were no longer a significant predictor of parenting stress. As previously

noted, these results could be accounted for by the relatively smaller sample size of the community sample ($N = 52$) such that inclusion of parents' general stress levels in the first step absorbed too much variance in the model to allow for other effects to be detected.

Contrary to hypotheses and across all samples, however, children's own ADHD traits, as well as the interaction of children's and parents' ADHD traits, did not emerge as significant predictors of parenting stress.

While not part of the main research focus, children's aggression levels in school-aged children (statistically significant only in the online sample, but with similar regression coefficients in the community sample) again emerged as a significant predictor of parenting stress beyond the effects of ADHD (with this effect remaining in the school-aged online sample when parents' general stress levels were included in the model). Not having single parent status was also associated with higher levels of parenting stress in the school-aged online sample (with a trend-level association once parents' general stress levels were controlled for in the model).

Table 17

Hierarchical Regression Results Predicting Parenting Stress with ADHD Traits in Preschool-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.06	.06
Constant	47.54***	36.05	59.03	5.78			
Child Age (Months)	-0.07	-0.28	0.14	0.11	-.07		
Child Gender	-2.09	-6.68	2.51	2.31	-.10		
Child Aggression	2.45*	0.36	4.53	1.05	.25*		
Single Parent	0.19	-6.78	7.16	3.51	.01		
Step 2						.34	.28***
Constant	43.40***	33.52	53.28	4.97			
Child Age (Months)	-0.02	-0.20	0.16	0.09	-.02		
Child Gender	-0.06	-4.03	3.91	2.00	-.00		
Child Aggression	1.56	-1.19	4.31	1.38	.16		
Single Parent	-0.68	-6.60	5.25	2.98	-.02		
Child ADHD	0.06	-1.53	1.63	0.80	.01		
Parent ADHD	0.74***	0.49	0.98	0.12	.54***		
Step 3						.35	.01
Constant	42.59***	32.63	52.56	5.01			
Child Age (Months)	0.00	-0.18	0.18	0.09	.00		
Child Gender	0.13	-3.85	4.10	2.00	.01		
Child Aggression	1.35	-1.42	4.12	1.39	.14		
Single Parent	-0.96	-6.89	4.98	2.99	-.03		
Child ADHD	0.28	-1.35	1.90	0.82	.05		
Parent ADHD	0.68***	0.41	0.95	0.13	.50***		
Child x Parent ADHD	-0.07	-0.20	0.06	0.07			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 93 for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = total average item score on SWAN Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems,

Table 17 (continued)**.**

Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

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

Table 18

Hierarchical Regression Results Predicting Parenting Stress with ADHD Traits in School-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.17	.17***
Constant	39.41***	32.87	45.96	3.30			
Child Age	-0.01	-0.06	0.03	0.02	-.06		
Child Gender	0.81	-2.93	4.54	1.89	.04		
Child Aggression	1.37***	0.62	2.12	0.38	.33***		
Single Parent	-5.19^t	-10.57	0.19	2.71	-.17^t		
Step 2						.29	.12***
Constant	39.66***	33.41	45.91	3.15			
Child Age	-0.01	-0.05	0.04	0.02	-.03		
Child Gender	-0.58	-4.15	2.98	1.80	-.03		
Child Aggression	1.08**	0.32	1.85	0.39	.26**		
Single Parent	-5.07*	-10.10	-0.04	2.54	-.17*		
Child ADHD	0.12	-0.13	0.37	0.13	.09		
Parent ADHD	0.49***	0.21	0.78	0.14	.31***		
Step 3						.30	.01
Constant	39.92***	33.68	46.16	3.15			
Child Age	-0.01	-0.05	0.03	0.02	-.04		
Child Gender	-0.32	-3.90	3.25	1.80	-.02		
Child Aggression	1.11**	0.34	1.87	0.39	.27**		
Single Parent	-4.27	-9.42	0.89	2.60	-.14		
Child ADHD	0.14	-0.12	0.39	0.13	.11		
Parent ADHD	0.53***	0.24	0.81	0.14	.33***		
Child x Parent ADHD	-0.02	-0.05	0.01	0.02			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 113 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems,

Table 18 (continued)**.**

Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 19

Hierarchical Regression Results Predicting Parenting Stress with ADHD Traits in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.28	.28**
Constant	42.35***	30.54	54.15	5.87			
Child Age	-0.05	-0.14	0.03	0.04	-.18		
Child Gender	-0.17	-4.96	4.63	2.38	-.01		
Child Aggression	1.94***	0.95	2.94	0.50	.50***		
Single Parent	-3.68	-12.91	5.55	4.59	-.11		
Step 2						.38	.10*
Constant	40.96***	29.36	52.55	5.76			
Child Age	-0.03	-0.12	0.05	0.04	-.11		
Child Gender	-0.11	-5.02	4.81	2.44	-.01		
Child Aggression	1.00	-0.29	2.29	0.64	.26		
Single Parent	-4.03	-13.31	5.25	4.61	-.12		
Child ADHD	0.11	-0.27	0.50	0.19	.10		
Parent ADHD	0.50*	0.08	0.92	0.21	.35*		
Step 3						.39	.01
Constant	40.66***	29.02	52.30	5.78			
Child Age	-0.03	-0.12	0.06	0.04	-.10		
Child Gender	-0.20	-5.13	4.73	2.45	-.01		
Child Aggression	1.12[t]	-0.20	2.43	0.65	.29[t]		
Single Parent	-4.69	-14.11	4.72	4.67	-.14		
Child ADHD	0.13	-0.26	0.51	0.19	.11		
Parent ADHD	0.53*	0.10	0.95	0.21	.37*		
Child x Parent ADHD	-0.02	-0.07	0.03	0.02			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 52 for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Parenting

Table 19 (continued)**.**

Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Chapter 6: Results for Research Question 1 Using Computerized Measures of Executive Functioning

This section serves to further explore the first research question, *How do both children's and parents' executive functioning relate to parenting stress, and importantly, is there an interactive effect wherein the association between children's executive functioning and parenting stress depends on the executive functioning of the parent?* In this chapter, this question was explored using **task-based measures** of specific aspects of executive functioning (in contrast to the preceding analyses which measured observations about executive functioning in day-to-day life via parent-reported questionnaires).

The associations between working memory, switching, and response inhibition for children and parents are depicted in Table 20. Performance across the tasks was not significantly correlated within or across children/parents. There was a trend-level correlation between children's working memory and children's response inhibition, $r = .26$, $p = .091$, suggesting that children with smaller working memory capacities may also present with worse response inhibition. There was also a trend-level correlation between children's switching abilities and parents' working memory, $r = -.26$, $p = .082$, suggesting that children of parents with smaller working memory capacities may demonstrate *better* switching abilities. There were no trend-level associations observed between the various computerized measures of parents' executive functioning. As noted elsewhere, interpretation of any conclusions that would arise from the derivation of latent variables measuring executive functioning in this sample would be limited given these non-existent/low correlations between tasks (e.g., Jurado & Rosselli, 2007; Camerota et al., 2020). As such, these variables were not combined into an overall composite of executive functioning in order to estimate their *combined* association with the psychosocial variable of interest.

Rather, and more pertinent to my primary research interest, hierarchical regressions were used to explore the extent to which children's and parents' executive functioning – here examined separately as working memory, switching, and response inhibition – were associated with parents' self-reported parenting stress levels in the school-aged community sample. All control variables were entered simultaneously in the first step. At the second step, respective measures of children's and parents' working memory, switching, **or** response inhibition were entered into the models. The interaction of children's/parents' working memory, children's/parents' switching, and children's/parents' response inhibition were then included in the third step of each respective model. That is, each executive function (main and interaction effects) was explored in its own respective model. Notably, given the small size of the community sample, there was likely to be insufficient power to detect an effect if each of the other two executive functions were entered simultaneously into the model further supporting the current analyses as an exploratory first step.

Analysis results are presented below for each of the respective measures of executive functioning (detailed in Tables 21 through 23). Results are also presented for added analyses in which parents' general stress levels were entered alongside the control variables to determine whether results of the main analyses could be attributed to parents' general stress levels rather than parenting stress. The chapter concludes with a summary of results as pertain to the current research question.

Working Memory

In the first step of the regression, higher aggression levels in children, $\beta = .45$, $p = .002$, predicted higher parenting stress levels, while not being a single parent emerged as a trend-level predictor, $\beta = -.27$, $p = .073$. The control variables in the first step of the regression accounted for 27.4% of the total variance in parenting stress, $p = .009$.

Entering children's and parents' working memory in the second step resulted in a trend-level increase in the variance explained in parenting stress, explaining an additional 10.2% (for a total of 37.6%) of the variance in parenting stress (p = .053). Although this step did not achieve statistical significance and thus the results must be interpreted with caution, the pattern of results was interpreted given its direct relevance to the research question of interest. Key to the research question, a more limited working memory capacity in parents, β = -.27, p = .021, was associated with higher levels of parenting stress. There was no effect of children's working memory, nor was the addition of the two-way interaction of children's and parents' working memory in the third step significant (change in R^2 = .01, p = .481).

Controlling for Parents' General Stress Levels in the Working Memory Analysis

The pattern of results differed somewhat when parents' general stress levels were controlled for in the first step of the regression. Although parents' working memory still emerged as a significant main effect in the second step, β = .28, p = .043, the inclusion of children's and parents' working memory in the second step no longer resulted in a trend-level increase in the variance explained in parenting stress (change in R^2 = .01, p = .468), with only the first step of the regression remaining significant and explaining 34.5% of the variance in parenting stress (p = .004). Higher levels of children's aggression, β = .37, p = .010, and parents' general stress levels, β = .29, p = .044, were significant predictors of parenting stress in the first step, while not being a single parent remained a trend-level predictor, β = -.25, p = .090.

Switching

As discussed in the section on working memory, the control variables in the first step accounted for 27.4% of the total variance in parenting stress in this sample.

There was no significant increase in the variance explained in parenting stress with the addition of children's and parents' switching in the second step (change in R^2 = .04, p = .320), nor from the addition of the two-way interaction of children's and parents' switching in the third step (change in R^2 = .01, p = .480). Neither children's nor parents' switching emerged as a significant predictor of parenting stress in the models.

Controlling for Parents' General Stress Levels in the Switching Analysis

The pattern of results differed to some extent when parents' general stress levels were controlled for in the first step of the regression. The first step of the regression remained significant, explaining 34.5% of the variance in parenting stress (p = .004), with children's aggression levels a significant predictor of parenting stress, β = .37, p = .010, while not being a single parent remained a trend-level predictor, β = -.25, p = .090. Parents' general stress levels also emerged as a significant predictor of parenting stress in the model, β = .29, p = .044. Also consistent with the above pattern of results, the inclusion of children's and parents' switching in the second step (change in R^2 = .07, p = .131), and the interaction of children's and parents' switching in the third step (change in R^2 = .00, p = .698), did not result in a significant increase in the variance explained in parenting stress. Although the step in which this variable was added did not result in a significant increase in the total variance explained in parenting stress, and thus caution must be exercised in interpreting the effects, related to the research question, parents' switching now emerged as having a negative trend-level association with parenting stress (β = -.27, p = .053). The pattern of results suggested that weaker switching abilities in parents were associated with *less* parenting stress.

Response Inhibition

Entering the control variables in the first step of the regression accounted for 25.9% of the total variance in parenting stress, p = .003. Higher parent-reported levels of aggression in children,

β = .50, $p < .001$, emerged as a significant predictor of parenting stress, while not being a single parent, β = -.29, $p = .057$, emerged as a trend-level predictor.

Although there was no significant increase in the variance explained in parenting stress when adding children's and parents' response inhibition in the second step (change in $R^2 = .06$, $p = .184$), and thus this result must be interpreted with caution, related to the research question there was an observed trend-level effect of stronger response inhibition in parents predicting greater parenting stress levels (β = -.25, $p = .069$). The addition of the two-way interaction of children's and parents' response inhibition in the third step did not result in a significant increase in the variance explained in parenting stress (change in $R^2 = .01$, $p = .384$).

Controlling for Parents' General Stress Levels in the Response Inhibition Analysis

The results were generally consistent when parents' general stress levels were controlled for in the first step of the analyses. The first step of the regression was significant, explaining 37.6% of the variance in parenting stress ($p = .002$), but there was no significant increase in the variance explained with the addition of children's and parents' response inhibition in the second step (change in $R^2 = .05$, $p = .205$), or the two-way interaction of their response inhibition in the third step (change in $R^2 = .02$, $p = .236$). Although this step was not statistically significant, related to the research question parents' response inhibition remained a trend-level predictor in the second step, β = -.24, $p = .081$. Children's higher parent-reported aggression levels were a significant predictor, β = .42, $p = .004$, while parents' higher general stress levels, β = .24, $p = .095$, and not having single parent status, β = -.27, $p = .072$, were trend-level predictors of parenting stress in the first step.

General Summary

Consistent with hypotheses, some evidence emerged to indicate that a more limited working memory capacity in parents was predictive of greater parenting stress, even after controlling for the influence of parents' general stress levels. Contrary to hypotheses, however, some evidence (albeit only at the trend-level) emerged to suggest that *stronger* response inhibition in parents was associated with greater parenting stress (even after controlling for the influence of parents' general stress levels). In analyses incorporating parents' general stress levels, there was also some trend-level evidence suggesting that *stronger* switching in parents was also associated with greater parenting stress. Of note, the latter two results must be interpreted with caution, as they were interpreted given their relevance to the research question but emerged within steps of the regressions that did not achieve statistical significance at even the trend-level. In addition, and contrary to hypotheses, children's executive functioning (measured as working memory, switching, or response inhibition) did not emerge as predictive of greater parenting stress, nor were any interaction effects observed with respect to any of the task-based measures of children's and parents' executive functioning.

Table 20

Bivariate and Partial Correlations between Computerized Measures of Children's/Parents' Executive Functioning

Variable	Child WM	Child Switching	Child RI	Parent WM	Parent Switching	Parent RI
Child WM	—	*-.22*	*.26*	*-.10*	*-.15*	*-.17*
Child Switching	-.24	—	*.14*	*-.26*	*.12*	*-.11*
Child RI	-.01	.11	—	*-.11*	*-.02*	*-.13*
Parent WM	-.09	-.17	-.02	—	*.03*	*-.05*
Parent Switching	-.04	.12	.16	.02	—	*.04*
Parent RI	-.11	-.10	-.02	-.10	.00	—

Note. $N = 52$ for the overall school-aged community sample with valid $N = 46$ for computerized measures of Working Memory and Switching, and valid $N = 44$ for computerized measure of Response Inhibition. Bivariate correlations are presented above the diagonal in italics. WM = d prime on 2-back Working Memory task. Switching = Switch Cost RT on Switching task. RI = SSRT on Stop-Signal Response Inhibition task. Higher scores on all measures reflect worse functioning.

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

Table 21

Hierarchical Regression Results Predicting Parenting Stress with Working Memory in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.27	.27**
Constant	37.04***	22.63	51.45	7.14			
Child Age (Months)	-0.01	-0.11	0.11	0.05	-.01		
Child Gender	-1.09	-6.07	3.89	2.47	-.06		
Child Aggression	1.80**	0.70	2.90	0.54	.45**		
Single Parent	-9.43^t	-19.78	0.92	5.12	-.27^t		
Step 2						.38	.10^t
Constant	41.99***	26.66	57.31	7.58			
Child Age (Months)	-0.04	-0.16	0.07	0.06	-.12		
Child Gender	-1.64	-6.42	3.14	2.36	-.09		
Child Aggression	1.89***	0.84	2.94	0.52	.48***		
Single Parent	-6.99	-17.09	3.10	4.99	-.20		
Child WM	-0.44	-1.75	0.87	0.65	-.10		
Parent WM	1.36*	0.21	2.50	0.57	.31*		
Step 3						.38	.01
Constant	41.09***	25.45	56.74	7.73			
Child Age (Months)	-0.04	-0.16	0.08	0.06	-.10		
Child Gender	-1.83	-6.66	3.01	2.39	-.10		
Child Aggression	1.91***	0.85	2.97	0.52	.48***		
Single Parent	-6.82	-17.00	3.36	5.03	-.20		
Child WM	-0.40	-1.72	0.92	0.65	-.09		
Parent WM	1.19^t	-0.06	2.44	0.62	.28^t		
Child x Parent WM	-0.24	-0.91	0.44	0.33			

Note. $N = 46$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child WM = d prime on 2-back Working Memory task. Parent WM = d prime on 2-back Working Memory task. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

Table 21 (continued)**.**

$^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Table 22

Hierarchical Regression Results Predicting Parenting Stress with Switching in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.27	.27**
Constant	37.04***	22.63	51.45	7.14			
Child Age (Months)	-0.01	-0.11	0.11	0.05	-.01		
Child Gender	-1.09	-6.07	3.89	2.47	-.06		
Child Aggression	1.80**	0.70	2.90	0.54	.45**		
Single Parent	-9.43^t	-19.78	0.92	5.12	-.27^t		
Step 2						.32	.04
Constant	34.53***	19.41	49.66	7.48			
Child Age (Months)	0.02	-0.10	0.13	0.06	.05		
Child Gender	-1.67	-6.69	3.36	2.48	-.10		
Child Aggression	1.79**	0.70	2.89	0.54	.45**		
Single Parent	-9.86^t	-20.64	0.91	5.33	-.29^t		
Child Switching	-0.01	-0.04	0.03	0.02	-.05		
Parent Switching	-0.02	-0.05	0.01	0.01	-.20		
Step 3						.32	.01
Constant	35.62***	20.08	51.17	7.68			
Child Age (Months)	0.01	-0.11	0.13	0.06	.03		
Child Gender	-1.72	-6.79	3.34	2.50	-.10		
Child Aggression	1.70**	0.57	2.83	0.56	.43**		
Single Parent	-9.41^t	-20.34	1.52	5.40	-.27^t		
Child Switching	-0.01	-0.04	0.02	0.02	-.10		
Parent Switching	-0.02	-0.05	0.01	0.01	-.20		
Child x Parent Switching	0.00	-0.00	0.00	0.00			

Note. $N = 46$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child Switching = Switch Cost RT on Switching task. Parent Switching = Switch Cost RT on Switching task. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

Table 22 (continued)**.**

$^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Table 23

Hierarchical Regression Results Predicting Parenting Stress with Response Inhibition in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.33	.33**
Constant	38.26***	23.76	52.75	7.17			
Child Age (Months)	-0.02	-0.13	0.09	0.05	-.05		
Child Gender	-0.12	-5.17	4.93	2.50	-.01		
Child Aggression	2.17***	0.99	3.35	0.58	.50***		
Single Parent	-9.93[t]	-20.15	0.30	5.05	-.29		
Step 2						.39	.06
Constant	35.66***	19.43	51.89	8.01			
Child Age (Months)	0.00	-0.12	0.12	0.06	-.00		
Child Gender	0.77	-4.29	5.82	2.50	.04		
Child Aggression	2.15***	0.99	3.31	0.57	.50***		
Single Parent	-10.19*	-20.27	-0.11	4.98	-.30*		
Child RI	0.00	-0.02	0.03	0.01	.02		
Parent RI	-0.04[t]	-0.09	0.00	0.02	-.25[t]		
Step 3						.40	.01
Constant	34.61***	18.14	51.08	8.12			
Child Age (Months)	0.01	-0.12	0.13	0.06	.03		
Child Gender	0.83	-4.25	5.91	2.51	.05		
Child Aggression	2.11***	0.94	3.28	0.58	.49***		
Single Parent	-10.27*	-20.39	-0.14	4.99	-.30*		
Child RI	0.01	-0.02	0.04	0.02	.12		
Parent RI	-0.04	-0.09	0.01	0.02	-.21		
Child x Parent RI	0.00	0.00	0.00	0.00			

Note. $N = 44$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child RI = SSRT on Stop-Signal Response Inhibition task. Parent RI = SSRT on Stop-Signal Response Inhibition task. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

Table 23 (continued)**.**

$^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Chapter 7: Results for Research Questions 3 and 4

To determine whether the pattern of results noted in previous sections are specific to parenting stress, as opposed to reflecting general family (dys)functioning, this section will serve to address the third and fourth research questions related to *whether or not the observed patterns of findings are unique to parenting stress, or do they relate more broadly to a measure of general family dysfunction?* That is, analyses were carried out to answer the following questions to determine whether the pattern of obtained results was different than the pattern obtained with respect to the parenting stress variable: *How do both children's and parents' executive functioning relate to general family dysfunction, and is there an interactive effect wherein the association between children's executive functioning and general family dysfunction depends on the executive functioning of the parent* (Research Question 3)*? Additionally, how do both children's and parents' ADHD traits relate to general family dysfunction, and is there an interactive effect in which the association between children's ADHD traits and general family dysfunction depends on parents' ADHD traits* (Research Question 4)*?* All foregoing primary analyses were repeated using general family dysfunction in place of parenting stress as the psychosocial factor of interest[8].

The results of the hierarchical regressions will be presented below, repeating analyses performed for Research Questions 1 and 2 in turn using general family dysfunction as the dependent variable, for each of the respective samples. All control variables were again entered simultaneously in the first step. Children's and parents' executive functioning **or** children's and parents' ADHD traits were entered in the second step, while the associated interaction term (children's/parents' executive functioning **or** children's/parents' ADHD traits) were entered in the

[8] As reported in Chapter 3 (Results: Preliminary Analyses), bivariate correlations between the measures of parenting stress and general family dysfunction ranged from r = .46 to .51 across the samples. Partial correlations (controlling for children's age, children's gender, children's aggression levels, and single parent status) ranged from r = .40 to .54 across the samples.

third step of the model. The chapter concludes with an overall summary of the findings as pertain to the current research questions. These results will then be integrated with the results from the parenting stress analyses in the **General Discussion**.

Predicting General Family Dysfunction with Executive Functioning (Questionnaires)

In a repetition of the analyses detailed in Chapter 4 (Results for Research Question 1), results of regression analyses exploring the extent to which children's and parents' executive functioning predict general family dysfunction are detailed in Tables 24 through 26 (Research Question 3).

Preschool-Aged Online Sample

In the first step of the regression, control variables accounted for 10.2% of the total variance in general family dysfunction ($p = .049$).

Related to the third research question, when children's and parents' executive functioning were entered in the second step, there was a significant increase in the variance explained by the model, $p < .001$, accounting for an additional 14.5% (24.6% total) of the variance in general family dysfunction. Weaker executive functioning in parents was associated with greater family dysfunction, $\beta = .37$, $p < .001$. Having younger children was also associated with more general family dysfunction, $\beta = -.20$, $p = .047$. There were no significant effects of children's executive functioning in the second step ($p = .525$), nor did adding the two-way interaction of children's/parents' executive functioning in the third step result in a significant increase in variance explained in general family dysfunction (change in $R^2 = .01$, $p = .307$).

School-Aged Online Sample

The control variables in the first step of the regression explained 11.3% of the variance in general family dysfunction ($p = .011$).

Relevant to the third research question, there was a significant increase in the variance explained in general family dysfunction when children's and parents' executive functioning were entered in the second step, explaining 23.8% of the total variance (change in $R^2 = .13$, $p < .001$). Weaker executive functioning in parents, $\beta = .37$, $p < .001$, was predictive of greater general family dysfunction, while higher levels of aggression in children was also a significant predictor, $\beta = .32$, $p = .003$. However, there were no significant effects of children's executive functioning, nor did adding the two-way interaction of children's and parents' executive functioning result in a significant increase in the amount of variance explained by the model (change in $R^2 = .00$, $p = .492$).

School-Aged Community Sample

In the first step of the regression, control variables accounted for 24.6% of the variance in general family dysfunction ($p = .009$). When children's and parents' executive functioning were entered in the second step, there was a significant increase in the variance explained in general family dysfunction (change in $R^2 = .18$, $p = .003$), explaining 42.1% of the total variance.

Related to the third research question, weaker executive functioning in parents emerged as a significant predictor of greater general family dysfunction, $\beta = .41$, $p = .003$. Having children who were older, $\beta = .35$, $p = .010$, was also a significant predictor of general family dysfunction, while having children who were girls, $\beta = -.25$, $p = .054$, emerged as a trend-level predictor. However, there were no main effects of children's executive functioning, nor did the addition of the two-way interaction of children's and parents' executive functioning in the third step result in a significant increase in the variance explained in general family dysfunction (change in $R^2 = .00$, $p = .745$).

Table 24

Hierarchical Regression Results Predicting General Family Dysfunction with Executive Functioning in Preschool-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.10	.10*
Constant	30.35***	23.06	37.64	3.67			
Child Age (Months)	-0.18**	-0.32	-0.05	0.07	-.28**		
Child Gender	0.03	-2.88	2.95	1.47	.00		
Child Aggression	1.00	-0.33	2.32	0.67	.16		
Single Parent	0.09	-4.34	4.51	2.23	.00		
Step 2						.25	.15***
Constant	27.02***	19.75	34.28	3.66			
Child Age (Months)	-0.13*	-0.27	-0.00	0.07	-.20*		
Child Gender	0.99	-1.78	3.76	1.39	.07		
Child Aggression	0.46	-1.06	1.98	0.77	.07		
Single Parent	0.43	-3.70	4.56	2.08	.02		
Child EF	-0.02	-0.08	0.04	0.03	-.08		
Parent EF	0.21***	0.10	0.33	0.06	.37***		
Step 3						.26	.01
Constant	26.77***	19.49	34.05	3.66			
Child Age (Months)	-0.13^t	-0.26	0.01	0.07	-.19^t		
Child Gender	1.18	-1.62	3.98	1.41	.08		
Child Aggression	0.48	-1.04	2.00	0.77	.08		
Single Parent	-0.03	-4.26	4.19	2.13	-0.00		
Child EF	-0.02	-0.09	0.04	0.03	-.10		
Parent EF	0.20**	0.08	0.31	0.06	.34**		
Child x Parent EF	0.00	-0.00	0.01	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; *EF* = executive functioning. *N* = 93 for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on REEF (in contrast to all other measures, *lower* scores reflect worse executive functioning). Parent EF = total raw score on BDEFS-SR. Family Dysfunction =

Table 24 (continued)**.**

total raw score on FAD General Family Functioning subscale. Higher scores on Child Aggression, Parent EF, and Family Dysfunction all reflect worse functioning.

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

Table 25

Hierarchical Regression Results Predicting General Family Dysfunction with Executive Functioning in School-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.11	.11*
Constant	16.54***	12.03	21.04	2.27			
Child Age (Months)	0.02	-0.02	0.05	0.02	.10		
Child Gender	0.42	-2.16	2.99	1.30	.03		
Child Aggression	0.87**	0.36	1.39	0.26	.31**		
Single Parent	-0.16	-3.86	3.55	1.87	-.01		
Step 2						.24	.13***
Constant	16.06***	11.79	20.33	2.15			
Child Age (Months)	0.02	-0.01	0.05	0.01	.13		
Child Gender	-0.10	-2.52	2.33	1.22	-.01		
Child Aggression	0.88**	0.31	1.45	0.29	.32**		
Single Parent	0.11	-3.39	3.60	1.76	.01		
Child EF	-0.03	-0.12	0.07	0.05	-.06		
Parent EF	0.30***	0.16	0.45	0.07	.37***		
Step 3						.24	.00
Constant	16.03***	11.74	20.31	2.16			
Child Age (Months)	0.02	-0.01	0.05	0.01	.13		
Child Gender	-0.22	-2.68	2.23	1.24	-.02		
Child Aggression	0.88**	0.30	1.45	0.29	.32**		
Single Parent	-0.08	-3.63	3.46	1.79	-.00		
Child EF	-0.03	-0.13	0.07	0.05	-.07		
Parent EF	0.30***	0.15	0.45	0.08	.36***		
Child EF x Parent EF	0.00	-0.01	0.01	0.01			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 113 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

Table 25 (continued)**.**

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

Table 26

Hierarchical Regression Results Predicting General Family Dysfunction with Executive Functioning in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.25	.25**
Constant	11.29**	3.29	19.30	3.98			
Child Age (Months)	0.07*	0.01	0.13	0.03	.34*		
Child Gender	-3.73*	-6.98	-0.48	1.62	-.31*		
Child Aggression	0.96**	0.29	1.64	0.34	.37**		
Single Parent	-3.13	-9.39	3.13	3.11	-.14		
Step 2						.42	.18**
Constant	11.46**	4.19	18.73	3.61			
Child Age (Months)	0.07*	0.02	0.13	0.03	.35*		
Child Gender	-3.00[t]	-6.05	0.05	1.51	-.25[t]		
Child Aggression	0.40	-0.41	1.22	0.41	.16		
Single Parent	-3.40	-9.04	2.24	2.80	-.16		
Child EF	0.06	-0.09	0.20	0.07	.13		
Parent EF	0.29**	0.11	0.47	0.09	.41**		
Step 3						.42	.00
Constant	11.49**	4.14	18.84	3.65			
Child Age (Months)	0.07*	0.02	0.13	0.03	.35*		
Child Gender	-2.94[t]	-6.04	0.16	1.54	-.25[t]		
Child Aggression	0.39	-0.44	1.22	0.41	.15		
Single Parent	-3.25	-9.03	2.53	2.87	-.15		
Child EF	0.06	-0.09	0.20	0.07	.13		
Parent EF	0.28**	0.09	0.47	0.09	.40**		
Child EF x Parent EF	0.00	-0.01	0.02	0.01			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 113 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

Table 26 (continued)**.**

$^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Predicting General Family Dysfunction with ADHD Traits

In a series of analyses paralleling those detailed in Chapter 5 (Results for Research Question 2), results of regression analyses examining the extent to which children's and parents' ADHD traits predict parent-reported general family dysfunction are detailed in Tables 27 through 29 (Research Question 4). The regression results at Step 1 for each of the samples are the same as those presented in the repetition of Research Question 1 (above), so will not be detailed here but are restated in the tables of model results below. Results will be reported from Step 2 onward.

Preschool-Aged Online Sample

Related to the fourth research question, there was a significant increase in the amount of variance explained when children's and parents' ADHD traits were entered in the second step, accounting for 23.1% of the variance in general family dysfunction (change in $R^2 = .13$, $p = .001$). More ADHD traits in parents, $\beta = .37$, $p < .001$, but not children, were associated with greater general family dysfunction. Younger age of children remained a significant predictor of greater levels of general family dysfunction, $\beta = -.24$, $p = .012$. Adding the two-way interaction of children's and parents' ADHD traits in the third step did not result in a significant increase in the variance explained by the model (change in $R^2 = .01$, $p = .219$).

School-Aged Online Sample

There was a significant increase in the amount of variance explained when children's and parents' ADHD traits were entered in the second step, with the model explaining 19.6% of the total variance in general family dysfunction (change in $R^2 = .08$, $p = .005$).

Relevant to the fourth research question, there was a significant main effect of parents' ADHD traits, $\beta = .30$, $p = .002$, such that more ADHD traits in parents were associated with greater general family dysfunction. Higher levels of parent-reported aggression in children were also a

significant predictor in the second step, β = .29, p = .004. There was no significant main effect of children's ADHD traits, nor was there an increase in the variance explained in general family dysfunction by the two-way interaction of children's and parents' ADHD traits in the third step (change in R^2 = .00, p = .645).

School-Aged Community Sample

There was a significant increase in the variance explained in general family dysfunction when children's and parents' ADHD traits were entered in the second step (change in R^2 = .17, p = .003). This model accounted for 41.4% of the total variance in general family dysfunction.

Related to the fourth research question, more ADHD traits in parents, β = .46, p = .003, was a significant predictor of greater general family dysfunction, though there were no significant effects of children's ADHD levels. Having children who were older, β = .42, p = .003, and who were girls, β = -.31, p = .023, were significant predictors of higher levels of general family dysfunction. There was no significant increase in the variance explained by the model when the two-way interaction of children's and parents' ADHD traits was entered in the third step (change in R^2 = .00, p = .593).

Table 27

Hierarchical Regression Results Predicting General Family Dysfunction with ADHD Traits in Preschool-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.10	.10*
Constant	30.35***	23.06	37.64	3.67			
Child Age (Months)	-0.18**	-0.32	-0.05	0.07	-.28**		
Child Gender	0.03	-2.88	2.95	1.47	.00		
Child Aggression	1.00	-0.33	2.32	0.67	.16		
Single Parent	0.09	-4.34	4.51	2.23	.00		
Step 2						.23	.13**
Constant	28.70***	21.78	35.63	3.48			
Child Age (Months)	-0.16*	-0.29	-0.04	0.06	-.24*		
Child Gender	0.86	-1.92	3.64	1.40	.06		
Child Aggression	1.01	-0.91	2.94	0.97	.16		
Single Parent	-0.35	-4.50	3.80	2.09	-.02		
Child ADHD	-0.28	-1.39	0.82	0.56	-.08		
Parent ADHD	0.33***	0.16	0.50	0.09	.37***		
Step 3						.24	.01
Constant	28.09***	21.12	35.06	3.51			
Child Age (Months)	-0.15*	-0.27	-0.02	0.06	-.22*		
Child Gender	1.00	-1.78	3.78	1.40	.07		
Child Aggression	0.85	-1.09	2.79	0.97	.13		
Single Parent	-0.56	-4.71	3.59	2.09	-.03		
Child ADHD	-0.11	-1.25	1.02	0.57	-.03		
Parent ADHD	0.29**	0.10	0.47	0.09	.33**		
Child x Parent ADHD	-0.06	-0.15	0.03	0.05			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 93 for the preschool-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = average item score on the SWAN ODD subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = total average item score on SWAN Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Family Dysfunction =

Table 27 (continued)**.**

total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 28

Hierarchical Regression Results Predicting General Family Dysfunction with ADHD Traits in School-Aged Online Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.11	.11*
Constant	16.54***	12.03	21.04	2.27			
Child Age (Months)	0.02	-0.02	0.05	0.02	.10		
Child Gender	0.42	-2.16	2.99	1.30	.03		
Child Aggression	0.87**	0.36	1.39	0.26	.31**		
Single Parent	-0.16	-3.86	3.55	1.87	-.01		
Step 2						.20	.08**
Constant	17.09***	12.67	21.51	2.23			
Child Age (Months)	0.02	-0.02	0.05	0.02	.09		
Child Gender	-0.41	-2.93	2.12	1.27	-.03		
Child Aggression	0.81**	0.27	1.36	0.27	.29**		
Single Parent	-0.06	-3.62	3.50	1.80	-.00		
Child ADHD	-0.02	-0.20	0.16	0.09	-.02		
Parent ADHD	0.32**	0.12	0.52	0.10	.30**		
Step 3						.20	.00
Constant	17.03***	12.58	21.47	2.24			
Child Age (Months)	0.02	-0.02	0.05	0.02	.10		
Child Gender	-0.47	-3.02	2.08	1.29	-.03		
Child Aggression	0.81**	0.26	1.35	0.28	.29**		
Single Parent	-0.26	-3.94	3.41	1.85	-.01		
Child ADHD	-0.02	-0.20	0.16	0.09	-.03		
Parent ADHD	0.31**	0.11	0.51	0.10	.30**		
Child x Parent ADHD	0.01	-0.02	0.03	0.01			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 113 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Family Dysfunction =

Table 28 (continued)**.**

total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 29

Hierarchical Regression Results Predicting General Family Dysfunction with ADHD Traits in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.25	.25**
Constant	11.29**	3.29	19.30	3.98			
Child Age (Months)	0.07*	0.01	0.13	0.03	.34*		
Child Gender	-3.73*	-6.98	-0.48	1.62	-.31*		
Child Aggression	0.96**	0.29	1.64	0.34	.37**		
Single Parent	-3.13	-9.39	3.13	3.11	-.14		
Step 2						.41	.17**
Constant	10.12**	2.66	17.59	3.71			
Child Age (Months)	0.09**	0.03	0.14	0.03	.42**		
Child Gender	-3.70*	-6.86	-0.53	1.57	-.31*		
Child Aggression	0.15	-0.68	0.98	0.41	.06		
Single Parent	-3.40	-9.38	2.57	2.97	-.16		
Child ADHD	0.10	-0.15	0.35	0.12	.13		
Parent ADHD	0.43**	0.16	0.70	0.13	.46**		
Step 3						.42	.00
Constant	10.24**	2.70	17.78	3.74			
Child Age (Months)	0.08**	0.03	0.14	0.03	.41**		
Child Gender	-3.66*	-6.86	-0.47	1.59	-.31*		
Child Aggression	0.11	-0.75	0.96	0.42	.04		
Single Parent	-3.15	-9.25	2.95	3.03	-.14		
Child ADHD	0.09	-0.16	0.34	0.12	.12		
Parent ADHD	0.42**	0.14	0.69	0.14	.45**		
Child x Parent ADHD	0.01	-0.02	0.04	0.02			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 52 for the school-aged online sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child ADHD = combined total raw score on the Conners 3 Inattention and Hyperactivity/Impulsivity subscales. Parent ADHD = combined total raw score on CAARS-Self Report Inattention/Memory Problems, Hyperactivity/Restlessness, and Impulsivity/Emotional Lability subscales. Family Dysfunction =

Table 29 (continued)**.**

total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Predicting General Family Dysfunction with Executive Functioning (Task-Based Measures)

In a series of analyses analogous to those detailed in Chapter 6 (Results for Research Question 1 Using Computerized Measures of Executive Functioning), results of regression analyses exploring the extent to which children's and parents' **task-based** executive functioning predict parenting stress are detailed in Tables 30 through 32 (Research Question 3).

Working Memory

The control variables in the first step of the regression accounted for 34.4% of the total variance in general family dysfunction, $p = .001$. Having children who were older, $\beta = .49$, $p = .002$, girls, $\beta = -.34$, $p = .015$, and had higher parent-reported aggression levels, $\beta = .42$, $p = .002$, as well as not being a single parent, $\beta = -.31$, $p = .034$, were all significant predictors of greater general family dysfunction. Adding children's and parents' working memory into the second step (change in $R^2 = .06$, $p = .166$), and their interaction in the third step (change in $R^2 = .00$, $p = .652$), did not result in a significant increase in the variance explained in general family dysfunction.

Although this step did not achieve statistical significance, and thus caution must be used in interpreting this result, these analyses also provided some evidence related to the third research question such that parents' smaller working memory capacity emerged as a trend-level predictor of greater general family dysfunction, $\beta = .25$, $p = .063$.

Switching

Consistent with the analyses reported directly above, the control variables in the first step of the regression accounted for 34.4% ($p = .001$) of the total variance in general family dysfunction.

Relevant to the third research question, there was no significant increase in the variance explained in general family dysfunction when children's and parents' switching were added into

the model in the second step (change in R^2 = .04, p = .342), and the interaction of their switching was added in the third step (change in R^2 = .00, p = .710).

Response Inhibition

The first step of the regression accounted for 34.8% of the total variance in general family dysfunction, p = .002. Greater levels of general family dysfunction were predicted by having children who are older, β = .48, p = .003, girls, β = -.31, p = .029, and who demonstrate higher parent-reported aggression, β = .42, p = .003, as well as not being a single parent, β = -.32, p = .035.

Related to the third research question and similar to the measures of working memory and switching, there was no statistically significant increase in the variance explained by the model when children's and parents' response inhibition were added in the second step (change in R^2 = .01, p = .825), or when the interaction of their response inhibition was added in the third step (change in R^2 = .01, p = .582).

Table 30

Hierarchical Regression Results Predicting General Family Dysfunction with Working Memory in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.34	.34**
Constant	5.15	-4.32	14.62	4.69			
Child Age (Months)	0.12**	0.05	0.19	0.04	.49**		
Child Gender	-4.09*	-7.37	-0.82	1.62	-.34*		
Child Aggression	1.16**	0.44	1.88	0.36	.42**		
Single Parent	-7.37*	-14.17	-0.57	3.37	-.31*		
Step 2						.40	.06
Constant	7.10	-3.27	17.48	5.13			
Child Age (Months)	0.10*	0.02	0.18	0.04	.43*		
Child Gender	-4.34*	-7.57	-1.11	1.60	-.36*		
Child Aggression	1.20**	0.49	1.91	0.35	.44**		
Single Parent	-6.02^t	-12.85	0.82	3.38	-.25^t		
Child WM	-0.09	-0.98	0.79	0.44	-.03		
Parent WM	0.74^t	-0.04	1.51	0.38	.25^t		
Step 3						.41	.00
Constant	7.49	-3.14	18.12	5.25			
Child Age (Months)	0.10*	0.02	0.18	0.04	.42*		
Child Gender	-4.26*	-7.54	-0.97	1.62	-.35*		
Child Aggression	1.19**	0.47	1.91	0.36	.43**		
Single Parent	-6.09^t	-13.01	0.83	3.42	-.26^t		
Child WM	-0.11	-1.01	0.79	0.44	-.04		
Parent WM	0.81^t	-0.04	1.66	0.42	.27^t		
Child x Parent WM	0.10	-0.36	0.56	0.23			

Note. $N = 46$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child WM = d prime on 2-back Working Memory task (higher scores reflect worse functioning). Parent WM = d prime on 2-back Working Memory task (higher scores reflect worse functioning). Family

Table 30 (continued)**.**

Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 31

Hierarchical Regression Results Predicting General Family Dysfunction with Switching in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.34	.34**
Constant	5.15	-4.32	14.62	4.69			
Child Age (Months)	0.12**	0.05	0.19	0.04	.49**		
Child Gender	-4.09*	-7.37	-0.82	1.62	-.34*		
Child Aggression	1.16**	0.44	1.88	0.36	.42**		
Single Parent	-7.37*	-14.17	-0.57	3.37	-.31*		
Step 2						.38	.04
Constant	5.33	-4.63	15.29	4.92			
Child Age (Months)	0.12**	0.04	0.19	0.04	.49**		
Child Gender	-4.33*	-7.64	-1.03	1.63	-.36*		
Child Aggression	1.15**	0.43	1.87	0.36	.42**		
Single Parent	-6.45^t	-13.54	0.65	3.51	-.27^t		
Child Switching	-0.01	-0.03	0.01	0.01	-.17		
Parent Switching	-0.00	-0.02	0.02	0.01	-.06		
Step 3						.38	.00
Constant	5.71	-4.58	15.99	5.08			
Child Age (Months)	0.12**	0.04	0.19	0.04	.48**		
Child Gender	-4.35*	-7.70	-1.01	1.65	-.36*		
Child Aggression	1.11**	0.37	1.86	0.37	.41**		
Single Parent	-6.29^t	-13.52	0.94	3.57	-.26^t		
Child Switching	-0.02	-0.04	0.01	0.01	-.20		
Parent Switching	-0.00	-0.02	0.02	0.01	-.06		
Child x Parent Switching	0.00	0.00	0.00	0.00			

Note. $N = 46$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child Switching = Switch Cost RT on Switching task (higher scores reflect worse functioning). Parent Switching = Switch Cost RT on Switching task (higher scores reflect worse functioning). Family

Table 31 (continued)**.**

Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

$^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 32

Hierarchical Regression Results Predicting General Family Dysfunction with Response Inhibition in School-Aged Community Sample

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.35	.35**
Constant	5.21	-4.69	15.10	4.89			
Child Age (Months)	0.12**	0.04	0.19	0.04	.48**		
Child Gender	-3.85*	-7.30	-0.41	1.70	-.31*		
Child Aggression	1.25**	0.45	2.06	0.40	.42**		
Single Parent	-7.53*	-14.50	-0.55	3.45	-.32*		
Step 2						.35	.01
Constant	6.03	-5.50	17.57	5.69			
Child Age (Months)	0.11*	0.02	0.20	0.04	.45*		
Child Gender	-4.07*	-7.66	-0.47	1.77	-.33*		
Child Aggression	1.26**	0.44	2.08	0.41	.42**		
Single Parent	-7.44*	-14.61	-0.27	3.54	-.31*		
Child RI	-0.00	-0.02	0.02	0.01	-.02		
Parent RI	0.01	-0.02	0.04	0.02	.08		
Step 3						.36	.01
Constant	6.51	-5.28	18.29	5.81			
Child Age (Months)	0.11*	0.02	0.20	0.04	.43*		
Child Gender	-4.10*	-7.73	-0.46	1.79	-.33*		
Child Aggression	1.28**	0.44	2.12	0.41	.43**		
Single Parent	-7.40*	-14.65	-0.16	3.57	-.31*		
Child RI	-0.01	-0.03	0.02	0.01	-.09		
Parent RI	0.01	-0.03	0.04	0.02	.06		
Child x Parent RI	0.00	-0.00	0.00	0.00			

Note. $N = 44$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. $N = 52$ for the school-aged community sample. Child Age = children's age in months. Child Gender = child's gender as reported by parent (0 = girl, 1 = boy). Child Aggression = total raw score on Conners 3 Aggression subscale. Single Parent = single parent status (0 = not a single parent, 1 = a single parent). Child RI = SSRT on Stop-Signal Response Inhibition task (higher scores reflect worse functioning). Parent RI = SSRT on Stop-Signal Response Inhibition task (higher scores reflect worse

Table 32 (continued)**.**

functioning). Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

General Summary

Relevant to the third and fourth research questions, some limited evidence did emerge to suggest that parents' executive functioning, as measured via questionnaire and with trend-level results for a computerized measure of working memory (though the step in which this result was obtained did not achieve statistical significance and therefore must be interpreted with caution), is associated with general family dysfunction. A similar pattern of results emerged with respect to parents' ADHD traits, such that there was a main effect of more ADHD traits in parents predicting greater general family dysfunction. Similar findings did not emerge with respect to measures of children's executive functioning (questionnaire or task-based) or ADHD. There were likewise no significant effects observed with respect to either the interaction of children's and parents' executive functioning (questionnaire or task-based) or the interaction of their ADHD traits vis-à-vis general family dysfunction. These results suggest that parents' own executive functioning and ADHD traits uniquely predict general family dysfunction regardless of children's executive functioning or ADHD traits. Notably, findings regarding parents' executive functioning were observed primarily with respect to parents' self-reported day-to-day executive functioning, with only limited evidence emerging with respect to the task-based measure of working memory, and no effects being found for task-based measures of switching or response inhibition.

While not part of the main research focus, these analyses also identified various control variables as predictive of general family dysfunction. Although not completely consistent across analyses, some evidence emerged to suggest that children's age – specifically being younger in a cohort of preschool-aged children, but older in a cohort of school-aged children (in the community, but not online school-aged, sample) – was predictive of greater general family dysfunction. Effects also emerged in the in-lab community sample to suggest that children's gender – specifically

having girls – was associated with greater general family dysfunction. Some evidence also emerged for the influence of children's aggression (school-aged online and community samples) and not being a single parent (subset of the school-aged community sample) on general family dysfunction.

Chapter 8: Results for Supplemental Analyses

In previous chapters, I examined the association between children's/parents' executive functioning and parenting stress/general family dysfunction within samples of different ages (preschool-aged, school-aged). In this chapter, I explore these associations with attention to the possible differences in association depending on the child's age. Related to the parenting stress variable, I ask, *does the association between children's and/or parents' executive functioning and parenting stress levels differ at various stages of children's development?* I then, in turn, ask *does the association between children's and/or parents' executive functioning and general family dysfunction differ at various stages of children's development?* For example, this section will examine whether having a preschool-aged child with weaker executive functioning has a stronger association with greater parenting stress levels/more general family dysfunction than having an adolescent with weaker executive functioning. The same pattern of associations will be explored with respect to parents' executive functioning. For example, analyses will explore whether the executive functioning of parents with preschool-aged children shows a stronger relation to their parenting stress/family dysfunction relative to the associations between executive functioning and parenting stress/family dysfunction for parents of adolescent children.

Two sets of analyses were completed to address this supplementary research question. In the first set of analyses, five age-bands reflecting 3-year groupings for children's age were developed (comprised of children aged 3 to 5 years, 6 to 8 years, 9 to 11 years, 12 to 14 years, and 15 to 17 years, respectively). Given that only online data was collected for the preschool-aged children and to have consistency in methodology, results pertaining to the online samples only are described in the text related to this set of analyses (but both the online and the combined community/online school-aged samples are presented within the tables). It is important to note that

these analyses are considered exploratory in nature, particularly given the low number of participants falling within some of the age bands. Smaller age-bands were selected to allow for observing developmental effects that may be obscured within larger age groupings where developmental differences on a variety of variables, including executive functioning (e.g., Howard et al., 2015), would be anticipated. Given the preschool-aged measure of executive functioning (REEF; Nilsen et al., 2017) was used with a three-year age grouping of preschool-aged children (aged 3 to 5 years), 3-year age bands were selected for continuity in the range of groupings amongst the school-aged children (with whom the BDEFS-CA was used as an age-appropriate measure of executive functioning; Barkley, 2012).

Analyses were then conducted to compare the strength of the correlation coefficients at different age bands. A benefit of this analysis strategy was that it allowed for including the full age range of children examined across all samples. Of note, for the moderated multiple regression analyses that were run separately (see below), data from the preschool-aged sample was eliminated due to the necessary use of a different measure of executive functioning in that sample. Prior to comparing the strength of the correlation coefficients, I will overview the associations at each stage for comprehensiveness. Descriptive statistics, and bivariate and partial correlations (controlling for children's aggression levels) between children's/parents' executive functioning and parenting stress/general family dysfunction across the five age groups of children are presented in Tables 33 through 37. Note, however, that interpretation of the main research questions regarding associations between executive functioning and parenting stress/general family dysfunction are not drawn from this chapter, but from Chapters 3, 4, 6, and 7. Related to the supplementary fifth research question and the main purpose of this chapter, comparisons of coefficients following Fisher *r* to *z* transformations are then presented in Tables 38 through 41, comparing the partial

correlation coefficients between children's/parents' executive functioning and parenting stress/general family dysfunction, respectively. Comparisons were calculated based on partial correlations controlling for children's aggression given the emergence of this control variable as predictive of parenting stress and general family dysfunction in the foregoing analyses.

In the second set of analyses, I tested this research question by exploring whether age moderated the association between children's/parents' executive functioning and the psychosocial variables of interest (parenting stress and general family dysfunction, respectively). Results are presented in Tables 42 through 45. For these analyses, I combined the data collected across the *school-aged* online and community-based samples (total N = 165).[9] As noted previously, participants from the preschool-aged online sample were excluded from these analyses given the use of a different measure of executive functioning in that sample. Age was treated continuously for the purpose of conducting the moderated multiple regression analyses.

This chapter then concludes with a summary of results from these supplementary analyses.

Associations Between (Child/Parent) Executive Functioning and Parenting Stress/General Family Dysfunction in the Online Samples

In the following section, I first discuss the observed bivariate and partial correlations (controlling for children's aggression levels) across each of the age bands with respect to children's and parents' executive functioning and parenting stress. In the next section, I will discuss the comparison of coefficient strengths reported here in order to address the fifth research question.

[9] Analyses were also run controlling for the method/sample of collection in the first step. The pattern of results was unchanged, with all β values ranging from -.07 to .03, and *p*s equal to or exceeding .291. As such, only the pattern of results associated with the analyses in which method/sample of collection were not controlled are reported/interpreted in detail.

Executive Functioning and Parenting Stress

Children aged 3 to 5 years (*N* = 93). In the sample of children aged 3 to 5 years, children's weaker executive functioning was associated with higher levels of parent-reported parenting stress, $r = -.37$, $p < .001$. This association held after controlling for children's aggression levels, $r = -.30$, $p = .004$. For parents' executive functioning, weaker skills were also significantly associated with higher levels of parent-reported parenting stress, $r = .59$, $p < .001$, even after controlling for children's aggression levels, $r = .60$, $p < .001$.

Children aged 6 to 8 years (*N* = 32). Weaker executive functioning in children aged 6 to 8 years was associated with higher levels of parent-reported parenting stress, $r = .37$, $p = .039$, but this association did not hold after controlling for children's aggression levels, $r = .17$, $p = .363$. Parents' weaker executive functioning, however, was associated with greater parenting stress levels, $r = .41$, $p = .021$, and this association remained after controlling for parent-reported aggression in children, $r = .36$, $p = .046$.

Children aged 9 to 11 years (*N*= 34). In the sample of children aged 9 to 11 years, weaker executive functioning in both children, $r = .54$, $p < .001$, and parents, $r = .61$, $p < .001$, was associated with greater parent-reported parenting stress levels. These associations held for both children's and parents' executive functioning after controlling for children's aggression levels ($r = .44$, $p = .011$, and $r = .57$, $p < .001$, respectively).

Children aged 12 to 14 years (*N* = 24). There was a trend-level association between weaker executive functioning in children aged 12 to 14 years and higher parent-reported parenting stress levels, $r = .39$, $p = .057$, though this association was no longer significant at the trend-level after controlling for children's aggression levels, $r = .35$, $p = .107$. There was no significant association between parents' own executive functioning and their parenting stress levels in this

age-band when estimated as a bivariate correlation, r = -.05, p = .815, or a partial correlation controlling for children's parent-reported aggression levels, r = -.02, p = .948.

Children aged 15 to 17 years (N = 23). Weaker executive functioning in children aged 15 to 17 was associated with higher parent-reported parenting stress levels, r = .51, p = .014, though this association was significant only at the trend-level after controlling for children's aggression levels, r = .39, p = .073. No significant associations emerged between parents' executive functioning and parenting stress levels in this sample when estimated as a bivariate correlation, r = .30, p = .165, or a partial correlation controlling for children's parent-reported aggression levels, r = .31, p = .167.

Executive Functioning and General Family Dysfunction

Children aged 3 to 5 years. In the sample of children aged 3 to 5 years, weaker executive functioning in both children, r = -.28, p = .006, and parents, r = .55, p < .001, was associated with greater general family dysfunction. These associations held after controlling for children's aggression levels for both children, r = -.24, p = .020, and parents, r = .41, p < .001.

Children aged 6 to 8 years. There were no significant associations between children's/parents' executive functioning and general family dysfunction (bivariate or partial correlations) in the 6- to 8-year age-band. Bivariate and partial correlations (controlling for children's aggression levels) between children's executive functioning and general family dysfunction were r = -.14, p = .439, and r = -.25, p = .179, respectively. Bivariate and partial correlations (controlling for children's aggression levels) between parents' executive functioning and general family dysfunction were r = .27, p = .131, and r = .24, p = .199, respectively.

Children aged 9 to 11 years. Weaker executive functioning in 9-to-11-year-old children was associated with greater general family dysfunction, r = .41, p = .016, but this association did

not hold after controlling for children's aggression levels, $r = .25$, $p = .157$. Parents' weaker executive functioning was also associated with greater general family dysfunction, $r = .55$, $p < .001$, even after controlling for children's aggression levels, $r = .51$, $p = .003$.

Children aged 12 to 14 years. No significant associations emerged between children's and parents' executive functioning and general family dysfunction in this age-band. Bivariate and partial (controlling for children's aggression levels) correlations between children's executive functioning and general family dysfunction were $r = .14$, $p = .520$, and $r = .04$, $p = .871$, respectively. Bivariate and partial correlations (controlling for children's aggression levels) between parents' executive functioning and general family dysfunction were $r = .11$, $p = .613$, and $r = .18$, $p = .419$, respectively.

Children aged 15 to 17 years. There were no significant associations between children's executive functioning and general family dysfunction in this age-band, either when estimated as a bivariate correlation, $r = .09$, $p = .669$, or partial correlation controlling for children's aggression levels, $r = .00$, $p = .991$. However, weaker executive functioning in parents was associated with greater general family dysfunction, $r = .44$, $p = .036$, even after controlling for children's aggression levels, $r = .44$, $p = .042$.

Table 33

Descriptive Statistics, and Bivariate and Partial Correlations between Key Variables for the 3-to-5 Year Age-Band

Method	Variable	*M*	*SD*	Child EF	Parent EF	Parenting Stress	Family Dysfunction
Online	Child Aggression	-0.224	1.072	-*.58****	*.05*	*.22**	*.16*
	Child EF	163.719	28.426	—	-*.25**	-*.37****	-*.28***
	Parent EF	35.080	11.931	-.27*	—	*.59****	*.41****
	Parenting Stress	42.049	10.536	-.30**	.60***	—	*.55****
	Family Dysfunction	20.679	6.827	-.24*	.41***	.54***	—

Note. The 3-to-5 year age-band is comprised of only online participants ($N = 93$). Bivariate correlations are presented above the diagonal in italics. Partial correlations controlling for children's aggression levels are presented below the diagonal. Child Aggression (3 to 5 years) = average item score on the SWAN ODD subscale. Child EF (3 to 5 years) = total raw score on REEF (in contrast to all other measures, *lower* scores reflect worse executive functioning). Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on Child Aggression, Parent EF, Parenting Stress, and Family Dysfunction all reflect worse functioning.

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

Table 34

Descriptive Statistics, and Bivariate and Partial Correlations between Key Variables for the 6-to-8 Year Age-Band in the Online-Only and Combined Online/Community Samples

Method	Variable	*M*	*SD*	Child EF	Parent EF	Parenting Stress	Family Dysfunction
Online	Child Aggression	0.938	1.645	*.38**	*.22*	*.66****	*.22*
	Child EF	35.906	10.085	—	*.04*	*.37**	*-.14*
	Parent EF	31.011	8.868	-.04	—	*.41**	*.27*
	Parenting Stress	39.274	10.228	.17	.36*	—	*.34*
	Family Dysfunction	18.927	5.008	-.25	.24	.27	—
Combined	Child Aggression	1.017	1.971	*.33**	*.38**	*.62****	*.34**
	Child EF	36.462	10.610	—	*.10*	*.28*^{t}	*-.07*
	Parent EF	31.445	9.455	-.03	—	*.41**	*.34**
	Parenting Stress	39.430	9.665	.11	.24	—	*.34**
	Family Dysfunction	18.710	4.940	-.20	.25	.18	—

Note. $N = 32$ for the online-only sample, and $N = 39$ for the combined sample. Bivariate correlations are presented above the diagonal in italics. Partial correlations controlling for children's aggression levels are presented below the diagonal. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

$^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Table 35

Descriptive Statistics, and Bivariate and Partial Correlations between Key Variables for the 9-to-11 Year Age-Band in the Online-Only and Combined Online/Community Samples

Method	Variable	*M*	*SD*	Child EF	Parent EF	Parenting Stress	Family Dysfunction
Online	Child Aggression	2.050	2.857	*.69***	*.29*	*.35**	*.35**
	Child EF	46.088	18.502	—	*.64****	*.54****	*.41**
	Parent EF	29.235	9.988	.64***	—	*.61****	*.55****
	Parenting Stress	39.187	11.107	.44*	.57***	—	*.48***
	Family Dysfunction	20.319	8.371	.25	.51**	.41*	—
Combined	Child Aggression	1.859	2.547	*.73****	*.25*	*.36***	*.33**
	Child EF	42.593	17.363	—	*.56****	*.44****	*.37***
	Parent EF	28.881	9.225	.57***	—	*.53****	*.56****
	Parenting Stress	39.006	9.950	.28*	.48***	—	*.47****
	Family Dysfunction	20.286	7.340	.21	.53***	.40**	—

Note. $N = 34$ for the online-only sample, and $N = 59$ for the combined sample. Bivariate correlations are presented above the diagonal in italics. Partial correlations controlling for children's aggression levels are presented below the diagonal. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 36

Descriptive Statistics, and Bivariate and Partial Correlations between Key Variables for the 12-to-14 Year Age-Band in the Online-Only and Combined Online/Community Samples

Method	Variable	*M*	*SD*	Child EF	Parent EF	Parenting Stress	Family Dysfunction
Online	Child Aggression	2.382	3.356	*.26*	*-.13*	*.29*	*.41**
	Child EF	44.167	14.321	—	*.39*	*.39*	*.14*
	Parent EF	29.208	6.600	.45*	—	*-.05*	*.11*
	Parenting Stress	40.186	9.340	.35	-.02	—	*.43**
	Family Dysfunction	21.327	7.007	.04	.18	.36	—
Combined	Child Aggression	1.815	2.978	*.37**	*-.01*	*.35**	*.34**
	Child EF	40.541	14.051	—	*.44***	*.55****	*.25*
	Parent EF	29.378	7.174	.47**	—	*.22*	*.31*
	Parenting Stress	37.850	9.894	.48**	.24	—	*.53****
	Family Dysfunction	21.471	6.804	.14	.33*	.46**	—

Note. $N = 24$ for the online-only sample, and $N = 37$ for the combined sample. Bivariate correlations are presented above the diagonal in italics. Partial correlations controlling for children's aggression levels are presented below the diagonal. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 37

Descriptive Statistics, and Bivariate and Partial Correlations between Key Variables for the 15-to-17 Year Age-Band in the Online-Only and Combined Online/Community Samples

Method	Variable	*M*	*SD*	Child EF	Parent EF	Parenting Stress	Family Dysfunction
Online	Child Aggression	0.696	1.396	*.49**	*.05*	*.40*	*.19*
	Child EF	35.044	14.998	—	*.13*	*.51**	*.09*
	Parent EF	30.261	8.120	.12	—	*.30*	*.44**
	Parenting Stress	38.309	11.676	.39	.31	—	*.58***
	Family Dysfunction	20.775	7.337	.00	.44*	.56**	—
Combined	Child Aggression	1.133	1.943	*.58****	*.07*	*.41**	*.25*
	Child EF	37.433	14.689	—	*.12*	*.50***	*.14*
	Parent EF	29.800	7.208	.09	—	*.32*	*.42**
	Parenting Stress	38.037	11.187	.35	.32	—	*.60****
	Family Dysfunction	20.994	6.920	-.01	.41*	.56**	—

Note. $N = 23$ for the online-only sample, and $N = 30$ for the combined sample. Bivariate correlations are presented above the diagonal in italics. Partial correlations controlling for children's aggression levels are presented below the diagonal. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Comparisons of Associations Between (Child/Parent) Executive Functioning and Parenting Stress/General Family Dysfunction Across Age Groups

Comparisons of the partial correlation coefficients using Fisher *r* to *z* transformations were conducted to explore whether the association between children's/parents' executive functioning and parenting stress/general family dysfunction (controlling for children's aggression levels) differed by children's age group. Analyses reported on here reflect findings from the online samples. Results are presented first for comparisons of coefficients related to children's executive functioning and then parents' executive functioning, considering each of the psychosocial factors in turn.

Executive Functioning and Parenting Stress

Children's Executive Functioning. As reported in Table 38, comparisons of the partial correlation coefficients between children's executive functioning and parent-reported parenting stress levels revealed no significant differences when comparing each of the children's age-bands to each of the other children's age-bands in turn (all *p*s > .05).

Parents' Executive Functioning. As reported in Table 39, comparisons of the partial correlation coefficients revealed a significant difference in the association between parents' own executive functioning and their self-reported parenting stress levels (controlling for children's aggression levels; online samples) only with respect to parents of children in the 12-to-14 year age-band. A significant difference emerged such that the association between the variables of interest was significantly stronger – with worse executive functioning predicting higher levels of parent-reported parenting stress – in parents of children in the 3-to-5 year, $z = 2.90$, $p = .004$, and 9-to 11-year, $z = 2.34$, $p = .019$, age-bands relative to the parents of children in the 12-to-14 year age-band. However, the association between parents' executive functioning and parenting stress

levels in the 12-to-14 year age-band were not statistically significant, suggesting there were no significant and meaningful z-score comparisons. No other significant *z*-score comparisons emerged.

Executive Functioning and General Family Dysfunction

Children's Executive Functioning. As reported in Table 40, *z*-score comparisons suggested that a significant difference in the association between children's executive functioning and general family dysfunction (controlling for children's aggression levels) may exist with respect to children in the 6-to-8 year age-band. It appeared that a significant difference emerged such that the association between the variables of interest was significantly stronger – with worse executive functioning in children predicting greater levels of general family dysfunction – in the 3-to-5 year, $z = 2.34$, $p = .019$, and 9-to 11-year, $z = -1.98$, $p = .048$, age-bands relative to children in the 6-to-8 year age-band. However, the association between these variables in 6-to-8 year age-band was not statistically significant, suggesting that there were no significant and meaningful *z*-score comparisons. Taken together, there is no evidence to suggest that there are differences in the association of children's executive functioning and general family dysfunction (controlling for children's aggression levels) based on children's age-band (all other *p*s > .05).

Parents' Executive Functioning. As reported in Table 41, *z*-score comparisons of the partial correlation coefficients between parents' executive functioning and parent-reported general family dysfunction revealed no significant differences when comparing each of the children's age-bands to each of the other children's age-bands (all *p*s > .05).

Table 38

Z-Score Comparisons of Partial Correlations Between Children's Executive Functioning and Parenting Stress Controlling for Children's Aggression Levels (by Child Age Group)

Age Group	Comparison Group	Online Only (*z*)	Online/Community (*z*)
3-5	6-8	0.63	0.99
	9-11	-0.79	0.13
	12-14	-0.23	-1.10
	15-17	-0.43	-0.26
6-8	3-5	-0.63	-0.99
	9-11	-1.16	-0.81
	12-14	-0.66	-1.75
	15-17	-0.83	-1.00
9-11	3-5	0.79	-0.13
	6-8	1.16	0.81
	12-14	0.39	-1.12
	15-17	0.20	-0.34
12-14	3-5	0.23	1.10
	6-8	0.66	1.75
	9-11	-0.39	1.12
	15-17	-0.17	0.64
15-17	3-5	0.43	0.26
	6-8	0.83	1.00
	9-11	-0.20	0.34
	12-14	0.17	-0.64

Note. Results of analyses using only online participants are reflected in black ink, while results of analyses using combined online/community samples are reflected in blue ink.

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

Table 39

Z-Score Comparisons of Partial Correlations Between Parents' Executive Functioning and Parenting Stress Controlling for Children's Aggression Levels (by Child Age Group)

Age Group	Comparison Group	Online Only (*z*)	Online/Community (*z*)
3-5	6-8	1.45	2.23*
	9-11	0.20	0.95
	12-14	2.90**	2.22*
	15-17	1.51	1.64
6-8	3-5	-1.45	-2.23*
	9-11	-1.04	-1.31
	12-14	1.37	0.02
	15-17	0.22	-0.32
9-11	3-5	-0.20	-0.95
	6-8	1.04	1.31
	12-14	2.34*	1.31
	15-17	1.15	0.85
12-14	3-5	-2.90**	-2.22*
	6-8	-1.37	-0.02
	9-11	-2.34*	-1.31
	15-17	-1.06	-0.33
15-17	3-5	-1.51	-1.64
	6-8	-0.22	0.32
	9-11	-1.15	-0.85
	12-14	1.06	0.33

Note. Results of analyses using only online participants are reflected in black ink, while results of analyses using combined online/community samples are reflected in blue ink.

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

Table 40

Z-Score Comparisons of Partial Correlations Between Children's Executive Functioning and General Family Dysfunction Controlling for Children's Aggression Levels (by Child Age Group)

Age Group	Comparison Group	Online Only (*z*)	Online/Community (*z*)
3-5	6-8	2.34*	2.30*
	9-11	-0.05	0.22
	12-14	0.87	0.55
	15-17	0.99	1.15
6-8	3-5	-2.34*	-2.30*
	9-11	-1.98*	-1.94
	12-14	-1.01	-1.43
	15-17	-0.88	-0.79
9-11	3-5	0.05	-0.22
	6-8	1.98*	1.94
	12-14	0.78	0.33
	15-17	0.89	0.92
12-14	3-5	-0.87	-0.55
	6-8	1.01	1.43
	9-11	-0.78	-0.33
	15-17	0.11	0.55
15-17	3-5	-0.99	-1.15
	6-8	0.88	0.79
	9-11	-0.89	-0.92
	12-14	-0.11	-0.55

Note. Results of analyses using only online participants are reflected in black ink, while results of analyses using combined online/community samples are reflected in blue ink.

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

Table 41

Z-Score Comparisons of Partial Correlations Between Parents' Executive Functioning and General Family Dysfunction Controlling for Children's Aggression Levels (by Child Age Group)

Age Group	Comparison Group	Online Only (z)	Online/Community (z)
3-5	6-8	0.90	0.93
	9-11	-0.60	-0.88
	12-14	1.05	0.45
	15-17	-0.15	-0.03
6-8	3-5	-0.90	-0.93
	9-11	-1.22	-1.56
	12-14	0.22	-0.39
	15-17	-0.79	-0.74
9-11	3-5	0.60	0.88
	6-8	1.22	1.56
	12-14	1.34	1.11
	15-17	0.31	0.62
12-14	3-5	-1.05	-0.45
	6-8	-0.22	0.39
	9-11	-1.34	-1.11
	15-17	-0.931	-0.37
15-17	3-5	0.15	0.03
	6-8	0.79	0.74
	9-11	-0.31	-0.62
	12-14	0.931	0.37

Note. Results of analyses using only online participants are reflected in black ink, while results of analyses using combined online/community samples are reflected in blue ink.

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

Examination of Children's Age as a Moderator of the Association between Children's/Parents' Executive Functioning and Parenting Stress/General Family Dysfunction

Moderated multiple regressions were carried out to explore children's age as a possible moderator of the association between children's/parents' executive functioning and parenting stress/general family dysfunction (controlling for children's aggression levels). Analyses reported here reflect findings from the combined school-aged online and community participants. Results are presented first for analyses related to children's and then parents' executive functioning, considering each of the psychosocial factors in turn. Results are presented in Tables 42 through 45. Of note, only the final step of the regressions in which age was tested as a moderator of the association between children's/parents' executive functioning and parenting stress/general family dysfunction are reported here (with all steps of the regressions reported in the tables below). Interpretations about the associations of children's age, children's aggression levels, executive functioning, and the psychosocial variables of interest in each of the separate samples are drawn from analyses in the foregoing chapters (Chapters 3 through 7).

Executive Functioning and Parenting Stress

Children's Executive Functioning. Adding the two-way interaction of children's age and children's executive functioning in the third step of the regression did not result in a significant increase in the variance explained in parenting stress (change in $R^2 = .00$, $p = .622$). There was no evidence of children's age as a moderator of the association between children's executive functioning and parenting stress.

Parents' Executive Functioning. The addition of the two-way interaction of children's age and parents' executive functioning in the third step did not result in a significant increase in

the variance explained in parenting stress (change in R^2 = .00, p = .886), providing no evidence of children's age as a moderator of the association between parents' executive functioning and parenting stress.

Executive Functioning and General Family Dysfunction

Children's Executive Functioning. The addition of the two-way interaction of children's age and executive functioning in the third step of the regression (change in R^2 = .00, p = .697) did not result in a significant increase in the total variance explained in general family dysfunction. There was no evidence of children's age as a moderator of the association between children's executive functioning and general family functioning.

Parents' Executive Functioning. The addition of the two-way interaction of children's age and parents' executive functioning in the third step did not result in a significant increase in the total variance explained in general family dysfunction (change in R^2 = .01, p = .227). There was no evidence of children's age as a moderator of the association between parents' executive functioning and general family dysfunction.

Table 42

Moderated Multiple Regression Results Examining Children's Age as a Moderator of the Association between Children's Executive Functioning and Parenting Stress

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.16	.16***
Constant	36.20***	34.53	37.88	0.85			
Child Aggression	1.63***	1.04	2.21	0.30	.40***		
Step 2						.23	.07***
Constant	37.28***	35.56	38.99	0.87			
Child Aggression	0.92**	0.24	1.60	0.34	.22**		
Child Age (Months)	-0.02	-0.06	0.02	0.02	-.07		
Child EF	0.21***	0.10	0.32	0.06	.31***		
Step 3						.23	.00
Constant	37.27***	35.55	38.99	0.87			
Child Aggression	0.92**	0.24	1.60	0.35	.22**		
Child Age (Months)	-0.02	-0.05	0.02	0.02	-.06		
Child EF	0.21***	0.09	0.32	0.06	.30***		
Child Age x Child EF	0.00	-0.00	0.00	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 165 for school-aged participants combined across the community and online samples. Child Age = children's age in months. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

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

Table 43

Moderated Multiple Regression Results Examining Children's Age as a Moderator of the Association between Parents' Executive Functioning and Parenting Stress

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.16	.16***
Constant	36.20***	34.53	37.88	0.85			
Child Aggression	1.63***	1.04	2.21	0.30	.40***		
Step 2						.27	.12***
Constant	36.55***	34.98	38.13	0.80			
Child Aggression	1.40***	0.84	1.95	0.28	.34***		
Child Age (Months)	-0.01	-0.05	0.02	0.02	-.05		
Parent EF	0.40***	0.24	0.56	0.08	.34***		
Step 3						.27	.00
Constant	36.55***	34.97	38.13	0.80			
Child Aggression	1.39***	0.84	1.95	0.28	.34***		
Child Age (Months)	-0.01	-0.05	0.02	0.02	-.05		
Parent EF	0.40***	0.23	0.56	0.08	.34***		
Child Age x Parent EF	0.00	-0.00	0.00	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 165 for school-aged participants combined across the community and online samples. Child Age = children's age in months. Child Aggression = total raw score on Conners 3 Aggression subscale. Parent EF = total raw score on BDEFS-SR. Parenting Stress = total raw score on Parental Stress Scale. Higher scores on all measures reflect worse functioning.

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

Table 44

Moderated Multiple Regression Results Examining Children's Age as a Moderator of the Association between Children's Executive Functioning and General Family Dysfunction

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.10	.10***
Constant	18.98***	17.83	20.12	0.58			
Child Aggression	0.88***	0.48	1.28	0.20	.32***		
Step 2						.12	.02
Constant	19.21***	18.00	20.42	0.61			
Child Aggression	0.72**	0.24	1.20	0.24	.27**		
Child Age (Months)	0.02	-0.01	0.05	0.01	.12		
Child EF	0.05	-0.03	0.12	0.04	.10		
Step 3						.13	.00
Constant	19.21***	17.99	20.42	0.62			
Child Aggression	0.73**	0.24	1.21	0.24	.27**		
Child Age (Months)	0.02	-0.01	0.05	0.01	.13		
Child EF	0.04	-0.04	0.12	0.04	.10		
Child Age x Child EF	0.00	-0.00	0.00	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 165 for school-aged participants combined across the community and online samples. Child Age = children's age in months. Child Aggression = total raw score on Conners 3 Aggression subscale. Child EF = total raw score on BDEFS-CA. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

Table 45

Moderated Multiple Regression Results Examining Children's Age as a Moderator of the Association between Parents' Executive Functioning and General Family Dysfunction

Variable	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	*UL*				
Step 1						.10	.10***
Constant	18.98***	17.83	20.12	0.58			
Child Aggression	0.88***	0.48	1.28	0.20	.32***		
Step 2						.26	.15***
Constant	19.24***	18.18	20.29	0.53			
Child Aggression	0.70***	0.33	1.08	0.19	.26***		
Child Age (Months)	0.02*	0.00	0.05	0.01	.14*		
Parent EF	0.30***	0.19	0.40	0.05	.38***		
Step 3						.26	.01
Constant	19.27***	18.21	20.32	0.53			
Child Aggression	0.71***	0.34	1.08	0.19	.26***		
Child Age (Months)	0.02*	0.00	0.05	0.01	.14*		
Parent EF	0.31***	0.20	0.42	0.06	.40***		
Child Age x Parent EF	0.00	-0.00	0.01	0.00			

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. *N* = 165 for school-aged participants combined across the community and online samples. Child Age = children's age in months. Child Aggression = total raw score on Conners 3 Aggression subscale. Parent EF = total raw score on BDEFS-SR. Family Dysfunction = total raw score on FAD General Family Functioning subscale. Higher scores on all measures reflect worse functioning.

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

General Summary

Two sets of analyses were carried out to examine whether the associations between executive functioning and parenting stress/general family dysfunction varied across different stages of children's development. In the first set of analyses, I examined bivariate and partial correlations between children's/parents' executive functioning and the psychosocial variables of interest, and then compared partial correlation coefficients using Fisher *r* to *z* transformations to determine if the association between children's/parents' executive functioning and each of the psychosocial factors of interest varied across different stages of children's development (five 3-year age-bands in the online samples). In the second set of analyses, this relationship was explored using moderated multiple regressions to determine if children's age moderated the association between executive functioning and parenting stress/general family dysfunction in families with school-aged participants (combined online and community samples). Results are presented for both sets of analyses for parenting stress and then general family dysfunction, in turn.

Parenting Stress

In the first set of analyses, bivariate and partial correlations reflected significant associations between children's/parents' executive functioning and parenting stress in the online samples, such that weaker executive functioning in either children or parents was associated with higher parent-reported parenting stress levels. When examining these associations separated by age groupings of children, however, with few exceptions, bivariate and partial correlations generally reflected associations between both children's and parents' own executive functioning and parenting stress levels only in the *younger* age-bands (ages 3 to 11 years), such that weaker executive functioning in either children under the age of 12 and/or their parents were associated with greater levels of parenting stress. The current results suggest a potentially more nuanced

understanding of the association between executive functioning and parenting stress, such that this association may be most meaningful in families with *younger* children rather than it being reflective of a more robust association across all stages of development. These effects were not found in the oldest two age-bands. This finding could suggest that parents shift their expectations of their children's behaviour as they age and/or expectations they hold for themselves for managing/regulating their children's behaviour (such as would be reliant on executive functioning skills) as they develop resulting in less stress associated with the parenting role. However, there were generally no statistically-significant differences that emerged between the age-bands when partial correlations between the age-bands were compared statistically (particularly with respect to *children's* executive functioning) meaning that such conclusions must be tempered as there may not be genuine differences in the association between executive functioning and parenting stress across the age-bands. Rather, the lack of significant findings in the older age-bands may – for example – reflect limitations in sample sizes whereby significant effects could not be detected.

There was, however, some limited evidence with respect to *parents'* executive functioning to indicate that weaker executive functioning in parents of *younger* children was associated with more parenting stress than associations found within age groupings of older children. Although only preliminary, these results may suggest that parents whose own executive functioning is weaker may struggle more with carrying out tasks of the parenting role with younger children who are developmentally and more consistently reliant on adults in their daily functioning than would be older children. Given that these results emerged within comparisons of correlation coefficients which had not uniformly achieved statistical significance, however, these results must be interpreted with caution.

In the moderated multiple regression analyses, however, there was no evidence that emerged to suggest that the association between either children's or parents' executive functioning and parenting stress varied as a function of children's age in families with children aged 6 to 17 years. More specifically, there was no evidence of an interaction of children's age and either children's or parents' executive functioning in predicting parent-reported parenting stress levels, suggesting that associations between these variables do not vary as a function of children's development.

Family Dysfunction

With respect to general family dysfunction, preliminary analyses reported on earlier reflect that in the full sample of participants, weaker executive functioning in parents was associated with greater general family dysfunction. Consistent with this, after controlling for children's aggression levels (amongst other control variables), only parents' weaker executive functioning (and not children's) was associated with greater family dysfunction in the full sample. A similar pattern was observed in three ages bands with respect to parents' executive functioning (namely in parents of children aged 3-to-5, 9-to-11, and 15-to-17-year-olds), with weaker executive functioning in parents associated with greater family dysfunction (but not in parents of children in the 6-to-8 or 12-to-14-year old age-bands). In contrast, only weaker executive functioning in the children in the 3-to-5 year old age-band was associated with poorer family functioning. However, in statistically exploring differences in the partial correlations across the age-bands, no statistically significant differences emerged with respect to parents' executive functioning and general family dysfunction, which again may suggest that there are no meaningful differences across the age-bands.

Results from the moderated multiple regression analyses again did not provide evidence of children's age moderating the association between children's/parents' executive functioning and

general family dysfunction. The interaction of children's age with either children's or parents' executive functioning did not emerge as significant predictors of general family dysfunction.

Taken together, these patterns of results suggest that there do not appear to be clear developmental patterns (as addressed via examining the pattern of effects within various age-bands for children, or when treating age continuously and as a moderator of the association between executive functioning and the psychosocial factors of interest) in understanding parenting stress and general family functioning on the basis of parents' and children's executive functioning. While one possibility is that significant effects could not be detected due to small sample sizes (particularly of the age-bands), it is also possible that the absence of differences may be attributable to the measures of executive functioning used in analyses. More specifically, given that parent-report was used as the measure of executive functioning for analyses, it may be that individual differences in how parents interpret their children's behaviour in completing these measures could have obscured important developmental differences that may have otherwise emerged. More specifically, while some parents may have interpreted items with respect to their child's objective ability to complete some particular task, other parents may have completed scales thinking about their child's ability to complete a given task relative to their same-aged group (i.e., are they where they would be expected to be on a particular skill given what any child their age would be expected to do, versus whether or not they are objectively able to complete the task regardless of their age, with the former highlighting a potentially higher level of skill than the latter style of responding). It is possible that this important methodological factor present when using parental report may have obscured important developmental differences in children's executive functioning, with resultant effects of a lack of variability in developmental patterns observed here with respect to parenting stress and general family functioning.

It is also, possible, however, that parents may be adjusting their expectations for children's executive functioning across different developmental stages such that associations with parenting stress levels or general family functioning adjusts accordingly. That is, even though a preschool-aged child with weaker executive functioning may require more executive functioning-related supports from a parent than a school-aged child given developmental trajectories of executive functioning development, parents may adjust their expectations for children's behaviour in a manner that results in relative stability in associated parenting stress levels. Moreover, with respect to parents' own executive functioning, associations with parenting stress levels may remain relatively stable even with developmental changes in children, such that rather than being reduced, the nature in which parents' executive functioning is tasked by children's developmental stages adjusts with their development (e.g., managing routines for preschool-aged children, handling increased scheduling and activities for school-aged children, and tracking activities for adolescents). It will be important for future research to further explore these considerations in order to better understand possible developmental patterns in the association between executive functioning and these psychosocial factors for families.

Chapter 9: General Discussion

This program of research endeavoured to expand the extant literature on the associations between executive functioning and psychosocial functioning to understand how differences in executive functioning may go beyond contributing to poorer functioning for the individual to have potential associations with the functioning of others with whom the individual interacts. Of note, given the correlational and cross-sectional nature of the current program of study as well as the extant literature, no assumptions of directionality or causality are intended. Moreover, several of the variables of interest to this program of research have been argued to have bidirectional effects on one another (e.g., parenting may have an effect on executive functioning development, while family functioning may also be influenced by child executive functioning; e.g., Downes et al., 2019; Heath et al., 2020; Taraban & Shaw, 2018; Schroeder & Kelley, 2009). As such, interpretations of the extant literature as well as the results of this dissertation speak generally to associations between variables of interest, with additional research – including further longitudinal designs – required in order for inferences of direction of effects to be made.

Anchored within the family unit, and with the aforementioned in mind, my research questions explored across three studies aimed to expand our understanding of how children's and parents' own executive functioning (and associated behavioural correlates of the ADHD phenotype) may interact to predict parenting stress for parents, as well as overall general family functioning for the broader family unit. More specifically, this research aimed to expand our understanding of the following:

- Do children's or parents' executive functioning relate to parenting stress, and is there an interactive effect wherein the association between children's executive functioning and parenting stress depends on parents' executive functioning?

- Do children's or parents' ADHD traits relate to parenting stress, and is there an interactive effect wherein the association between children's ADHD traits and parenting stress depends on parents' own ADHD traits?
- Do children's or parents' executive functioning relate to overall levels of general family dysfunction? Is there an interactive effect wherein the association between children's executive functioning and general family functioning depend on the executive functioning of the parent?
- Do children's or parents' ADHD traits relate to general family functioning, and is there an interactive effect in which the association between children's ADHD traits and family functioning depends on parents' own ADHD traits?
- (Supplementary) Do the associations between children's/parents' executive functioning and parenting stress/general family functioning vary based on children's stage of development?

An important contribution to the literature, my program of research has focused on exploring these associations within a community sample, where most available research on factors associated with poorer psychosocial functioning within families has focused on clinical populations at higher risk of these parent/family factors (e.g., parenting stress; Park et al., 2022). This contribution is important to the extent that observed associations within said clinical populations may be due to other factors associated with psychopathology which may not be relevant within non-clinical samples.

Summary of Results

Executive Functioning and Parenting Stress

As predicted, across both preschool- and school-aged populations, evidence emerged to indicate that children's and parents' executive functioning may be independently related to parents'

experience of parenting stress. More specifically, results suggested that weaker executive functioning in either children or parents may be uniquely associated with greater parenting stress levels in parents. In considering these results, it is relevant to consider the extent to which executive functions are implicit in a number of day-to-day activities in which children and parents participate. For example, morning routines in a household, including dressing, packing, and eating before one's day begins, involve several elements of executive functioning including but not limited to keeping track of instructions and belongings, inhibiting the desire/tendency to engage in unnecessary actions in favour of necessary ones, and switching between tasks (sometimes in progress) in order to ensure the timely completion of all necessary tasks prior to achieving the goal of departing for the day. When stronger executive functioning is present in the child (thereby resulting in fewer associated demands on the parent) or in the parent themselves (thereby allowing them to more readily juggle these executive functioning-related responsibilities), less stress may result because there are more executive functioning resources contributing to the effective carrying out of the morning routine. In contrast, where children require much more support when their own executive functioning is compromised and/or parents struggle more with managing executive functioning-related demands in their parenting role, this may conversely result in increased stress associated with the parenting role.

These findings add to the literature by demonstrating that both children's *and* parents' executive functioning are relevant considerations when trying to understand parenting stress. Explorations that focus more exclusively on children's executive functioning to date have been too narrow, and miss explaining important variance in this psychosocial variable. From an applied perspective, this may point to the importance of interventions which address executive functioning

in both family members – such as environmental adaptations – that will benefit all family members in order to reduce the likelihood of elevations in parenting stress for parents.

Conversely, however, given the correlational nature of my work it is also the case that parents who are more taxed or overwhelmed by their parenting role (i.e., those who reported higher levels of parenting stress) may subsequently view their other skills as being deficient to the extent that they may be insufficient to overcome or compensate for parenting-role related stresses (i.e., they are not sufficiently intact to make parenting demands easier). While this is speculative in nature, this may be consistent with research from clinical samples which suggests that maternal psychopathology may lead to inflated reporting of externalizing and internalizing symptoms in their children (e.g., Chilcoat & Breslau, 1997; Gartstein et al., 2009). It will be important for further research to clarify the direction of effects vis-à-vis the association between parents' executive functioning and parenting stress.

Of note, these findings were generally specific to questionnaire-based measures of executive functioning. Questionnaire-based measures (including parent report) are thought to provide information more specifically about the ability to effectively *apply* executive functioning skills in the less-structured context of everyday life. This is in contrast to performance-based tasks which are thought to assess executive skills under ideal conditions (such as in a controlled research laboratory environment) (McAuley et al., 2010; Toplak et al., 2013). Previous research has suggested that failure to distinguish between these aspects makes it difficult to ascertain whether associations between executive functioning and other aspects of functioning reflect actual underlying executive deficits, or rather are the result of some difficulty with the *application* of intact executive abilities in context.

Consistent with this extant literature (Toplak et al., 2013; Tomlinson et al., 2022; Fisher et al., 2022; Wiebe et al., 2008; Jurado & Rosselli, 2007), I found a relative lack of evidence of an association between task-based measures of executive functioning and the psychosocial variables of interest in a community sample. Taken together, these results suggest that failures in the execution of executive functioning – which may otherwise be intact – may better account for elevations in parenting stress, relative to underlying deficits in more pure aspects of executive functioning thought to be tapped by task-based measures of executive functioning. It is also conceivable, however, that using parent reports of both executive functioning, as well as parenting stress, in measuring my key variables of interest may have resulted in an inflation of the association between these variables, which I will discuss in the **Limitations** section below. In addition, it is possible that self-report measures may be reflective more of the understanding that has been encoded in parents' minds – e.g., related to their own skills and psychosocial functioning within their homes, as well as the skills and behaviours of their children – and less related to objective measures of how these factors occur in the day-to-day (e.g., how well they would correlate with observations made by others). This line of reasoning would be consistent with the above-noted research indicating that psychopathology may influence parents' exaggerated reporting on questionnaires (e.g., Chilcoat & Breslau, 1997; Gartstein et al., 2009), as well as research which has failed to find an association between teachers' ratings of children's executive functioning (e.g., Joyner et al., 2009) or oppositional behaviours (e.g., Theule et al., 2011) and parent-reported parenting stress levels. It will be important for further research to attempt to parse out these explanations.

Although significant results pertained generally to questionnaire-based measures, however, there were some results from the task-based measures of executive functioning that warrant

mention. In the final study, mothers and children completed in-lab computerized measures of subcomponents of executive functioning including working memory, switching, and response inhibition. Some research has indicated that lab-based executive functioning tasks may capture meaningful variance in everyday task performance (Miyake & Friedman, 2012). While there were only limited effects in support of an association between executive functioning and parenting stress detected through my analyses when executive functioning was examined via task-based measures, some preliminary evidence did emerge to suggest that smaller working memory capacity in mothers (but not children) was associated with higher levels of parenting stress. This finding is consistent with research which suggests that mothers with deficits in their working memory are more emotionally reactive to children's behavioural challenges (see Deater-Deckard et al., 2010). One possible explanation of this finding is that working memory is an executive skill that may be consistently taxed in the course of parenting responsibilities through needing to simultaneously track the belongings, activities, and schedules of not only oneself, but also one's child/children on an ongoing basis. As such, parents who experience more limited functioning in this domain may not only feel heightened parenting stress associated with constant high-pressure demands on working memory in the course of parenting, but would also be provided with constant feedback about deficits in this domain which may also be inherently stressful to parents. For example, feedback may occur when parents realize or have to compensate for anything that has been forgotten in the context of carrying out parenting responsibilities.

In contrast, smaller working memory capacity in children, as assessed via the lab-based measure, was not associated with higher levels of parenting stress. In their research, Park and colleagues (2022) found that only 17% of the variance in child-related parenting stress was explained by *meta-cognitive* aspects of executive functioning (i.e., executive functioning skills

associated with cognitive regulation, in contrast to executive functioning skills associated with behavioural regulation) when measured via parent-report. Specifically, executive skills in the metacognitive domain of executive functioning including working memory (as well as planning skills) were not associated with parenting stress in their sample despite parents' ratings reflecting their awareness of children's struggles within these domains. A similar pattern of results was also suggested by McLuckie et al. (2021) in their sample of school-aged children with ADHD, wherein a greater level of parenting stress was associated with aspects of children's behavioural regulation/emotional control (including inhibition and shifting) relative to aspects of their meta-cognitive functioning (with no effects of working memory found). As such, it may be that parents find it easier to compensate for or tolerate these meta-cognitive aspects of executive functioning, which can be more readily assumed by parents through completing actions for their children or providing a structured environment which allows for managing these difficulties, in contrast to more behavioural aspects of executive functioning which may be more difficult to manage or tolerate.

As suggested by other authors (McLuckie et al., 2021), these findings may also be understandable within the context of Abidin's (1990) operational definition of parenting stress, such that while particular executive deficits may be apparent to parents – such that they report weaknesses in these domains for their children on questionnaire-based measures of executive functioning – it may not result in heightened levels of parenting stress provided that parents do not perceive a mismatch between the demands of parenting (i.e., having a child in need of working memory supplementation) and their resources for meeting those demands. In contrast, where parents' own working memory may be more readily taxed given their own working memory deficits, heightened parenting stress may result due to subjective and/or objective evaluations of

their parenting abilities (at least in this specific domain) as being insufficient to meet the working memory demands of parenting.

Contrary to expectations, there was also some preliminary trend-level evidence which emerged to suggest that *stronger* response inhibition (as well as better switching abilities in parents in analyses controlling for parents' general stress levels) may be associated with higher parenting stress levels. Although these findings are difficult to interpret, it may be that better response inhibition in parents, along with their better ability to switch flexibly between sets or tasks, may reflect parents' overall general abilities to effectively meet demands in several (non-parenting) domains of their lives. Within the domain of parenting, however, which may include several variables that are less readily controlled (i.e., those pertaining to children's behaviour or activities, and how these may impact parents' own activities/plans), parents who are accustomed to more effective functioning may become more frustrated and/or stressed in the parenting role.

It is noteworthy, however, that there were no observed associations between children's executive functioning (when assessed using *task-based measures* of the subcomponents of executive functioning) and parenting stress. Although these findings need to be interpreted within the context of methodological limitations of my dissertation (discussed below) and further investigation is warranted, one possibility is that these findings are suggestive of parenting stress being linked with challenges in *executing* executive functioning in daily activities more so than being associated with true executive functioning deficits as measured under more controlled conditions. These findings underscore the highlighted importance of differentiating between performance-based and questionnaire-reported measures of executive functioning as discussed above. However, it also the case that even via parent-report, more variance in parenting stress has been found to be associated with more behavioural regulation – versus metacognitive aspects – of

executive functioning (McLuckie et al., 2021; Park et al., 2022). As such, it may also be that the association between performance on the selected task-based measures of executive functioning and parenting stress was not found given that they may have tapped more into elements of meta-cognitive executive functions, while tasks that more readily tap into elements of behavioural/emotional regulation may be more strongly associated with psychosocial functioning.

Task-related issues may have also obscured possible associations between children's tasked-based executive functioning and parenting stress. Although tasks were selected for their appropriate application within both adult and child populations, and children did not move ahead with experimental trials until proficiency was attained on the teaching and practice items, it may be that the computer-based tasks of executive functioning did not tap into the same constructs in children as they did with older participants, with performance in all children collapsed across the entire age range. As discussed in the background literature, a challenge for researchers is that given developmental variations in cognitive abilities, tasks that are suitable for use with children may not be appropriate for use with adults, and vice versa, in attempting to capture various cognitive processes. Any effects that may have occurred could thereby be attenuated due to measurement problems rather than being attributable to true deficits in executive functioning abilities (e.g., Cuevas et al., 2014b). It will be important for research using additional task-based measures of executive functioning with attention to developmental suitability to occur in order to rule out this possible explanation of the null results.

Also contrary to hypotheses, limited evidence was found in support of an interaction of children's and parents' executive functioning in parenting stress. This was true both for task-based measures of executive functioning (where no interaction effects were observed), as well as for questionnaire-based measures of executive functioning in families with *school-aged* children. In

exploring this within the sample of preschool-aged children, however, some preliminary evidence of an interaction effect did emerge. In this sample, higher levels of parenting stress were reported by parents who reported their own executive functioning to be weaker *regardless* of their children's executive functioning status. When parents' executive functioning was stronger, however, parenting stress levels were still higher for parents when their *child* had weaker reported executive functioning. The lowest levels of parenting stress were reported by parents whose own, and whose children's, executive functioning were reported by parents as being better developed, while weaker executive functioning in either child or parent was associated with higher levels of parenting stress. Here again, these findings may reflect the fact that higher parenting stress may result from parents perceiving themselves as having less ability to manage the demands of parenting, when demands themselves are higher (i.e., children have weaker executive functioning, resulting in higher demands being placed on parents) and/or when they perceive themselves as having fewer resources for managing these demands (i.e., their own executive functioning is weaker and may be insufficient to meet parenting requirements effectively). Of note, this preliminary indication of an interactive effect emerged only within the preschool-aged sample, which may reflect the younger and more dependent developmental stage of the children relative to older school-aged children who may not be *as* dependent on their parents for successful navigation of their day-to-day lives.

It is important to note that these results held even when accounting for parents' general stress, such that in the online samples weaker executive functioning in both children and parents was associated with greater parenting stress levels even after controlling for parents' general stress in analyses. These results highlight the important distinction between general stress that parents experience from everyday stressors relative to elevated levels of stress that occur related to the demands of parenting (Park et al., 2022). Moreover, these results are not limited to evaluations that

were reliant solely on parent-report as the indices of executive functioning and parenting stress. Parents' performance on a task-based measure of working memory also provided preliminary evidence of an association between a smaller working memory capacity in parents and higher parenting stress after controlling for general stress levels, while some preliminary evidence also suggested that having *stronger* response inhibition in parents may also predict parenting stress (although this latter result must be interpreted with caution given that this particular finding did not achieve statistical significance). However, when parents' general stress levels were controlled for in analyses exploring the association of parents' switching abilities with parenting stress, although caution must again be used in interpreting the finding, a trend-level effect emerged of *weaker* switching abilities in parents being associated with less parenting stress. While these findings are preliminary in nature and in need of further clarification, they suggest that even when measured via performance-based tasks, executive functioning in parents appears to predict meaningful variance in stress *unique* to the parenting role.

ADHD Traits and Parenting Stress

Addressing a limitation identified a in meta-analytic exploration of the association between ADHD and parenting stress (Theule et al., 2013), this program of research also served to further explore the association of parents' own ADHD traits, alongside those of their children, with parenting stress. Beyond the effects of parents' general stress levels, results from the online studies suggested that parents' higher ADHD traits – independent of their children's ADHD – predict greater parenting stress (though in the community sample, the association between parents' ADHD traits and parenting stress was no longer evident after controlling for parents' general stress levels). Consistent with the results of Theule et al. (2011), this adds to the literature by providing further evidence that an overemphasis on children's ADHD traits may have obscured important findings

with respect to parents' own ADHD traits – to such an extent that children's ADHD traits may be of relatively little importance relative to potentially much more significant associations of parents' own ADHD traits with their parenting stress.

In attempting to understand these results, it may be that more traits of ADHD in parents may position them to less effectively manage the demands of parenting, thereby resulting in associated increases in parenting stress. Returning to the example of the morning routine, parents who experience more inattention may struggle with tracking the completion of necessary daily tasks, may themselves become distracted in carrying out their own tasks, or may fail to recognize or execute on any required changes that come as a result of pivots in a child's typical routine (e.g., the need to complete and return a permission form to school). In contrast, parents who have stronger attentional skills may be more likely to be able to focus on and carry out this routine in a focused and thereby more efficient manner, leading to fewer errors and increasing the likelihood of successfully completing all required tasks to leave the house as scheduled. As discussed in the section on executive functioning, however, another possible interpretation of these results is that parents who are feeling heighted stress related to the parenting role may perceive/be reporting on their own ADHD traits as being more significant. Further research is required to clarify the direction of effects in understanding these associations, though there again may be important intervention implications for targeting supports at parents related to their own ADHD traits in order to improve this aspect of their psychosocial functioning.

Notably, however, children's ADHD traits were no longer associated with parenting stress when they were simultaneously entered into the models with parents' ADHD traits. This finding is consistent with results from Theule et al. (2011) who found that children's ADHD traits were not predictive of parents' parent-domain parenting stress after accounting for parent-level factors

including their own ADHD traits. Moreover, I did not find evidence of anticipated interactive effects between parents' and children's ADHD in predicting parenting stress. Recent longitudinal work by Uchida et al. (2023) elucidated the association between children's and parents' ADHD. Their results highlighted that children of parents with ADHD were significantly more likely to demonstrate traits of ADHD in clinical assessment (36% of children, when measured at a subthreshold or diagnostic level of symptoms), as well as significantly higher rates of other psychopathologies including disruptive behaviours (such as oppositionality), and mood and anxiety disorders. More functional impairments in the social and educational domains were also noted relative to children of parents without ADHD. Within this context, it is evident that the ADHD traits of parents must be simultaneously considered alongside the ADHD traits of children in any exploration of correlates of psychosocial functioning within families. Where effects have been attributed to children's ADHD traits, it is not only possible but likely that a failure to include parents' ADHD traits – which are likely present in a significant proportion of parents of children with ADHD – may be obscuring important neurodivergences in parents that may actually better account for psychosocial functioning in families, at least insofar as factors at the parent-level (i.e., parenting stress) are concerned. Despite the limitations of this research discussed below, this represents an important contribution of my program of research to the psychosocial functioning literature – highlighting the importance of examining factors at the level of the parent *and* child in any explorations in which there is an aim of better understanding factors that increase the likelihood of worse psychosocial functioning for individual family members.

Executive Functioning and General Family Dysfunction

In contrast to the findings on parenting stress, significant effects were only found with respect to parents' own self-reported – and *not* children's – executive functioning and general

family dysfunction. Contrary to hypotheses, no interactive effects were found, nor were there any significant effects of task-based measures of executive functioning for either parents or children. As discussed above, one possibility is that this may be understood within the context of deficits in application versus 'true' deficits in underlying executive functioning in understanding functioning of the broader family unit. That is, it seems that irrespective of underlying cognitive abilities, parents' perceptions of difficulties with executing on demands reliant on good executive functioning (as tapped by their reports on questionnaires) are associated with parents' overall perceptions of worse general family functioning.

It is noteworthy, however, that these effects were unique to parents' own executive functioning, and were not significantly associated with children's executive functioning. One possible interpretation of these effects is that the overall family climate is more associated with parents' level of functioning, such that when considering the associations of weaker executive functioning in family members with family variables, associations of children's weaker executive functioning are not as significant as those of parents' weaker executive functioning. This may be the case given that parents have more responsibility for effective functioning of the *overall* household – relative to the influence of one child whose executive dysfunction may not result in measurable or significant impacts on the broader family unit to the same extent.

In an early influential model of parents'/familial functioning, Belsky (1984) highlighted that overall family functioning is determined by the psychological resources of the parents (e.g., their own personality and psychopathology), child characteristics (including temperament and negative emotionality), and contextual sources of stress and support for the parents (e.g., work, quality of the marital relationship, and sources of support to the parent). Consistent with Abidin's model of parenting stress, Belsky cited evidence that it is generally the goodness of fit between

parents' resources and child characteristics that determines functioning within the relationship. Importantly, this highlights how paramount an exploration of parent-related factors is within any exploration of overall parental and family functioning, as limiting explorations primarily to child-level factors may prevent a more fulsome understanding of factors that may be associated with the overall functioning of the family. Findings related to the role of parents', rather than children's, executive functioning in my studies again reflect the importance of ensuring that explanations within families equally or over-emphasize the role of parents' executive functioning in endeavouring to understand and address general family dysfunction.

ADHD and General Family Dysfunction

In exploring the association between ADHD traits and general family functioning, elevated levels of ADHD traits in parents were found to be predictive of greater general family dysfunction across all samples. In contrast, no effects emerged for children's ADHD traits, or an interaction of children's and parents' ADHD traits, suggesting that parents' ADHD traits uniquely predict general family dysfunction irrespective of children's ADHD traits. The results of my studies are consistent with previous literature which suggests that family functioning is often worse amongst families wherein parents and children have ADHD traits (Moen et al., 2015, 2016). This previous research has suggested that parents' well-being and psychological distress seem to influence family functioning the most (see also Tolou-Shams et al., 2018), with the behaviours of children with ADHD, as well as the amount of support received by the family from community resources, also associated with family functioning (Moen et al., 2016). Of note, while much of the extant literature has focused on the effects of children's ADHD traits on the broader family unit, this previous research has suggested that younger age of parents and better parental emotional well-being (lower psychological distress, and higher well-being), in addition to less problematic behaviour from

children and better perceived social supports from community health services, all have a positive effect on overall family functioning. These results are consistent with other research indicating that families of children with ADHD may struggle more in terms of family functioning due to difficulties with organization and family conflict within those homes. In that research, the authors found that 44.3% of the variance in family functioning is explained by parent variables, with only 5.3% explained by child behaviour (Schroeder & Kelley, 2009). Again, those authors concluded that most of the variance in general family functioning was explained by parents' psychological distress and well-being.

Given the high heritability of ADHD traits within families, some authors have argued that parents within these families may not have deficits in their parenting abilities per se, but rather their own ADHD-related difficulties may be associated with their ability to effectively achieve a "normal" family environment regardless of other resources available to them (Moen et al., 2015). These results again suggest the importance of looking at the family as a whole rather than attempting to explain family functioning based on characteristics of single individuals in order to best understand this important psychosocial facet of families. Future research may also serve to determine whether these associations vary by ADHD subtype, although previous research looking at the associations between children's ADHD traits and family functioning did not find that the association varied according to ADHD subtypes (see Savci et al., 2023). Rather, those authors noted that family functioning was more highly associated with comorbidities of children's ADHD including oppositionality. Taken together, however, and as discussed in the foregoing summary, my results indicate that a consideration of parent factors is critical in any explorations of and attempts to address general family functioning within families.

Variations in the Association between Executive Functioning and Psychosocial Functioning within the Family (Parenting Stress and General Family Dysfunction) based on Stages of Children's Development (Supplementary Analyses)

In order to explore the possibility of developmental differences in the association between executive functioning in either children or parents with the psychosocial variables of interest, these associations were explored across different age-bands for children in the online samples. Overall, there were very few differences that emerged across the age-bands, such that neither with respect to parenting stress levels nor general family dysfunction did there appear to be a change in the association between executive functioning and either of the psychosocial variables based on children's age. Some research has suggested that using larger age bands, particularly in younger samples, may obscure important developmental differences that occur in executive functioning in children (e.g., Howard et al., 2015); however, given that differences were also not observed within the older school-aged samples where slower rates of executive functioning development are believed to occur, this does not seem the most likely explanation of these results. More likely, it is possible that anticipated differences across the age groups may have been obscured by methodological limitations of the samples, including relatively limited sample sizes for each of the groups. Given concerns that large confidence intervals for correlations associated with small sample sizes may also have obscured differences across the age bands, moderated multiple regression analyses were also carried out to test whether age (treated continuously) moderated the association between executive functioning and the psychosocial variables of interest across all school-aged participants. These analyses did not reveal any statistical evidence that age moderated these associations, providing no evidence of a developmental effect.

Rather, the following potential interpretations of these results are offered. First, it may be the case that parents may be adjusting their expectations for children's executive functioning across different stages such that even when executive functioning of younger children is weaker (i.e., developmentally-speaking, as in younger preschool-aged children have weaker executive functioning than school-aged children), there are no associated elevations in parenting stress levels. That is, even though a preschool-aged child with weaker executive functioning may objectively require more effort on the part of the parent (thus increasing the demands of parenting), parenting these children may not be associated with higher levels of parenting stress if parents hold adjusted expectations for what is required of them in the parenting role.

Second, it may be that parents' own executive functioning is associated with psychosocial factors in an overall consistent manner if their own executive functioning is taxed to a similar extent – though by different requirements based on their children's changing needs – over the course of children's development. For example, while management of routine and structuring of steps for everyday task completion may be paramount in the parenting of preschool-aged children, the coordination of increasingly complex schedules and activities for school-aged children and tracking of activities of teenaged youth may emerge as children age and replace (at least to some extent) the executive functioning-related activities that occur in the parenting of younger children. That is, it may be that the extent to which parents' executive functioning is taxed by the parenting activities required at each stage of children's development is comparable, resulting in a stable association between parents' executive functioning and parenting stress across all stages of children's development.

Taken together, these possible explanations may explain why executive functioning in both children and parents may have generally consistent associations with psychosocial functioning at

the parent- and family-level regardless of children's stage of development. Although preliminary in nature, the results of my analyses – to my knowledge – provide the first exploration of developmental changes in the association between executive functioning and psychosocial functioning within families and suggest that these associations may not vary based on the developmental stage of the child.

Differences in Findings of Parenting Stress versus General Family Dysfunction

As stated in the introduction, an overarching goal of my dissertation was to explore the association between children's and parents' executive functioning (and associated ADHD behavioural traits), and psychosocial variables at both the individual (parenting stress) and family (general family dysfunction) levels. A number of differences emerged to suggest that the proposed variables under examination may have differential associations with both aspects of psychosocial functioning. To my knowledge, this presents the first study in which these factors were both explored and point to the importance of considering various individual-level factors in trying to explain psychosocial functioning within families.

First, as outlined above, there were notable differences in the associations of executive functioning with parenting stress versus general family dysfunction, with greater support emerging for a unique association between children's and parents' executive functioning (at least when measured via parent report) with *parenting stress*. In contrast, and contrary to hypotheses, only parents' – and not children's – executive functioning was found to associate with general family dysfunction. Overall, these findings suggest that executive functioning within various family members may be more uniquely associated with negative psychosocial functioning at the individual level (i.e., parenting stress) rather than at the level of the broader family unit (i.e., general family functioning).

Second, there were also observed differences in relation to ADHD traits with respect to the two different psychosocial variables, such that while parents' ADHD traits were predictive of both parenting stress and general family dysfunction, children's ADHD levels were not predictive of either across samples. The latter is a surprising result given associations that have been reported in the literature with respect to children's ADHD traits and elevations in both parenting stress (e.g., Theule et al., 2013) and general family dysfunction (Young et al., 2013; Schei et al., 2016). As discussed above, it may be that a failure to explore parents' ADHD traits in studies has inadvertently resulted in attributions about children's ADHD traits being associated with poorer psychosocial functioning for families when it may be that parents' own ADHD functioning may be more explanatory.

Finally, although not a primary focus of this program of research, analyses also revealed the possible differential association of control variables with psychosocial factors at the individual (parenting stress) and family (general family dysfunction) levels. With respect to parenting stress, preliminary evidence emerged to suggest that higher aggression levels in children and *not* being a single parent were predictive of parenting stress. The first finding is consistent with research which suggests that oppositional behaviours in youth with ADHD may be more predictive of parenting stress than ADHD symptoms per se (Anastopoulos et al., 1992). In terms of the second finding, other research has suggested that *being* a single parent is more likely to be associated with negative functioning within families (e.g., Moen et al., 2015, 2016). These findings have been inconsistent in the literature, however, with possible discrepancies being explained by the association between single parenthood and poorer functioning actually being exacerbated by other factors that may be accompany single parenthood such as financial constraints (Sarsour et al., 2011). Considerations such as these may not have been a factor within the present samples given their relatively higher

educational attainment and income levels. It may also be the case that single parenthood may be advantageous in instances where marital quality is poorer, such that some researchers have discussed that marital quality may "spill over" into other aspects of family life including parenting behaviours (Taraban & Shaw, 2018). As such, poorer marriage quality may be associated with worsening of parenting behaviours and effects on other aspects of psychosocial functioning within families, with single parenthood potentially resulting in a removal of negative effects that may be associated with poor relationship quality amongst parents. Stated differently, it may be that although single parenthood may present with some challenges that two-parent households may not face (e.g., greater financial constraints, more responsibility for children's behaviour monitoring), the negative effects of this may not outweigh the negative effects of parenting from within a poor-quality marital relationship.

A somewhat different picture of relevant control variables emerged with respect to general family dysfunction, further reflecting differences in factors contributing to these distinct psychosocial functioning variables. In these analyses, children's age (a trend-level finding of having younger children in the preschool-aged online sample and having older children in the school-aged community sample) and gender (a trend-level effect of having children who are girls in the school-aged community sample) emerged as explaining significant variance in general family dysfunction but were statistically nonsignificant in predicting parenting stress. Consistent with the parenting stress analyses, there was also some limited evidence that greater general family dysfunction was predicted by not having single-parent status, as well as children's parent-reported higher aggression levels. These findings suggest that a broader range of control variables that are independent of children's cognitive and behavioural functioning – including children's age and gender – may be associated with the overall functioning of the family unit, while more

cognitive/behavioural factors in children (including their executive functioning) may be associated more uniquely with parenting stress.

Implications

Importantly, for the purpose of this dissertation, parenting stress and general family functioning were explored as separate psychosocial constructs. It is noteworthy, however, that these two psychosocial variables were moderately correlated across all samples examined (with partial correlations controlling for control variables ranging from r = .40 to .54). Some authors have argued that there may be a complex interplay of associations between the overall functioning of families and parenting stress levels, such that poorer family functioning has been suggested as a possible mediator of elevated parenting stress levels in families of children with ADHD (Savci et al., 2023). Some evidence has also emerged to suggest that improving collaborative problem solving – which is one element that factors into healthy family functioning – results in significant reductions in children's behavioural difficulties, as well as parenting stress levels (Heath et al., 2020). As such, while the results of this program of research suggest separability of these constructs such that they are differentially predicted by various child- and parent-level factors, it is important to note that there is likely a significant amount of practical overlap in these constructs when considered within the context of everyday functioning for families.

Nonetheless, there are a number of important implications arising from this work for methodological/theoretical perspectives, as well as clinical applications. First, these results highlight the importance of considering the executive functioning and ADHD traits of adults – as well as children – in any explorations of psychosocial functioning within families (e.g., Theule et al., 2013; Theule et al., 2011). While the extant literatures have focused largely on exploration of child-level factors in explaining both parenting stress and general family dysfunction, the findings

of this program of research highlight that parent-level factors may potentially hold more explanatory value. This was particularly the case for general family dysfunction, where most of the variance in general family dysfunction was explained by parent-level factors. The results of this study also provide further evidence for the importance of considering separate estimates of executive functioning – specifically differentiating between performance-based measures and rating scales of everyday applications of executive functioning – in understanding psychosocial effects within families. As demonstrated here, one possibility is that psychosocial variables may be more highly associated with parents' evaluations of the *application* of these skills in everyday functioning – rather than the presumed purer assessment of these underlying cognitive abilities that are thought to be tapped by performance-based measures of these constructs.

There are also some applied implications that follow from the results of this program of research. Most notably, it may be that interventions that are aimed at ameliorating associated factors within the *parents*, and more so than those of the children, may actually reduce the likelihood of negative psychosocial functioning from occurring within families (Theule et al., 2011). In the model of family functioning proposed by Epstein and colleagues (1978) and updated by Taraban and Shaw (2018), it is argued that changes in individuals will be associated with changes in the family unit given the critical role of the family unit in shaping and maintaining the social, psychological, and biological well-being of all family members. This is consistent with recommendations from other researchers which highlight the need for exploring characteristics of all family members as relates to family functioning, in accessing appropriate supports (Moen et al., 2016), as well as in findings of family problem-solving interventions which result in reduced parenting stress amongst parents perhaps as a result of parents' enhanced understanding of and empathy for the challenges faced by their children (e.g., Heath et al., 2020).

Indeed, it is possible that associated improvements in parents' functioning may explain the improvements in familial psychosocial variables that have been observed in intervention studies which may have otherwise been explained more in terms of improvements in child-related factors. For example, parent training in families of children with ADHD and its associated executive dysfunction has been associated with better general family functioning, as well as improvements in the specific subdomains of problem solving, communication, roles, affective sensitivity, and behavioural control (Öztürk et al., 2019). While such training likely results in shifts in interactions amongst family members, its is also conceivable that there are associated improvements in parents' *own* functioning as a result of such training. A lack of measuring parent-related predictor variables in most studies will necessarily obscure the possibility of empirical explorations of this, marking an important area for further research. Related to this, it is possible and likely that the benefits of interventions may result in the aforementioned bidirectional results of factors between parents and children that improve psychosocial functioning. For example, in an exploration of a collaborative problem-solving family therapy program, Heath and colleagues (2020) found that improvements in both children's behavioural difficulties, as well as parenting stress, were closely correlated. The authors suggested that this behavioural approach may reduce parenting stress via helping parents to predict and respond proactively to children's behavioural difficulties, with reduced parental distress allowing for parents to respond more productively in required problem-solving with their children and/or to make accommodations or offer supports to their children in a manner that better allows their children to meet expectations.

This program of research also highlighted the importance of applications of executive functioning in daily life in both children and parents for understanding parenting stress. While there is mixed evidence in support of the ability to feasibly train executive functions to achieve

any type of far-transfer effects (see Bombonato et al., 2024, for a review), it is generally the case that executive function training results in improvements only within the specific skill practiced rather than contributing to broader improvements in executive functioning for individuals. Rather, providing environmental accommodations to facilitate executive functioning within the environment is the approach that is most often utilized in supporting weaker executive functioning in day-to-day life. The results of this program of study suggest that implementation of environmental supports to facilitate the executive functioning of *both* the parent and the child may be associated with meaningful reductions in parenting stress, which is a specific area that may benefit from empirical exploration.

Moreover, parenting stress analyses highlighted that it may be parental ADHD traits – and not ADHD traits in children – that may increase the likelihood of elevated levels of parenting stress. Reductions in parenting stress via management of *parents*' ADHD symptoms, rather than focusing on the management of these symptoms in their children, may also be an important area of exploration insofar as it may point to a different target of intervention than would be implied by the current literature focusing on the explanatory role of children's ADHD traits in understanding parenting stress (Theule et al., 2011). Related to the latter, my results have also suggested that supporting parents who are experiencing worse executive functioning and/or more traits of ADHD traits is more likely to result in improvements in overall general family functioning versus interventions aimed at child-level functioning.

Finally, results from both analyses highlighted the importance of children's externalizing behaviours (oppositionality, aggression) to psychosocial functioning at both levels within families. These results are consistent with findings from the parenting stress literature which indicate that externalizing behaviours are associated with higher levels of parenting stress within the ADHD

population (Theule et al., 2013; Anastopoulos et al., 1992). Interventions aimed at reducing these behaviours in youth and/or supporting parents in their management of these behaviours may lead to important improvements in the psychosocial functioning of these children's family members.

Limitations

Although providing some important contributions, it is important to note that there are several limitations to this program of research that may limit the conclusions which may be drawn, and which should be addressed in further research.

There were very high correlations that were observed between measures of the key variables (notably between measures of children's executive functioning and their ADHD, and parents' executive functioning with their own ADHD). This may be associated with shared method variance, such that parent-report measures of executive functioning and ADHD traits were used in analyses. However, it is also the case that a decision to include the parent-report measures of executive functioning used (respective measures of the BDEFS for measuring executive functioning in both school-aged children and adults) may be criticized given their development by an individual whose underlying model of ADHD is one of a disorder largely characterized by impaired executive functioning (Barkley, 1997).

Of note, because of the significant correlations between measures of these respective constructs in the study samples, anticipated hierarchical regressions to examine the extent to which the association between children's and parents' executive functioning and parents' self-reported parenting stress/general family functioning varied based on the presence of ADHD-related behaviours could not be carried out. This was because interpretation of any observed interaction effects involving executive functioning and ADHD traits would have been very difficult to complete with any reasonable certainty as to which factors were driving the effects. While various

measures of ADHD traits and executive functioning are often moderately to significantly correlated within the literature, with estimates ranging from r = .68 to .91 (Barkley & Murphy, 2010a, b, as cited in Toplak et al., 2013), it will be important for future research to examine these associations with measures that are likely to offer less overlap in measuring their respective constructs.

Another important consideration relates to common method variance given that several analyses used in this program of research relied on parent report as the measures of all key variables of interest (i.e., the predictor and the outcome variables). While this is unlikely to explain all of the results obtained, such that the outcome variables demonstrated different associations with the predictor variables despite these variables being highly correlated with each other and being reported on by the same parent, it is an important consideration in the current studies. It is possible that common method variance may provide an alternative explanation to the higher associations between questionnaire-based measures of executive functioning and psychosocial effects relative to those observed when performance-based measures of executive functioning were used.

Previous research has established that higher levels of distress and/or psychopathology in parents and teenagers can impact the extent to which heightened levels of negative reporting on questionnaires occurs (e.g., Schei et al., 2016; Heath et al., 2020). Although the results for parenting stress in these samples generally held even after controlling for parents' general stress levels, some patterns of results *did* differ when controlling for these. As such, it is not possible to rule out the possibility that parents' general well-being may have influenced the patterns of observed associations. This is particularly important given the overrepresentation of mothers in the samples, where some research has suggested that mothers may report higher levels of psychological distress than fathers in clinical samples – perhaps due to their heightened parenting

responsibilities (Schei et al., 2016). This has led several researchers to highlight the importance of multi-informant reporting or in-vivo/observational measures of variables of interest (e.g., Huang-Pollock et al., 2009; Schroeder & Kelley, 2010; Young et al., 2013; Savci et al., 2023; Schei et al., 2016). Relatedly, some researchers have argued that children and adolescents within the families themselves may be important sources of information and may present with a very different perspective than parents thereby adding important information to any clinical assessment of psychosocial functioning within families (Schei et al., 2016; Fisher et al., 2022). While a limited number of teacher and observer reports of executive functioning and ADHD traits were obtained within the third study (school-aged community sample), this portion of the research protocol was abandoned due to difficulties with participant recruitment and the already onerous requirements of the broader research study. As such, this represents another important limitation of this research.

It is also the case, however, that parent-report provides important information such that although it may present a biased picture based on reliance on a single informant, it *does* present useful information about how parents' *perceptions* of their own and their children's behaviours – though this may differ from more objective evaluations – may be associated with important aspects of psychosocial functioning in families (Taraban & Shaw, 2018). This may have important treatment implications, such that exploring/addressing parental evaluations of and coping with perceived deficits in themselves or others may help to ameliorate the effects of these psychosocial variables for family members (Heath et al., 2020). This presents an important future direction coming from this work.

In addition, a significant limitation of this program of research was the small sample sizes across studies – most notably in the community sample where performance-based measures of

executive functioning were administered. With the community sample in particular[10], but also with respect to the preschool-aged online sample, these studies were underpowered to detect effects that were anticipated which may also explain why the pattern of observed results differed somewhat in the community-based versus online samples. It will be important for the pattern of results to be replicated within larger sample sizes to have more confidence in interpretations of effects. Efforts were made to reduce the number of predictors in the regression analyses in order to accommodate for reduced power due to the sample size while still attempting to be consistent with the overarching aims of the program of research (i.e., selective inclusion of control variables on the basis of their statistically-significant association with the outcome variables of interest in the study samples). Still, caution must be taken in the over-interpretation of these regression analyses on the basis of reduced power in these studies (Downes et al., 2019).

Related to the sample characteristics, the community sample was comprised of mothers only, while the online samples – though including some fathers – were also predominantly comprised of mothers. While this is consistent with the broader research literature, which cites mothers continuing to assume primary caretaking responsibilities in several households cross-culturally (e.g., Cuevas et al., 2014a, b; Deater-Deckard et al., 2012; Park et al., 2022), this presents another limitation of this program of research. Parental responsibility distributions do appear to be shifting given noted increases in fathers' reported time spent doing child-care related activities (Taraban & Shaw, 2018). Moreover, mounting evidence suggests that there may be differential associations with various child and family variables for mothers versus fathers (e.g., Moen et al.,

[10] Post-hoc power analyses were conducted for each of the three study samples using G*Power 3.1.9.7 software (Faul et al., 2009). Estimating a medium effect size of Cohen's $f^2 = 0.15$ (see Selya et al., 2012), an alpha error probability of .05, and seven predictors used in the primary analyses (four control variables, two main effects, and one interaction term for each multiple regression, as detailed in the **Results** chapters), only the online school-aged sample achieved adequate power (achieved power of 0.85), while the preschool-aged online sample approached adequate power (achieved power of 0.75). The school-aged community sample was significantly underpowered to detect an effect (achieved power of 0.42).

2015, 2016; Taraban & Shaw, 2018; Blum & Ribner, 2022). For example, research has suggested amongst parents of children with ADHD, mothers may experience more psychological distress than fathers (Moen et al., 2016), perhaps associated with the ongoing socialization of mothers to assume primary caregiving responsibilities. Other researchers have found differences in ratings of general family functioning when this domain is mother- versus father-reported and have recommended that their scores not be combined when examining this variable (Cooke et al., 2015). Still other research, however, has suggested that perhaps the differences between mothers and fathers may be minimal (Moen et al., 2015). As such, it will be important for future research to examine associations amongst variables in mothers versus fathers, respectively, to ascertain if different associations exist based on parents' gender.

Related to sample recruitment, the use of online sampling for data collection has also come under criticism, particularly in more recent years (Douglas et al., 2023; Barends & de Vries, 2019; Berry et al., 2019). Inattentive responding associated with reduced data quality has been identified even within voluntary participants (Berry et al., 2019), with researchers exploring methodological strategies for reducing and screening for poor responding in online samples (e.g., insertion of infrequently endorsed [Kay & Saucier, 2023] and "bogus" [Berry et al., 2019] items that would identify problematic responders). More specific to the use of Mechanical Turk (MTurk) itself, Douglas et al. (2023) examined factors associated with high versus low quality responses across a number of online data collection platforms given research indicating that the quality of data collected through MTurk has declined since 2015. Their results suggested that MTurk, along with Qualtrics and SONA (two often-used platforms in the social sciences literature), provided lower quality data relative to other online sourcing platforms. Data quality was reduced with respect to passing attentional checks, providing meaningful responses, following instructions, remembering

previously-presented information, taking adequate time to read all items, and responding from unique geolocations relative to other participants.

Of note, research available at the time that my program of research was designed regarding the use of online samples indicated that data provided by MTurk was of good quality and was generalizable to the broader population (Buhrmester et al., 2011). Indeed, other researchers also cited evidence that earlier studies provided initial support for high quality data collection from MTurk. For example, in their review, Douglas et al. cited evidence that data collected from MTurk was comparable in quality to in-person samples (e.g., on personality measures), was comparable in quality to student samples and higher quality than other professional platforms, took respondents less time despite comparable performance on attentional checks, and was more representative of the broader United States population. Data collection for my studies was collected during or largely prior to 2019, and pre-screening efforts were made that did not reveal the purpose of the pre-screen/subsequent research studies. Based on this pre-screening, participants were then contacted with a specific invitation to participate in the studies in an effort to improve data quality. Nonetheless, given the more recent research findings, this does present as an important limitation of the current research. As such, it will be important for further research to replicate these results within less controversially-recruited samples (e.g., community samples) to ascertain the generalizability of results.

Another potential limitation specific to the community sample, limited associations between the computerized measures of executive functioning did not allow for the creation of a latent variable for executive functioning. It was also the case that I was interested in understanding how specific aspects of executive functioning – namely working memory, switching, and response inhibition – related to the psychosocial variables of interest, necessitating their separate

consideration. As discussed elsewhere in this thesis, however, several researchers argue that a latent variables analysis of executive functioning is more reliable as it accounts for other non-executive functioning related variance (e.g., measurement error) that is also present in executive functioning task performance (e.g., Miyake et al., 2000; Miyake & Friedman, 2012; Cuevas et al., 2014b; Sarsour et al., 2011; Huizinga et al., 2006; Jurado & Rosselli, 2007). Practically speaking, interpreting results from individual tasks and/or using brief questionnaires to capture a variable as complex as executive functioning has been criticized on the basis of more limited assessments of executive functioning demonstrating limited predictive validity and reliability relative to composite scores (Deater-Deckard et al., 2012; Jester et al., 2009). Factors impacting reliability estimates for various tasks include having similar-seeming tasks appear to measure different skills depending on the age of participants, as well as the loss of novelty following an initial administration necessarily limiting test-retest estimates of executive functioning abilities (e.g., Jester et al., 2009).

As discussed, however, some authors have argued that latent variables analyses may not always be most appropriate (e.g., Camerota et al., 2020). Consistent with results from my community sample, research has found that there are often only small to moderate and/or nonsignificant correlations between performance on individual tasks, potentially indicative of there being very little shared variance reflective of an underlying latent construct (Jurado & Rosselli, 2007; Camerota et al., 2020; Huizinga et al., 2006). On this basis, other authors have argued that derivation of latent constructs for analyses may actually obscure important individual differences that are otherwise captured by individual task performance. As such, although there is some debate within this literature, it may be beneficial for further research to examine these associations with use of a latent construct to determine if similar patterns of findings emerge.

Finally, although analyses did control for single-parent status, information collected about other aspects of the family environment were used only in characterizing the study samples. This presents a limitation as evidence from the extant literature suggests not only that the contextual environments in which families exist may be associated with several of the key variables of interest within these studies (Sarsour et al., 2011; Bernier et al., 2010), but may also affect the interplay of these variables in understanding psychosocial functioning (e.g., with family environment having a stronger association with the cognitive development of children from lower socioeconomic groups than children from higher socioeconomic groups; Downes et al., 2019; Taraban & Shaw, 2018). As such, an important future direction will be to consider how various family environmental factors may influence the observed associations found within the current program of research. This will be important in order not only to replicate results but will be necessary in order to make claims about the generalizability of the results from my studies across various ethnic groups and the full SES spectrum (Cuevas et al., 2014b). In addition to being predominantly Caucasian, participants in my studies – and particularly the school-aged community sample – reported relatively high educational and household income levels. Based on the information collected, it may have been possible to compute a composite index of family socioeconomic status by averaging standardizations of parents' education levels and family income (Hébert et al., 2021); however, the data collected was not done so to a degree of completion and accuracy that would allow for a strong exploration of the effects of socioeconomic status vis-à-vis the psychosocial functioning variables explored here.

Moreover, the background literature reviewed suggested that other factors reflective of the broader family context, including factors such as noise, crowding, lack of routines, and access to informal and formal supports (e.g., Deater-Deckard et al., 2012; Sarsour et al., 2011), are also

important to explore insofar as these factors may further tax parents' capacities resulting in fewer available resources for executing their parenting role (e.g., the ability to be emotionally and verbally responsive parents, who reinforce positive behaviour and scaffold development; Sarsour et al., 2011). Some evidence exists to suggest that caregiving within families may be most impacted by contextual factors, including having more financial resources, such that higher quality parenting (e.g., more warmth) may be associated with favourable contextual factors over and above the effects of parent- and child-specific characteristics. Moreover, these contextual factors are argued to be more impactful in lower SES versus higher SES families (Taraban & Shaw, 2018), suggesting that contextual factors (including sources of stress and support to parents) may be differentially associated with psychosocial functioning at the individual and family level based on various demographic features of families. As such, it will be important to ascertain how the associations between executive functioning, ADHD traits, and aspects of psychosocial functioning (including parenting stress and general family dysfunction) may vary across groups.

Conclusion

As discussed in the **General Introduction**, understandings of the associations between executive functioning (and its behavioural correlates of ADHD) and psychosocial functioning within families, including parenting stress and general family dysfunction, have been limited by a relative sparsity of research as well as a number of methodological limitations. In particular, explorations have focused predominantly on the executive functioning/ADHD traits of children to the exclusion of parents' own executive functioning/ADHD traits, have utilized mostly clinical samples, and have relied largely on questionnaire-based measures of executive functioning. My research adds to the literature by simultaneously exploring parents' functioning along with that of

their children, and by utilizing questionnaire- *and* task-based measures of executive functioning in a community sample.

Results indicated that while weaknesses in both children's and parents' executive functioning are associated with parenting stress (particularly when assessed via questionnaire, but also with some limited evidence from a computerized measure of mothers' working memory), it is parents' ADHD traits – and not those of their children – that are associated with this aspect of psychosocial functioning. These results held even after controlling for parents' general stress levels suggesting that this pattern of associations is unique to stress associated with the parenting role and are less likely to be just a reflection of parents' general well-being. A different picture emerged, however, with respect to general family functioning such that this aspect of psychosocial functioning in families appeared the be primarily associated with *parents'* – and not children's – executive functioning and ADHD traits. These findings highlight the importance of a fulsome assessment of factors operating at both the level of the child and – perhaps more so – the parent in understanding psychosocial functioning within families. In addition to methodological and theoretical contributions, the results of this dissertation also add to the intervention literature by suggesting that interventions aimed at supporting and addressing needs in the parent may optimize psychosocial functioning within families.

References

Amador-Campos, J. A., Gómez-Benito, J., & Ramos-Quiroga, J. A. (2014). The Conners' Adult ADHD Rating Scales – Short self-report and observer forms: Psychometric properties of the Catalan version. *Journal of Attention Disorders*, *18*(8), 671-679. https://doi.org/10.1177/1087054712446831

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Anastopoulos, A. D., Guevremont, D. C., Shelton, T. L., & DuPaul, G. J. (1992). Parenting stress among families of children with attention deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, *20*(5), 503-520. https://doi.org/10.1007/BF00916812

Anderson, L. S. (2008). Predictors of parenting stress in a diverse sample of parents of early adolescents in high-risk communities. *Nursing Research*, *57*(5), 340-350. https://doi.org/10.1097/01.NNR.0000313502.92227.87

Anthony, L. G., Anthony, B. J., Glanville, D. N., Naiman, D. Q., Waanders, C., & Shaffer, S. (2005). The relationships between parenting stress, parenting behaviour and preschoolers' social competence and behaviour problems in the classroom. *Infant and Child Development*, *14*, 133-154. https://doi.org/10.1002/icd.385

Åsberg, K. K., Vogel, J. J., & Bowers, C. A. (2008). Exploring correlates and predictors of stress in parents of children who are deaf: Implications of perceived social support and mode of communication. *Journal of Child and Family Studies*, *17*(4), 486-499. https://doi.org/10.1007/s10826-007-9169-7

Baddeley, A. (1992). Working memory. *Science*, *255*(5044), 556-559. https://doi.org//science.1736359

Baddeley, A. (1996). The fractionation of working memory. *The Proceedings of the National Academy of Sciences*, *93*(24), 13468-13472. https://doi.org/10.1073/pnas.93.24.13468

Baker, C. E., & Iruka, I. U. (2013). Maternal psychological functioning and children's school readiness: The mediating role of home environments for African American children. *Early Childhood Research Quarterly*, *28*(3), 509-519. https://doi.org/10.1016/j.ecresq.2013.02.004

Barends, A. J., & de Vries, R. E. (2019). Noncompliant responding: Comparing exclusion criteria in MTurk personality research to improve data quality. *Personality and Individual Differences*, *143*, 84-89. https://doi.org/10.1016/j.paid.2019.02.015

Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, *121*(1), 65-94. https://doi.org/10.1037/0033-2909.121.1.65

Barkley, R. A. (2011). *Barkley Deficits in Executive Functioning Scale (BDEFS)*. New York: The Guilford Press.

Barkley, R. A. (2012). *Barkley Deficits in Executive Functioning Scale – Children and Adolescents (BDEFS-CA).* New York: The Guilford Press.

Bedard, A., Nichols, S., Barbosa, J. A., Schachar, R., Logan, G. D., & Tannock, R. (2002). The development of selective inhibitory control across the life span. *Developmental Neuropsychology*, *21*(1), 93-111. https://doi.org//10.1207/S15326942DN2101_5

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*(1), 83-96. https://doi.org/10.1111/j.1467-8624.1984.tb00275.x

Bernier, A., Beauchamp, M. H., Carlson, S. M., & Lalonde, G. (2015). A secure base from which to regulate: Attachment security in toddlerhood as a predictor of executive functioning at

school entry. *Developmental Psychology*, *51*(9), 1177-1189. https://doi.org/10.1037/dev0000032

Bernier, A., Carlson, S. M., Deschênes, M., & Matte-Gagné, C. (2012). Social factors in the development of early executive functioning: A closer look at the caregiving environment. *Developmental Science*, *15*(1), 12-24. https://doi.org/10.1111/j.1467-7687.2011.01093.x

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development*, *81*(1), 326-339. https://doi.org/10.1111/j.1467-8624.2009.01397.x

Berry, J. O., & Jones, W. H. (1995). The Parental Stress Scale: Initial psychometric evidence. *Journal of Social and Personal Relationships*, *12*(3), 463-472. https://doi.org/10.1177/0265407595123009

Berry, K., Rana, R., Lockwood, A., Fletcher, L., & Pratt, D. (2019). Factors associated with inattentive responding in online survey research. *Personality and Individual Differences*, *149*, 157-159. https://doi.org/10.1016/j.paid.2019.05.043

Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. *Child Development*, *81*(6), 1641-60. https://doi.org/10.1111/j.1467-8624.2010.01499.x

Bloomfield, L., & Kendall, S. (2012). Parenting self-efficacy, parenting stress and child behaviour before and after a parenting programme. *Primary Health Care Research and Development*, *13*(4), 364-372. https://doi.org/10.1017/S1463423612000060

Blum, M., & Ribner, A. (2022). Parents' expressed emotions and children's executive functions. *Journal of Experimental Child Psychology*, *219*, 1-12. https://doi.org/10.1016/j.jecp.2022.105403

Bombonato, C., Del Lucchese, B., Ruffini, C., Di Lieto, M. C., Brovedani, P., Sgandurra, G., Cioni, G., & Pecini, C. (2024). Far transfer effects of trainings on executive functions in neurodevelopmental disorders: A systematic review and metaanalysis. *Neuropsychology Review*, *34*(1), 98-133. https://doi.org/10.1007/s11065-022-09574-z

Brocki, K. C., & Bohlin, G. (2004). Executive functions in children aged 6 to 13: A dimensional and developmental study. *Developmental Neuropsychology*, *26*(2), 571-593. https://doi.org/10.1207/s15326942dn2602_3

Bromley Little, H. J. (1999). Parenting stress among parents of children with attention-deficit/hyperactivity disorder: The role of control and responsibility attributions. *Dissertation Abstracts International*, *59*(9-B), 5072.

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, *6*(1), 3-5. https://doi.org/10.1177/1745691610393980

Byles, J., Byrne, C., Boyle, M. H., & Offord, D. R., (1988). Ontario Child Health Study: Reliability and validity of the general functioning subscale of the McMaster Family Assessment Device. *Family Process*, *27*(1), 97-104. https://doi.org/10.1111/j.1545-5300.1988.00097.x

Camerota, M., Willoughby, M. T., & Blair, C. B. (2020). Measurement models for studying child executive functioning: Questioning the status quo. *Developmental Psychology*, *56*(12), 2236-2245. https://doi.org/10.1037/dev0001127

Cepeda, N. J., Cepeda, M. L., & Kramer, A. F. (2000). Task switching and attention deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, *28*(3), 213-226. https://doi.org/10.1023/A:1005143419092

Chilcoat, H. D., & Breslau, N. (1997). Does psychiatric history bias mothers' reports? An application of a new analytic approach. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(7), 971-979. https://doi.org/10.1097/00004583-199707000-00020

Clauss, K., Witte, T. K., & Bardeen, J. R. (2021). Examining the factor structure and incremental validity of the Barkley Deficits in Executive Functioning Scale – Short form in a community sample. *Journal of Personality Assessment*, *103*(6), 777-785. https://doi.org/10.1080/00223891.2021.1887879

Congdon, E., Mumford, J. A., Cohen, J. R., Galvan, A., Canli, T., & Poldrack, R. A. (2012). Measurement and reliability of response inhibition. *Frontiers in Psychology*, *3*, Article 37. https://doi.org/10.3389/fpsyg.2012.00037

Conners, K. C. (2008). *Conners 3rd edition*. Toronto, ON: Multi-Health Systems.

Conners. C. K., Erhardt, D., Sparrow, E. (1999). *Conners' Adult ADHD Rating Scales (CAARS)*. North Tonawanda, NY: Multi-Health Systems.

Cooke, D., Marais, I., Cavanagh, R., Kendall, G., & Priddis, L. (2015). Differences between mothers' and fathers' ratings of family functioning with the Family Assessment Device: The validity of combined parent scores. *Measurement and Evaluation in Counseling and Development*, *48*(3), 226-237. https://doi.org/10.1177/0748175615578756

Cuevas, K., Deater-Deckard, K., Kim-Spoon, J., Wang, Z., Morasch, K. C., & Bell, M.A. (2014a). A longitudinal intergenerational analysis of executive functions during early childhood. *British Journal of Developmental Psychology*, *32*(X), 50-64. https://doi.org/10.1111/bjdp.12021

Cuevas, K., Deater-Deckard, K., Kim-Spoon, J., Watson, A. J., Morasch, K. C., & Bell, M.A. (2014b). What's mom got to do with it? Contributions of maternal executive function and caregiving to the development of executive function across early childhood. *Developmental Science*, *17*(2), 224-238. https://doi.org/10.1111/desc.12073

Cuthbert, B. N. (2022). Research domain criteria (RDoC): Progress and potential. *Current Directions in Psychological Science*, *31*(2), 107-114. https://doi.org/10.1177/09637214211051363

Dajani, D. R., & Uddin, L. Q. (2015). Demystifying cognitive flexibility: Implications for clinical and developmental neuroscience. *Trends in Neuroscience*, *38*(9), 1-22. https://doi.org/10.1016/j.tins.2015.07.003

Deater-Deckard, K. (1998). Parenting stress and child adjustment: Some old hypotheses and new questions. *Clinical Psychology: Science and Practice*, *5*(3), 314-332. https://doi.org/10.1111/j.1468-2850.1998.tb00152.x

Deater-Deckard, K. (2004). *Parenting stress.* New Haven, CT: Yale University Press.

Deater-Deckard, K. (2014). Family matters: Intergenerational and interpersonal processes of executive function and attentive behavior. *Current Directions in Psychological Science*, *23*(3), 230-236. https://doi.org/10.1177/0963721414561597

Deater-Deckard, K., Pinkerton, R., & Scarr, S. (1996). Child care quality and children's behavioral adjustment: A four-year longitudinal study. *Child Psychology and Psychiatry & Allied Disciplines*, *37*(8), 937-948. https://doi.org/10.1111/j.1469-7610.1996.tb01491.x

Deater-Deckard, K., Sewell, M. D., Petrill, S. A., & Thompson, L.A. (2010). Maternal working memory and reactive negativity in parenting. *Psychological Science*, *21*(1), 75-79. https://doi.org/10.1177/0956797609354073

Deater-Deckard, K., Wang, Z., Chen, N., & Bell, M. A. (2012). Maternal executive function, harsh parenting, and child conduct problems. *Journal of Child Psychology and Psychiatry*, *53*(10), 1084-1091. https://doi.org/10.1111/j.1469-7610.2012.02582.x

de Cock, E. S. A., Henrichs, J., Klimstra, T. A., Maas, A. J. B. M., Vreeswijk, C. M. J. M., Meeus, W. H. J., & van Bakel, H. J. A. (2017). Longitudinal associations between parental bonding, parenting stress, and executive functioning in toddlerhood. *Journal of Child and Family Studies*, *26*(6), 1723-1733. https://doi.org/10.1007/s10826-017-0679-7

DeLongis, A., Folkman, S., & Lazarus, R. S. (1988). The impact of daily stress on health and mood: Psychological and social resources as mediators. *Journal of Personality and Social Psychology*, *54*(3), 486-495. https://doi.org/10.1037//0022-3514.54.3.486

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135-168. https://doi.org/10.1146/annurev-psych-113011-143750

Douglas, B. D., Ewell, P. J., & Brauer, M. (2023). Data quality in online human-subjects research: Comparison between Mturk, Prolific, CloudResearch, Qualtrics, and SONA. *PLOS One*, *18*(3), 1-17. https://doi.org/10.1371/journal.pone.0279720

Downes, M., de Haan, M., Telfer, P. T., & Kirkham, F. J. (2019). The role of family functioning in the development of executive functions in preschool children with sickle cell anemia. *Developmental Neuropsychology*, *44*(6), 452-467. https://doi.org/10.1080/87565641.2019.1660779

Epstein, N. B., Baldwin, L. M., Bishop, D. S. (1983). The McMaster Family Assessment Device. *Journal of Marital and Family Therapy*, *9*(2), 171-180. https://doi.org/10.1111/j.1752-0606.1983.tb01497.x

Epstein, N. B., Bishop, D. S., & Levin, S. (1978). The McMaster model of family functioning. *Journal of Marriage and Family Counselling*, *4*(4), 19-31. https://doi.org/10.1111/j.1752-0606.1978.tb00537.x

Epstein, T., & Saltzman-Benaiah, J. (2010). Parenting children with disruptive behaviours: Evaluation of a collaborative problem solving pilot program. *Journal of Clinical Psychology Practice*, *1*, 27-40. Retrieved from, livesinthebalance.org.

Epstein, T., Saltzman-Benaiah, J., O'Hare, A., Goll, J. C., & Tuck, S. (2008). Associated features of Asperger syndrome and their relationship to parenting stress. *Child: Care, Health and Development*, *34*(4), 503-511. https://doi.org/10.1111/j.1365-2214.2008.00834.x

Faul, F., Erdfelder, E., Buchner, A., & Lang, A-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Fisher, A. P., Gies, L. M., Narad, M. E., Austin, C. A., Yeates, K. O., Taylor, H. G., Zhang, N., & Wade, S. L. (2022). Parent- and adolescent-reported executive functioning in the context of randomized control trials of online family problem-solving therapy. *Journal of International Neuropsychological Society*, *28*(2), 123-129. https://doi.org/10.1017/S1355617721000308

Friedman, N. P., & Miyake, A. (2017). Unity and diversity of executive functions: Individual differences as a window on cognitive structure. *Cortex*, *86*, 186-204. https://doi.org/10.1016/j.cortex.2016.04.023

Friedman, N. P., Miyake, A., Robinson, J. L., & Hewitt, J. K. (2011). Developmental trajectories in toddlers' self-restraint predict individual differences in executive functions 14 years

later: A behavioral genetic analysis. *Developmental Psychology*, *47*(5), 1410-1430. https://doi.org/10.1037/a0023750

Friedman, N. P., Miyake, A., Young, S. E., DeFries, J. C., Corley, R. P., & Hewitt, J. K. (2008). Individual differences in executive functions are almost entirely genetic in origin. *Journal of Experimental Psychology: General*, *137*(2), 201-225. https://doi.org/10.1037/0096-3445.137.2.201

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin*, *134*(1), 31-60. https://doi.org/10.1037/0033-2909.134.1.31

Gartstein, M.A., Bridgett, D. J., Dishion, T. J., & Kaufman, N. K. (2009). Depressed mood and maternal report of child behavior problems: Another look at the depression-distortion hypothesis. *Journal of Applied Developmental Psychology*, *30*(2), 149-160. https://doi.org/10.1016/j.appdev.2008.12.001

Goldberg, S., Morris, P., Simmons, R. J., Fowler, R. S., & Levison, H. (1990). Chronic illness in infancy and parenting stress: A comparison of three groups of parents. *Journal of Pediatric Psychology*, *15*(3), 347-358. https://doi.org/10.1093/jpepsy/15.3.347

Graziano, P. A., McNamara, J. P., Geffken, G. R., & Reid, A. (2011). Severity of children's ADHD symptoms and parenting stress: A multiple mediation model of self-regulation. *Journal of Abnormal Child Psychology*, *39*(7), 1073-1083. https://doi.org/10.1007/s10802-011-9528-0

Haatveit, B. C., Sundet, K., Hugdahl, K., Ueland, T., Melle, I., & Andreassen, O. A. (2010). The validity of d prime as a working memory index: Results from the "Bergen n-back task."

Journal of Clinical and Experimental Neuropsychology, *32*(8), 871-880. https://doi.org/10.1080/13803391003596421

Hammond, S. I., Müller, U., Carpendale, J. I. M., Bibok, M. B., & Liebermann-Finestone, D. P. (2012). The effects of parental scaffolding on preschoolers' executive function. *Developmental Psychology*, *48*(1), 271-281. https://doi.org/10.1037/a0025519

Harrison, C., & Sofronoff, K. (2002). ADHD and parental psychological distress: Role of demographics, child behavioral characteristics, and parental cognitions. *Journal of the American Academy of Child & Adolescent Psychiatry*, *41*(6), 703-711. https://doi.org/10.1097/00004583-200206000-00010

Hassall, R., Rose, J., & McDonald, J. (2005). Parenting stress in mothers of children with an intellectual disability: The effects of parental cognitions in relation to child characteristics and family support. *Journal of Intellectual Disability Research*, *49*(6), 405-418. https://doi.org/10.1111/j.1365-2788.2005.00673.x

Heath, G. H., Fife-Schaw, C., Wang, L., Eddy, C. J., Hone, M. J. G., & Pollastri, A. R. (2020). Collaborative problem solving reduces children's emotional and behavioral difficulties and parenting stress: Two key mechanisms. *Journal of Clinical Psychology*, *76*(7), 1226-1240. https://doi.org/10.1002/jclp.22946

Hébert, É., Regueiro, S., & Bernier, A. (2021). Investigating the associations between family alliance and executive functioning in middle childhood. *Journal of Cognition and Development*, *22*(5), 789-805. https://doi.org/10.1080/15248372.2021.1956930

Howard, S. J., Okely, A. D., & Ellis, Y. G. (2015). Evaluation of a differentiation model of preschoolers' executive functions. *Frontiers in Psychology*, *6*, Article 285. https://doi.org/10.3389/fpsyg.2015.00285

Huang-Pollock, C. L., Mikami, A. Y., Pfiffner, L., & McBurnett, K. (2009). Can executive functions explain the relationship between attention deficit hyperactivity disorder and social adjustment? *Journal of Abnormal Child Psychology*, *37*, 679-691. https://doi.org/10.1007/s10802-009-9302-8

Hughes, C. (1998). Executive function in preschoolers: Links with theory of mind and verbal ability. *Journal of Developmental Psychology*, *16*(2), 233-253. https://doi.org/10.1111/j.2044-835X.1998.tb00921.x

Hughes, C., Ensor, R., Wilson, A., & Graham, A. (2009). Tracking executive function across the transition to school: A latent variable approach. *Developmental Neuropsychology*, *35*(1), 20-36. https://doi.org/10.1080/87565640903325691

Huizinga, M., Dolan, C. V., & van der Molen, M. W. (2006). Age-related changes in executive function: Developmental trends and a latent variable analysis. *Neuropsychologia*, *44*(11), 2017-2036. https://doi.org/10.1016/neuropsychologia.2006.01.010

Izzo, V. A., Donati, M. A., & Primi, C. (2019). Assessing ADHD through the multi-informant approach: The contributions of the Conners' 3 scales. *Journal of Attention Disorders*, *23*(6), 641-650. https://doi.org/10.1177/1087054718815581

Jester, J. M., Nigg, J. T., Puttler, L. I., Long, J. C., Fitzgerald, H. R., & Zucker, R. A. (2009). Intergeneration transmission of neuropsychological executive functioning. *Brain and Cognition*, *70*(X), 145-153. https://doi.org/10.1016/j.bandc.2009.01.005

Joyce, A. W., Kraybill, J. H., Chen, N., Cuevas, K., Deater-Deckard, K., & Bell, M. A. (2016). A longitudinal investigation of conflict and delay inhibitory control in toddlers and preschoolers. *Early Education and Development*, *27*(6), 788-804. https://doi.org/10.1080/10409289.2016.1148481

Joyner, K. B., Silver, C. H., & Stavinoha, P. L. (2009). Relationship between parenting stress and ratings of executive functioning in children with ADHD. *Journal of Psychoeducational Assessment*, *27*(6), 452-464. https://doi.org/10.1177/0734282909333945

Jurado, M. B., & Rosselli, M. (2007). The elusive nature of executive functions: A review of our current understanding. *Neuropsychology Review*, *17*, 213-233. https://doi.org/10.1007/s11065-007-9040-z

Kay, Camerson S., & Saucier, G. (2023). The Comprehensive Infrequency/Frequency Item Repository (CIFR): An online database of items for detecting careless/insufficient-effort responders in survey data. *Personality and Individual Difference*, *205*, 1-5. https://doi.org/10.1016/j.paid.2022.112073

Kim, J., & Deater-Deckard, K. (2011). Dynamic changes in anger, externalizing and internalizing problems: Attention and regulation. *Journal of Child Psychology and Psychiatry*, *52*(2), 156-166. https://doi.org/10.1111/j.1469-7610.2010.02301.x

Kovacs, M. (2011). *Children's Depression Inventory 2 (CDI 2)*. North Tonawanda, NY: Multi-Health Systems.

Lakes, K. D., Swanson, J. M., & Riggs, M. (2012). The reliability and validity of the English and Spanish strengths and weaknesses of ADHD and normal behavior rating scales in a preschool sample: Continuum measures of hyperactivity and inattention. *Journal of Attention Disorders*, *16*(6), 510-516. https://psycnet.apa.org/doi/10.1177/1087054711413550

Larsson, H., Ackarsater, H., Råstam, M., Chang, Z., & Lichtenstein, P. (2012). Childhood attention-deficit hyperactivity disorder as an extreme of a continuous trait: A quantitative

genetic study of 8,500 twin pairs. *Journal of Child Psychology and Psychiatry*, *53*(1), 73-80. https://doi.org/10.1111/j.1469-7610.2011.02467.x

Laslo-Roth, R., George-Levi, S., & Rosenstreich, E. (2021). Protecting children with ADHD against loneliness: Familial and individual factors predicting perceived child's loneliness. *Personality and Individual Differences*, *180*, 1-6. https://doi.org/10.1016/j.paid.2021.110971

Levy, F., Hay, D. A., McStephen, M., Wood, C., & Waldman, I. (1997). Attention-deficit hyperactivity disorder: A category or a continuum? Genetic analysis of a large-scale twin study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(6), 737-744. https://doi.org/10.1097/00004583-199706000-00009

Lezak, M. D. (1982). The problem of assessing executive functions. *International Journal of Psychology*, *17*(2-3), 281-297. https://doi.org/10.1080/00207598208247445

Lipszyc, J., & Schachar, R. (2010). Inhibitory control and psychopathology: A meta-analysis of studies using the stop-signal task. *Journal of the International Neuropsychological Society*, *16*(6), 1064-1076. https://doi.org/10.1017/S1355617710000895

Logan, G. D., & Cowan, W. B. (1984). On the ability to inhibit thought and action: A theory of an act of control. *Psychological Review*, *91*(3), 295-327. https://doi.org/10.1037/0033-295X.91.3.295

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the Beck depression and anxiety inventories. *Behaviour Research and Therapy*, *33*(3), 335-343. https://doi.org/10.1016/0005-7967(94)00075-U

Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour, and cognition. *Nature Reviews Neuroscience*, *10*, 434-445. https://doi.org/10.1038/nrn2639

March, J. S. (1997). *Multidimentional Scale for Children: Technical Manual*. Toronto, ON: Multi-Health Systems.

Marcus, D. K., & Barry, T. D. (2011). Does attention-deficit/hyperactivity disorder have a dimensional latent structure? A taxometric analysis. *Journal of Abnormal Psychology*, *120*(2), 427.442. https://doi.org/10.1037/a0021405

Martinussen, R., Hayden, J., Hogg-Johnson, S., & Tannock, R. (2005). A meta-analysis of working memory impairments in children with attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *44*(4), 377-384. https://doi.org/10.1097/01.chi.0000153228.72591.73

McAuley, T., Chen, S., Goos, L., Schachar, R., & Crosbie, J. (2010). Is the behavior rating inventory of executive function more strongly associated with measures of impairment or executive function? *Journal of the International Neuropsychological Society*, *16*(3), 495-505. https://doi.org/10.1017/S1355617710000093

McAuley, T., & White, D. A. (2011). A latent variables examination of processing speed, response inhibition, and working memory during typical development. *Journal of Experimental Child Psychology*, *108*(3), 453-468. https://doi.org/10.1016/j.jecp.2010.08.009

McLuckie, A., Landers, A. L., Rowbotham, M., Landine, J., Schwartz, M., & Ng, D. (2021). Are parent- and teacher-reported executive function difficulties associated with parenting

stress for children diagnosed with ADHD? *Journal of Attention Disorders*, *25*(1), 22-32. https://doi.org/10.1177/1087054718756196

Miyake, A., & Friedman, N. P. (2012). The nature and organization of individual differences in executive functions: Four general conclusions. *Current Directions in Psychological Science*, *21*(1), 8-14. https://doi.org/10.1177/0963721411429458

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*, 49-100. https://doi.org/10.1006/cogp.1999.0734

Moen, Ø. L., Hedelin, B., & Hall-Lord, M. L. (2015). Parental perception of family functioning in everyday life with a child with ADHD. *Scandinavian Journal of Public Health*, *43*(1), 10-17. https://doi.org/10.1177/1403494814559803

Moen, Ø. L., Hedelin, B., & Hall-Lord, M. L. (2016). Family functioning, psychological distress, and well-being in parents with a child having ADHD. *SAGE Open*, *6*(1), 1-10. https://doi.org/10.1177/2158244015626767

Monsell, S. (2003). Task switching. *Trends in Cognitive Sciences*, *7*(3), 134-140. https://doi.org/10.1016/S1364-6613(03)00028-7

Morgan, J., Robinson, D., & Aldridge, J. (2002). Parenting stress and externalizing child behaviour. *Child & Family Social Work*, *7*(3), 219-225. https://doi.org/10.1046/j.1365-2206.2002.00242.x

National Institute of Mental Health (n.d.). *Adult stress – Frequently asked questions – How it affects your health and what you can do about it*. Retrieved from http://www.nimh.nih.gov/health/publications/stress/index.shtml

Nigg, J. T. (2000). On inhibition/disinhibition in developmental psychopathology: Views from cognitive and personality psychology and a working inhibition taxonomy. *Psychological Bulletin*, *126*(2), 220-246. https://doi.org/10.1037/0033-2909.126.2.220

Nilsen, E. S., Huyder, V., McAuley, T., & Liebermann, D. (2017). Ratings of Everyday Executive Functioning (REEF): A parent-report measure of preschoolers' executive functioning skills. *Psychological Assessment*, *29*(1), 50-64. https://doi.org/10.1037/pas0000308

Öztürk, Y., Özyurt, G., & Akay, P. A. (2019). The effects of the triple P-positive parenting programme on parenting, family functioning and symptoms of attention-deficit/hyperactivity disorder. A randomized controlled trial. *Psychiatry and Clinical Psychopharmacology*, *29*(4), 665-673. https://doi.org/10.1080/24750573.2018.1542189

Park, M. S., Chung, C. Y., Lee, K. M., Sung, K. H., Choi, I. H., & Kim, T. W. (2012). Parenting stress in parents of children with cerebral palsy and its association with physical function. *Journal of Pediatric Orthopedics B.*, *21*(5), 452-456. https://doi.org/10.1097/BPB.0b013e32835470c0

Park, S., Oh, W., Kim, Y., Kim, H. K., & Mastergeorge, A. M. (2022). Longitudinal trajectories of maternal parenting stress in Korean families: Children's executive function and school adjustment. *Social Development*, *32*(3), 1-17. https://doi.org/10.1111/sode.12661

Patel, S. K., Wong, A. L., Cuevas, M., & Van Horn, H. (2013). Parenting stress and neurocognitive late effects in childhood cancer survivors. *Psycho-Oncology*, *22*(8),1774-1782. https://doi.org/10.1002/pon.3213

Plant, K. M., & Sanders, M. R. (2007). Predictors of care-giver stress in families of preschool-aged children with developmental disabilities. *Journal of Intellectual Disability Research*, *51*(2), 109-124. https://doi.org/10.1111/j.1365-2788.2006.00829.x

Raphael, J. L., Zhang, Y., Liu, H., & Giardino, A. P. (2010). Parenting stress in US families: implications for paediatric healthcare utilization. *Child: Care, Health and Development*, *36*(2), 216-224. https://doi.org/10.1111/j.1365-2214.2009.01052.x

Reimers, S., & Maylor, E. A. (2005). Task switching across the life span: Effects of age on general and specific switch costs. *Developmental Psychology*, *41*(4), 661-671. https://doi.org/10.1037/0012-1649.41.4.661

Ribeiro, M. F., Porto, C. C., & Vandenberghe, L. (2013). Parental stress in families of children with cerebral palsy: an integrative review. *Ciência & Saúde Coletiva*, *18*(6), 1705-1715. https://doi.org/10.1590/S1413-81232013000600022

Riley, A. W., Lyman, L. M., Spiel, G., Döpfner, M., Lorenzo, M. J., Ralston, S. J., & ADORE Study Group. (2006). The Family Strain Index (FSI). Reliability, validity, and factor structure of a brief questionnaire for families of children with ADHD. *European Child & Adolescent Psychiatry*, *15*(Suppl1), 72-78. https://doi.org/10.1007/s00787-006-1010-0

Rose, S. A., Feldman, J. F., & Jankowski, J. J. (2011). Modeling a cascade of effects: the role of speed and executive functioning in preterm/full-term differences in academic achievement. *Dev Sci*, *14*(5), 1161-1175. https://doi.org/j.1467-7687.2011.01068.x

Sarsour, K., Sheridan, M., Jutte, D., Nuru-Jeter, A., Hinshaw, S., & Boyce, W. T. (2011). Family socioeconomic status and child executive functions: The roles of language, home environment, and single parenthood. *Journal of the International Neuropsychological Society*, *17*(X), 120-132. https://doi.org/10.1017/S1355617710001335

Savci, U., Tufan, A. E., Ozturk, Y., & Cansiz, M. A. (2023). The effects of child and adolescent attention deficit / hyperactivity disorder and associated executive function deficits on family functioning. *Psychiatry and Behavioral Sciences*, *13*(1), 1-12. https://doi.org/10.5455/PBS.20220525080051

Schei, J., Jozefiak, T., Nøvik, T. S., Lydersen, S., & Indredavik, M. S. (2016). The impact of coexisting emotional and conduct problems on family functioning and quality of life among adolescents with ADHD. *Journal of Attention Disorders*, *20*(5), 424-433. https://doi.org/10.1177/1087054713507976

Schreiber, J. E., Possin, K. L., Girard, J. M., & Rey-Casserly, C. (2014). Executive function in children with attention deficit/hyperactivity disorder: the NIH EXAMINER battery. *Journal of the International Neuropsychological Society*, *20*(1), 41-51. https://doi.org/10.1017/S1355617713001100

Schroeder, V. M., & Kelley, M. L. (2009). Associations between family environment, parenting practices, and executive functioning of children with and without ADHD. *Journal of Child and Family Studies*, *18*(2), 227-235. https://doi.org/10.1007/s10826-008-9223-0

Schroeder, V. M., & Kelley, M. L. (2010). Family environment and parent-child relationships as related to executive functioning in children. *Early Child Development and Care*, *180*(10), 1285-1298. https://doi.org/10.1080/03004430902981512

Selya, A. S., Rose, J. S., Dierker, L. C., Hedeker, D., & Mermelstein, R. J. (2012). A practical guide to calculating Cohen's f^2, a measure of local effect size, from PROC MIXED. *Frontiers in Psychology*, *3*, Article 111. https://doi.org/10.3389/fpsyg.2012.00111

Soveri, A., Lehtonen, M., Karlsson, L. C., Lukasik, K., Antfolk, J., & Laine, M. (2018). Test-retest reliability of five frequently used executive tasks in healthy adults. *Applied Neuropsychology*, *25*(2), 155-165. https://doi.org/10.1080/23279095.2016.1263795

Swanson, J. M. (n.d.). Strengths and weaknesses of ADHD-symptoms and normal behavior rating scale [Measurement instrument]. Retrieved from www.adhd.net.

Taraban, L., & Shaw, D. S. (2018). Parenting in context: Revisiting Belsky's classice process of parenting model in early childhood. *Developmental Review*, *48*, 55-81. https://doi.org/10.1016/j.dr.2018.03.006

Theule, J., Wiener, J., Tannock, R., & Jenkins, J. M. (2013). Parenting stress in families of children with ADHD: A meta-analysis. *Journal of Emotional and Behavioral Disorders*, *21*(3), 3-17. https://doi.org/10.1177/1063426610387433

Theule, J., Wiener, J., Rogers, M. A., & Marton, I. (2011). Predicting parenting stress in families of children with ADHD: Parent and contextual factors. *Journal of Child and Family Studies*, *20*(5), 640-647. https://doi.org/10.1007/s10826-010-9439-7

Thiyagarajan, A., James, T. G., & Marzo, R. R. (2022). Psychometric properties of the 21-item depression, anxiety, and stress scale (DASS-21) among malaysians during COVID-19: a methodological study. *Humanities and Social Sciences Communications*, *9*(1), 1-8. https://doi.org/10.1057/s41599-022-01229-x

Tolou-Shams, M., Brogan, L., Esposito-Smythers, C., Healy, M. G., Lowery, A., Craker, L., & Brown, L. K. (2018). The role of family functioning in parenting practices of court-involved youth. *Journal of Adolescence*, *63*, 165-174. https://doi.org/10.1016/j.adolesence.2017.12.016

Tomlinson, R.C., Hyde, L. W., Weigard, A. S., Klump, K. L., & Burt, S. A. (2022). The role of parenting in the intergenerational transmission of executive functioning: A genetically informed approach. *Development and Psychopathology*, *34*(5), 1731-1743. https://doi.org/10.1017/S0954579422000645

Toplak, M. E., West, R. F., & Stanovich, K. E. (2013). Practitioner review: Do performance-based measures and ratings of executive function assess the same construct? *The Journal of Child Psychology and Psychiatry*, *54*(2), 131-143. https://doi.org/10.1111/jcpp.12001

Uchida, M., DiSalvo, M., Walsh, D., & Biederman, J. (2023). The heritability of ADHD in children of ADHD parents: A post-hoc analyses of longitudinal data. *Journal of Attention Disorders*, *27*(3), 250-257. https://doi.org/10.1177/10870547221136251

Uzark, K., & Jones, K. (2003). Parenting stress and children with heart disease. *Journal of Pediatric Health Care*, *17*(4), 163-168. https://doi.org/10.1067/mph.2003.22

Vaughan, L., & Giovanello, K. (2010). Executive function in daily life: Age-related influences of executive processes on instrumental activities of daily living. *Psychology and Aging*, *25*(2), 343-355. https://doi.org/10.1037/a0017729

Wang, Z., Deater-Deckard, K., Petrill, S. A., & Thompson, L. A. (2012). Externalizing problems, attention regulation, and household chaos: A longitudinal behavioral genetic study. *Development and Psychopathology*, *24*(3), 755-769. https://doi.org/10.1017/S0954579412000351

Wechsler, D. (1999). Wechsler Abbreviated Scale of Intelligence. New York: Psychological Corporation.

Whipple, E. E., & Webster-Stratton, C. (1991). The role of parental stress in physically abusive families. *Child Abuse & Neglect*, *15*(3), 279-291. https://doi.org/10.1016/0145-2134(91)90072-L

Wiebe, S.A., Espy, K.A., & Charak, D. (2008). Using confirmatory factor analysis to understand executive control in preschool children: I. Latent structure. *Developmental Psychology*, *44*(2), 575-587. https://doi.org/10.1037/0012-1649.44.2.575

Wiebe, S. A., Sheffield, T., Nelson, J.M., Clark, C. A. C., Chevalier, N., & Espy, K. A. (2011). The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology*, *108*(3), 436-452. https://doi.org/10.1016/j.jecp.2010.08.008

Wiegand-Grefe, S., Sell, M., Filter, B., & Plass-Christl, A. (2019). Family functioning and psychological health of children with mentally ill parents. *International Journal of Environmental Research and Public Health*, *16*(7), 1278-1289. https://doi.org/10.3390/ijerph16071278

Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention-deficit/hyperactivity disorder: a meta-analytic review. *Biological Psychiatry*, *57*(11), 1336-1346. https://doi.org/10.1016/j.biopsych.2005.02.006

Wolf, L. C., Noh, S., Fisman, S. N., & Speechley, M. (1989). Brief report: Psychological effects of parenting stress on parents of autistic children. Journal of Autism and Developmental Disorders, 19(1), 157-166. https://doi.org/10.1007/BF02212727

Woolfson, L., & Grant, E. (2006). Authoritative parenting and parental stress in parents of pre-school and older children with developmental disabilities. *Child: Care, Health & Development*, *32*(2), 177-184. https://doi.org/10.1111/j.1365-2214.2006.00603.x

Yaple, Z., & Arsalidou, M. (2018). *N*-back working memory task: Meta-analysis of normative fMRI studies with children. *Child Development*, *89*(6), 2010-2022. http://doi.org/10.1111/cdev.13080

Yaple, Z. A., Stevens, W. D., & Arsalidou, M. (2019). Meta-analyses of the n-back working memory task: fMRI evidence of age-related changes in prefrontal cortex involvement across the adult lifespan. *Neuroimage*., *1*(196), 16-31. https://doi.org/10.1016/j.neuroimage.2019.03.074

Young, M. E., Galvin, T., Reidy, B. L., Pescosolido, M. F., Kim, K. L., Seymour, K., & Dickstein, D. P. (2013). Family functioning deficits in bipolar disorder and ADHD in youth. *Journal of Affective Disorders*, *150*(3), 1096-1102. https://doi.org/10.1016/j.jad.2013.04.027

Yousefia, S., Soltani Far, A., & Abdolahian, E. (2011). Parenting stress and parenting styles in mothers of ADHD with mothers of normal children. *Procedia: Social and Behavioral Sciences*, *30*, 1666-1671. https://doi.org/10.1016/j.sbspro.2011.10.323

Zebdi, R., Goyet, L., Pinabiaux, C., & Guellaï, B., (2016). Psychological disorders and ecological factors affect the development of executive functions: Some perspectives. *Frontiers in Psychiatry*, *7*, Article 195. https://doi.org/10.3389/fpsyt.2016.00195

Zelman, J. J., & Ferro, M.A. (2018). The parental stress scale: Psychometric properties in families of children with chronic health conditions. *Family Relations: An Interdisciplinary Journal of Applied Family Studies*, *67*(2), 240-252. https://doi.org/10.1111/fare.12306

Appendix A: This dissertation was carried out as part of a larger project completed by the Child and Adolescent Neuropsychology Lab of Dr. Tara McAuley at the University of Waterloo. The following table identifies additional measures that were completed by participants, but which were *not* used in analyses for the purpose of this dissertation.

Table 46

Additional Measures Completed by Study Participants

Measure + Citation	Study that included measure	Elements Not Used
Background Questionnaire (lab developed),	Studies 1, 2, and 3	Various subsections including: pregnancy information, children's medication use, household composition, health status of family members, parent's life stressors and perceived social support.
Family Strain Index (Riley et al., 2006)	Studies 1, 2, and 3	Entire questionnaire.
Family Assessment Device (Epstein et al., 1983)	Studies 1, 2, and 3	Six items were administered but not used in Studies 1, 2, and 3 (subset of participants). Forty-eight items were administered and not used in

		Study 3 (subset of participants).
Depression Anxiety Stress Scale 21 (Lovibond & Lovibond, 1995)	Studies 1, 2, and 3	Fourteen items (reflecting symptoms of Anxiety and Depression) were administered but not used.
Conners Adult ADHD Rating Scale – Self Report Short Version (Conners et al., 1999)	Studies 1, 2, and 3	Items pertaining to the Problems with Self-Concept subscale were administered but not used.
Conners 3 – Parent Short Form (Conners, 2008)	Studies 2 and 3	Items pertaining to the Learning Problems and Executive Functioning subscales were administered but not used.
Parent Cognition Scale (Snarr, Smith, Slep, & Grande, 2009)	Study 3	Entire questionnaire.
Perceived Stress Scale (Cohen & Williamson, 1998)	Study 3	Entire questionnaire.
Child Behavior Checklist for Ages 6-18 (Achenbach & Rescorla, 2001)	Study 3 (subset of participants)	Entire questionnaire.

Parenting Styles and Dimensions Questionnaire (Robinson, Mandleco, Olsen, & Hart, 2001)	Study 3 (subset of participants)	Entire questionnaire.
Survey of Recent Life Experiences (Kohn & Macdonald, 1992)	Study 3 (subset of participants only)	Entire questionnaire.
Quality of Marriage Index (Norton, 1983)	Studies 2 and 3 (subset of participants only)	Entire questionnaire.
Social Support Questionnaire – Short Form Revised (Sarason, Sarason, Shieran, & Pierce, 1987)	Study 2	Entire questionnaire.
Conners 3 – Teacher Short Form (Conners, 2008)	Study 3	Entire questionnaire (subset of participants).
Barkley Deficits in Executive Functioning Scale – Children and Adolescents: Short Form (Barkley, 2012) (teacher report)	Study 3	Entire questionnaire (subset of participants).
Conners Adult ADHD Rating Scale – Observer Report	Study 3	Entire questionnaire (subset of participants).

Short Version (Conners et al., 1999)		
Barkley Deficits in Executive Functioning Scale – Short Form: Other Report (Barkley, 2011)	Study 3	Entire questionnaire (subset of participants).
Children's Depression Inventory 2 – Self-Report Short (Kovacs, 2011) (child self-report)	Study 3	Entire questionnaire (subset of participants).
Multidimensional Anxiety Scale for Children (March, 1997) (child self-report)	Study 3	Entire questionnaire (subset of participants).

Appendix B: The following tables provide the number of scores winsorized (by questionnaire) for each of the respective samples.

Table 47

Winsorized Values in the Preschool-Aged Online Sample

Measure	*Number of Winsorized Scores*
SWAN – Inattention subscale	1
SWAN – Hyperactivity/Impulsivity subscale	1
SWAN – combined Inattention and Hyperactivity/Impulsivity subscales	1
REEF – imputed total for Section F	1
REEF – imputed total for Section G	1
CAARS – Impulsivity/Emotional Lability subscale	2
CAARS – ADHD Index subscale	1
CAARS – combined Inattention/Memory, Hyperactivity/Restlessness and Impulsivity/Emotional Lability subscales	1
BDEFS-Self-Report total score	1
DASS – Stress subscale	1
FAD – General Family Functioning subscale	1

Table 48

Winsorized Values in the School-Aged Online Sample

Measure	*Number of Winsorized Scores*
Conners 3-P – Aggression subscale	3
CAARS – Inattention/Memory subscale	1
CAARS – Hyperactivity/Restlessness subscale	1
CAARS – Impulsivity/Emotional Lability subscale	2
BDEFS-Self-Report total score	1
DASS – Stress subscale	1
FAD – General Family Functioning subscale	2

Table 49

Winsorized Values in the School-Aged Community Sample

Measure	*Number of Winsorized Scores*
Conners 3-P – Aggression subscale	1
CAARS – Inattention/Memory subscale	1
CAARS – Hyperactivity/Restlessness subscale	1
DASS – Stress subscale	1
FAD – General Family Functioning subscale	1