COPING, COMMUNICATION, AND ADJUSTMENT IN PEDIATRIC CANCER: THE ROLE OF CHILDREN'S EXECUTIVE FUNCTION

By

ERIN M. RODRIGUEZ

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Approved:

Professor Bruce E. Compas

Professor Megan Saylor

Professor C. Melanie Schuele

Professor Frances Niarhos

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INTRODUCTION

Over 12,000 children are diagnosed with cancer each year in the United States and it is the second leading cause of death in children in the U.S. (Jemal, Siegel, Xu, & Ward, 2010). Although the incidence of pediatric cancer diagnoses has increased in the past three decades (Ross, Severson, Pollock, & Robison, 1996), treatment methods have also improved, allowing more children to enter remission and survive. Five-year survival rates increased from 58% in 1975–77 to 81% in 1999–2005, and current survival rates are as high as 89% for acute lymphocytic leukemia, the most common type of childhood cancer (Jemal et al., 2010). In spite of advances in treatment, pediatric cancer still remains a potentially fatal disease, causing 12.2% of total deaths in children ages 1 to 14-years-old (Jemal et al., 2010). Even when children survive the disease they are at an increased risk for long-term problems with physical health, functioning in school and work, and limitations in physical activities (e.g., Hudson et al., 2003). For children who have been recently diagnosed and their families, numerous new sources of stress enter their lives, including changes in routines (e.g., missing school and frequent hospital visits), physical effects of treatment (e.g., feeling sick from treatments and changes in appearance), and uncertainty about their disease and chances of survival (Rodriguez et al., 2011). Overall, childhood cancer and the stressors associated with it may have significant negative psychological and emotional consequences for children and their families.

The focus of the two studies presented here is on parent-child communication, children's cognitive development and executive function, and children's coping, and how these factors relate to children's adjustment to cancer. First, I review the literature on each of these topics, highlighting research findings on the intersections of two or more of these topics and addressing their relevance to pediatric cancer. Then I present the rationale and hypotheses for the current studies. Next I present the methods and results from Study 1, followed by the methods and results from Study 2. Finally, the findings from both studies are interpreted and discussed, commenting on their relevance to the current literature and their implications for future research.

Adjustment to Pediatric Cancer

Although children with cancer often experience high levels of stress, including uncontrollable stressors associated with their cancer and its treatment, there is mixed evidence for difficulties in adjustment and emotional distress in these children. Some authors have argued that pediatric patients and survivors of cancer are characterized by "hardiness" and resilience (Noll & Kupst, 2007) and suggest that the great majority of children with cancer do not develop significant emotional and behavioral problems in response to the stressors associated with the disease (Eiser, Hill & Vance 2000; Noll et al. 1999). Consistent with this perspective, an early meta-analysis that examined children with chronic illnesses concluded that children with cancer generally did not show poor adjustment (Bennett, 1994). In this review, the overall mean effect size was non-significant for all studies, and the majority of studies did not show differences in children with cancer compared to controls.

However, numerous studies have noted that while general indicators of adjustment problems may not be elevated, certain types of distress, particularly symptoms of post-traumatic stress, are elevated in childhood cancer survivors. In a recent review of the literature on post-traumatic stress disorder and symptoms in childhood cancer survivors and their parents, Bruce (2006) found that the lifetime prevalence of cancer-related PTSD and post-traumatic stress symptoms was elevated in survivors (20.5% to 35%) compared to the lifetime prevalence of PTSD in the general population of 7.8%. For example, Kazak et al. (2004) found that 17.6% of adolescent survivors of childhood cancer had moderate or severe symptoms, and their average score on a measure of post-traumatic symptoms was above an empirically validated cutoff for diagnosing PTSD (Kazak et al. 2004). Another study found that 88% of cancer survivors experienced at least one functionally significant post-traumatic symptom, and 10% met criteria for current PTSD (Erikson & Steiner, 2001).

Several empirical studies and reviews have also highlighted inconsistencies with the timing of studies that assess adjustment as well as the participant characteristics (Eiser, Hill, & Vance, 2000; Patenaude & Kupst, 2005; Sawyer, Antoniou, Toogood, Rice, & Baghurst, 2000). Most studies of adjustment to pediatric cancer have focused on cancer survivors and have often examined adjustment and distress several years after diagnosis. When children with cancer are studied closer to diagnosis, studies suggest a somewhat different picture. For example, Sawyer et al. (2000) conducted a prospective study of psychological adjustment and found that children with cancer had higher levels of internalizing symptoms compared to controls at the assessment immediately following diagnosis, although they did not did not differ from controls at the follow-up assessments

(Sawyer et al., 2000). Similarly, in a study of children being actively treated for cancer or receiving maintenance therapy, mean scores for this sample were one standard deviation or more above the mean on several clinical subscales, including withdrawal and somatic concerns (Sanger, Copeland & Davidson, 1991).

These studies suggest that levels of distress may be elevated in children in the first months after diagnosis or while they are receiving active treatment. To date, there have been no comprehensive reviews or meta-analyses of children with cancer that distinguish children currently on treatment for cancer and cancer survivors and examine emotional distress and adjustment in children close to diagnosis. Recent descriptive reviews of the literature (e.g., Eiser, Hill, & Vance, 2000; Patenaude & Kupst, 2005) have noted that inconsistencies in findings about childhood adjustment to cancer may be due to differences between studies in time since diagnosis. Studies that do not consider this distinction may overlook significant emotional distress and adjustment problems near diagnosis and during treatment.

The mixed findings regarding difficulties in adjustment in children with cancer suggest that there may be significant variability in the adjustment of this population. Accordingly, several factors may influence how resilient children and parents are to pediatric cancer, including external factors such as the child's prognosis and course of treatment, interpersonal factors such as the parent-child relationship and communication, and individual factors such as the child's own coping and cognitive development.

Parent-Child Communication and Child Adjustment

The National Cancer Institute, in its guidelines to parents of children with cancer, recommends that parents talk "openly and honestly" with their children about the disease and its treatment (NCI, 2002). This recommendation reflects research on a wide range of issues showing that parent-child communication is related to children's and adolescents' adjustment in a variety of domains, including alcohol, tobacco and drug use (Kelly, Comello & Hunn, 2002; Litrownik et al., 2000), sexual and pregnancy risk behaviors (Blake, Simkin, Ledsky, Perkins, & Calabrese., 2000; DiClemente et al., 2001; Hutchinson & Cooney, 1998, Miller, Levin, Whitaker, & Xu,1998), self-harm behaviors (Tulloch, Blizzard, & Pinkus., 1997), adjustment to parents' divorce (Afifi, Huber & Ohs, 2006), loneliness (Brage, Meredith & Woodward, 1993), self-esteem (Lanz, Iafrate, Rosnati, & Scabini, 1999), and overall psychosocial risk factors (Marta, 1997). Generally, research suggests that open and frequent communication during which parents provide information to their children may reduce high-risk behaviors and problems. Findings also suggest that parent-child communication that is open and supportive of the child is related to better emotional and psychosocial outcomes. Furthermore, intervention research indicates that it is possible to intervene with the quality of parent-child communication, and that improvements in communication may lead to better outcomes for children and adolescents (Blake et al. 2000; Hutchinson & Cooney, 1998; Litrownik et al., 2000).

Parent-Child Communication in Pediatric Populations

Research on parent-child communication about pediatric illness has also begun to draw connections between communication and children's adjustment, including health-related behaviors such as adherence to treatment. For example, in a sample of adolescents with diabetes, Miller and Drotar (2007) found that parents' "positive communication (e.g., making suggestions, praising) was related to better treatment adherence. In contrast, poor parent-adolescent communication (e.g., criticizing, ignoring, more conflicts and less problem-solving) was linked to worse treatment adherence (Miller & Drotar, 2007). Similarly, Wysocki (1993) found that adolescent and parent self-reports of family communication were related to adolescents' adjustment to diabetes, as well as adolescents' diabetes control. Specifically, poorer communication (e.g., more conflicts and less problem-solving) was related to poorer adjustment (i.e., worse diabetes self-efficacy, social adjustment, and treatment adherence), as well as poorer diabetes metabolic control (Wysocki, 1993). In another study of female adolescents with diabetes, Kichler, Foster, & Opipari-Arrigan (2008) examined mother-daughter communication and found that communication moderated the relationship between daughters' body dissatisfaction and eating behaviors. Specifically, higher levels of negative communication by mothers (e.g., negative comments/teasing about daughters' appearance) were related to maladaptive eating behaviors in girls with high body dissatisfaction (Kichler et al., 2008).

Observational Studies of Parent-Child Communication in Pediatric Populations

Studies of parent-child communication have also used direct observations of parent-child interactions to examine parent-child interaction style in pediatric populations, including children and adolescents with diabetes (Martin, Miller-Johnson, Kitzmann, & Emery 1998; Miller & Drotar, 2007; Patton, Dolan, & Powers, 2008; Wysocki et al., 2008), asthma (Lim, Wood, & Miller, 2008; Lim, Wood, Miller, & Simmens, 2011), and cystic fibrosis (DeLambo, Ievers-Landis, Drotar, & Quittner, 2004). In children with diabetes, observational studies have been used to examine the relations between parent-child interaction, adherence and adherence-related behaviors, and medical outcomes. For example, Miller & Drotar (2007) found that positive parent communication during an observed problem solving task was associated with better treatment adherence. In another study of young children (ages 2 to 8 years old) with and without diabetes, Patton et al. (2008) examined family mealtime interactions through direct observations. Findings indicated that parents of children with diabetes gave more direct and indirect commands than parents of children without diabetes. Children with diabetes also ate less and had more behaviors related to poor diet and adherence during the mealtime (Patton et al., 2008). Martin et al. (1998) observed parent-child interactions in families of children and adolescents with diabetes and found that parents who showed more emotional support and warmth rated their children as more adherent to treatment; these children also had better measures of metabolic diabetes control. Wysocki et al. (2008) conducted a randomized controlled trial for families of adolescents with diabetes in which they observed family interactions about a topic of conflict. The results of the intervention indicated that the intervention improved communication in families, and that better

family communication was related to better treatment adherence, better diabetes control, and less conflict in these families.

In children with respiratory diseases, observational studies have examined parent-child interaction in relation to disease activity, family adjustment, and emotional distress. For example, a mother-child interaction study of children with asthma found that negative parenting (e.g., intrusiveness, neglect/distancing) was related to children's internalizing symptoms and asthma disease activity, and that child internalizing symptoms partially accounted for the relationship between negative parenting and child disease activity (Lim et al., 2008). Another recent study by Lim et al. (2011) modeled the pathways between parental depression and child asthma disease activity using both questionnaire reports and observational data. The results indicated that maternal self-reports of depression symptoms predicted mothers' observed dyadic behaviors towards their children (e.g., hostility and warmth), which were associated with observed parenting behaviors (e.g., intrusiveness, neglect/distancing). Parenting behaviors then predicted child disease activity (Lim et al., 2011). In a family interaction study of children with cystic fibrosis and their parents, family interactions with better relationship quality and problem solving were related to airway clearance in children, and relationship quality accounted for part of the variance in airway clearance (DeLambo et al., 2004). Overall, the results of observation studies about parent-child interaction for pediatric populations suggest that parent-child communication and interaction style are important components of family and child adjustment in pediatric populations, and may also affect health behaviors such as treatment adherence.

Parent-Child Communication About Cancer. Despite the recommendation offered by the NCI, and the extensive research on parent-child communication with at-risk and pediatric populations, quantitative research on parent-child communication about a child's cancer is limited. The quantitative research that does exist has focused on communication during medical procedures (e.g., Cline et al., 2006; Dahlquist, Power & Carlson; 1995; Dahlquist, Power, Cox & Fernbach, 1994). For example, Cline et al. (2006) examined parent-child communication during painful medical treatments, and found that parental communication during a procedure was related to children's pain and distress ratings. In the study, parent-child communication was observed during a painful procedure and the experimenters categorized the parent's communication as one of four styles: normalizing, supportive, invalidating, or distancing. Their results indicated that parents who used invalidating communication had children who reported more pain during the procedure than parents who used normalizing, supportive, or distancing communication (Cline et al., 2006). In a study of parent-child interaction during bone-marrow aspirations, parent communication behaviors such as commands, criticism, and reassurance were positively related to children's distress (Dahlquist, Power & Carlson, 1995). Similarly, in a study of parent communication during invasive procedures, distress for younger children was positively related to parents' reassurance and information-giving during the procedure, while distress for older children was negatively related to parent distraction during the procedure (Dalquist et al., 1994). These studies of parent-child communication during medical procedures are important for understanding how parental behavior may affect child distress during procedures. Furthermore, these studies utilized direct observations of interactions between parents and children during these

procedures. However, the findings from these studies may not necessarily apply to parent-child communication about cancer more generally.

A recent study in our lab examined the feasibility and acceptability of conducting parent-child observations with a pediatric cancer population. The study involved a more general communication task than in previous studies of children undergoing medical procedures (i.e., mothers and children were videotaped having a conversation about the child's cancer). The results from this study indicated that about half of all eligible families participated, and that emotions, dyadic behaviors, and parenting behaviors were able to be reliably coded (Dunn et al., 2011). These results suggest that observational studies may be a feasible and acceptable methodology with a pediatric cancer population. However, research on parent-child communication about cancer is still in the early stages.

Parent-Child Communication: Integrating Macro- and Micro- Levels of Analysis

The recommendation that parents talk "openly and honestly" with their children about cancer and its treatment (NCI, 2002) may seem straightforward at first glance. However, parents may have difficulty putting this recommendation into practice because they do not know the types of communication skills that would help them discuss such a complicated, emotionally charged topic with their child. For clinical and pediatric psychologists, this difficulty may be addressed by integrating research on macro- and micro- levels of analysis of parent-child communication.

At a macro-level, measuring and quantifying parent-child communication has included asking parents and children about their interactions through questionnaires (e.g., asking parents to rate how frequently they talk with their child), or by observing a

communication sample and rating the quality of certain dyadic or parenting behaviors (e.g., warmth, responsiveness, intrusiveness, permissiveness). Macro-level analyses can be conducted using questionnaire reports (e.g., the Parent-Adolescent Communication Scale; Barnes & Olsen, 1982, 1985) or by using a global coding system to analyze videotaped observational data (e.g., the Iowa Family Interaction Rating Scale; IFIRS; Melby & Conger, 2001). Macro-level analyses using the IFIRS and similar coding systems quantify behaviors on scales that indicate the overall frequency and intensity of the behaviors throughout an interaction (Melby & Conger, 2001) and do not quantify the frequency of specific behaviors or the sequence of behaviors between parents and children. For example, a global coding system might score a parent on how warm/supportive he or she was based on the parent's verbal and non-verbal behavior throughout the interaction, but would not directly measure the number of times the parent said, "you were brave" or hugged the child. Furthermore, a global coding system would not necessarily take into account the child behaviors that preceded a parent's warm statement or gesture.

At a micro-level, measuring and quantifying communication has included analyses of conversational pragmatics or discourse, or the syntactic structure of the language. Conversational pragmatics or discourse can be defined as the ways in which a speaker directs or manages a conversation, including how one speaker responds to another (e.g., see Lasky & Klopp, 1982). Syntactic structure can be defined as the grammatical aspects of the speaker's language (e.g., see Hart & Risley, 1992). Research on conversational pragmatics or discourse often involves calculating the number of times a parent uses a certain type of response, such as a repetition, question, or command. Research in this area

has primarily been done with young children and their parents or other adults. Findings suggest that certain types of repetitions, such as when a parent expands on what a child says by adding additional grammatical content, is associated with growth in children's language abilities (e.g., Lasky & Klopp, 1982) and that repetitions and questions are positively correlated with child age and intellectual development and functioning (Hart & Risley, 1992). Findings have also indicated that, when communicating with young children, question type (e.g., yes-no questions compared to wh- questions) may influence the accuracy of children's responses (e.g., Peterson, Dowdin & Tobin 1999). Research on syntax often involves examining the parent's linguistic complexity (e.g., the average number of words a parent uses in each sentence) over the course of an interaction. Research with young children has indicated that adults adjust the complexity of their speech based on the age of the child with whom they are talking (e.g., Phillips, 1973; Snow, 1972) and that parent language becomes more complex as children grow older (Huttenlocher, Vasilyeva, & Waterfall., 2007). These types of micro-level analyses require observational data that is transcribed and coded using an utterance-based coding system, which, in contrast to a global coding system, involves deciding whether or not a specific response or aspect of language has occurred and counting how many times it occurs over the course of an interaction. For example, a micro-level coding system might count the number of times a parent asks a question or repeats what the child said, or the number and types of words or grammatical constructs a parent uses.

Research in clinical and pediatric psychology typically uses macro-level analyses (e.g., Dunn et al., 2010; Lim et al., 2008, 2011), while research in linguistics and developmental psychology more often relies on micro-level analyses (e.g., Black &

Logan, 1995; Hart & Risley, 1992; Lasky & Klopp, 1982). Research on the development of child language, especially, has provided valuable information about how parental responses may promote child language development. For example, Lasky and Klopp (1982) found that parental imitations and expansions (i.e., imitations with additional grammatical information) were positively correlated with children's language development over time (i.e., development of more complex language). Similarly, in an intervention study, Nelson, Camarata, Welsh, Butkovsky, and Camarata (1996) found that typically developing children and children with Specific Language Impairment learned new grammatical constructs faster when adults responded to them with recasts (i.e., imitations with added complexity) than exact imitations.

Integrating this type of micro-level data and analysis with a macro-level approach could provide valuable information about the aspects of conversational discourse and language that characterize certain parental behaviors and emotions during an interaction. For example, an intervention by Smith, Landry and Swank (2005) with parents of premature and full-term infants examined multiple levels of maternal behavior during a mother-child interaction, including support of signals (e.g., maintaining, redirecting, and contingency), quality of language (e.g., labeling, verbal scaffolding), and emotional support (warmth, intrusiveness). Support of signals and quality of language were coded on an "event" basis (i.e., using micro-level analysis), while emotional support was coded using a global, 5-point rating scale (i.e., using macro-level analysis). The authors found relationships between parent competence/emotions and multiple levels of these maternal behaviors (e.g., lower levels of maternal competence were related to lower levels of

verbal scaffolding and higher levels of intrusiveness; lower levels of maternal contingency were related to higher levels of anger/hostility).

Research that identifies aspects of parental conversational discourse and language that are associated with desirable dyadic behaviors (e.g., warmth) parenting behaviors (e.g., consistency) and emotions (e.g., positive mood) could facilitate the development of parenting and communication interventions. However, currently there is minimal research that has used both macro-level and micro-level analyses in the same study.

Coping and Adjustment in Children and Adolescents

Coping is a second possible mediator of the association between children's cancer-related stress and their adjustment. Coping has been defined as controlled, volitional efforts to regulate cognitions, emotions, behavior, physiological reactions and the environment in response to stress, and can include either engaging with or disengaging from the stressor (Compas, Connor-Smith, Saltzman, Thomsen & Wadsworth, 2001). Confirmatory factor analyses with both child, adolescent and adult samples have identified three categories of coping: primary control coping, secondary control coping, and disengagement coping (Compas et. al. 2001; Compas et al., 2006; Connor-Smith, Compas, Wadsworth, Thomsen & Saltzman, 2000). Primary control coping involves efforts to directly change the stressor or one's response to the stressor, and includes strategies such as problem solving and the modulated expression of emotions. Secondary control coping involves changing thoughts or behavior (e.g., cognitive reappraisal, acceptance) to adapt to the stressor. Disengagement coping

involves attempts to detach oneself from the stressor or one's emotions through coping strategies such as avoidance, denial, or wishful thinking.

Coping has been shown to relate to adjustment in a variety of child and adolescent samples exposed to different types of stress, including children of depressed parents (Jaser et al., 2005), children of divorced parents (Sandler, Tein & West, 1995), children coping with economic stress and poverty (Wadsworth & Compas, 2002), and adolescents coping with homelessness (Votta & Manion, 2004). Findings from these studies suggest that coping strategies that reflect disengagement from the stressor and one's emotions are associated with negative outcomes, such as increased internalizing and externalizing symptoms (Sandler et al., 1995) and suicidal ideation (Votta & Manion). In contrast, strategies related to primary and secondary control coping are associated with less anxiety and depression (Wadsworth & Compas, 2002) and less aggression (Jaser et al., 2005). In general, research on coping suggests that primary and secondary control coping may be protective in populations facing a variety of stressors, while disengagement coping may increase risk in these populations.

Coping and Adjustment in Pediatric Populations

Research on adjustment in pediatric populations has also examined the role of coping. In studies that have examined coping using the model of primary control, secondary control, and disengagement coping (Compas et al., 2001), findings suggest that secondary control coping may be beneficial, while disengagement coping may be detrimental. For example, disengagement coping strategies were related to poorer adjustment, including higher anxiety, in children with sickle-cell disease (Lewis &

Kwieler, 1996) and higher levels of somatic complaints and anxiety/depression in adolescents with chronic abdominal pain (Compas et al., 2006). In contrast, secondary control coping may actually improve both psychological and physical health outcomes, such as fewer somatic complaints and less anxiety/depression in adolescents with chronic abdominal pain (Compas et al., 2006), and better lung function and less anxiety in children with asthma (Schereier & Chen, 2008). In general, strategies such as acceptance, distraction, and cognitive restructuring may be beneficial to children with illnesses, which is consistent with the literature indicating that secondary control coping is most effective in coping with uncontrollable stressors (Compas et al., 2001; Rudolph, Dennig, & Weisz, 1995).

Coping and Adjustment in Pediatric Cancer

Despite the extensive literature on coping and adjustment in children and adolescents (Compas et al., 2001), research on children with cancer has been unclear about the role of coping in the adjustment of these children. This may be due in part to the lack of clarity about children's adjustment to cancer in general (see above), as well as the failure to use empirically validated measures and models of coping in many studies. A recent meta-analysis examined research on coping in 26 studies of 1,230 children with cancer and survivors of childhood cancer (Aldridge & Roesch, 2007). The authors defined coping along two dimensions: the focus of children's coping responses (i.e., whether the coping response was focused on the problem or on their emotions), and whether the stressor was approached or avoided (approach vs. avoidance focused). However, these two ways of categorizing coping were not empirically validated, and grouping into these categories

was done qualitatively by judges. This way of classifying coping strategies caused similar types of coping strategies to be classified in different categories, and different types of strategies to be included in the same category. As a consequence, some of these categories were confounded with each other and included heterogeneous types of coping. For example, the approach category included seeking guidance/support, while the emotion-focused category included seeking emotional support, and both the approach and problem-focused categories included problem solving. Furthermore, strategies such as denial and distraction were both grouped in the avoidance category, which is contrary to research that suggests that distraction is a type of engagement rather than disengagement coping (e.g., Connor-Smith et al., 2000). In addition to the non-empirical categorization of coping strategies, studies with different ways of operationalizing adjustment (ranging from life satisfaction to normal functioning to depression) were all included and combined to create a single index of adjustment. The ways in which Aldridge and Roesch (2007) grouped these various types of coping are at odds with the results of recent empirically based analyses of the structure of coping (see Compas et al., 2001; Skinner, Edge, Altman & Sherwood, 2003; Skinner & Zimmer-Gembeck, 2007).

The results of the meta-analysis suggested that, overall, emotion-focused coping (i.e., focusing one's coping efforts on trying to regulate one's emotions in response to a stressor), approach coping (i.e., focusing on or attending to the stressor), and avoidance coping (i.e., orienting away from the stressor) were unrelated to children's adjustment (Aldridge & Roesch, 2007). A small negative correlation was found between problem-focused coping (i.e., trying to change or control the environment/external stressor) and adjustment. However, when the authors examined several moderating variables, they

found that time since diagnosis moderated the relationship between different types of coping and adjustment (Aldridge & Roesch, 2007). For example, at 6 months to 1 year after diagnosis, approach coping was associated with poorer adjustment, but at 4-5 years post-diagnosis this type of coping was associated with better adjustment. At 6 months to a year after diagnosis, problem-focused coping was associated with poorer adjustment, and emotion focused coping was associated with better adjustment at 2-3 years and 3-4 years after diagnosis.

The results reported by Aldridge and Roesch (2007) are surprising, given that they suggest an inconsistent pattern of the association between coping efforts and psychological adjustment over the course of children's treatment and recovery. For example, approach- and problem- focused coping included forms of social support such as communication and information seeking, which have been shown to be beneficial in several studies (Bruce, 2006). It is unclear why these types of coping may be related to poorer adjustment close to diagnosis, but better adjustment later. Although the review by Aldridge and Roesch (2007) is an important first step in examining coping in children with cancer, future quantitative reviews are needed to examine additional moderator variables of the relation between coping and adjustment, such as distinguishing different types of adjustment (e.g., quality of life, depression, and post-traumatic symptoms).

Furthermore, future research on the relationship between coping and adjustment should consider empirically validated models of coping that have been shown to relate to adjustment for several types of stressors. For example, a study by Campbell et al. (2009) examined coping and adjustment in survivors of pediatric leukemia using a validated model of coping that distinguished between primary control coping, secondary control

coping, and disengagement coping. The results of the study suggested that secondary control coping was strongly related to lower internalizing and externalizing behavior problems in survivors, and accounted for the relationship between neurocognitive functioning and behavior problems in these children and adolescents (Campbell et al., 2009). Similarly, a study of temperament, coping, and distress in pediatric cancer patients, which used the same model of coping, found that secondary control coping accounted for the relationship between negative affectivity and depressive symptoms (Miller et al., 2009). As in the study by Campbell et al. (2009), Miller et al. (2009) found that secondary control coping was related to lower levels of negative affect and depressive symptoms. The results of these studies suggest that secondary control coping may be an important predictor of adjustment to pediatric cancer, in part because many of the most stressful aspects of cancer for a child are uncontrollable and are well suited to efforts to adapt to rather than change these stressors.

Coping and Parent-Child Communication

Coping in childhood has also been shown to be associated with parent-child communication, and may even mediate the relationship between parent-child communication and adjustment in children with cancer. Research on the development of coping suggests that parents may encourage certain coping strategies in their children, or even initiate or scaffold child coping, through their interactions and communication with their children (Skinner & Zimmer-Gembeck 2006). For example, research indicates that parents who employ distraction during their children's painful medical procedures have children who are less distressed during the procedures (Dahlquist et al., 1994). Research

has also linked parent-child communication with specific coping strategies in children. For example, Gentzler, Contreras-Grau, and Kerns (2005) found that supportive and emotionally open parent-child communication, especially between mothers and children, accounted for higher levels of constructive coping in children (i.e., higher problem solving and support-seeking, and lower avoidance and aggression). Similarly, in a study of Dutch adolescents and their parents, Jackson, Bijstra, Oostra, and Bosma (1998) found that more open mother-child communication was positively related to more problem solving and support-seeking, and less avoidance coping, in adolescents. Additionally, in a study of adolescents coping with their parents' divorce, adolescents' positive coping (e.g., social support, relaxation, cognitive restructuring) was related to better parent-adolescent relationship quality during an interaction (Afifi, Huber & Ohs, 2006). In general, open and supportive parent-child communication has been found to relate to children's and adolescents' coping strategies such as problem solving and support-seeking. However, despite the extensive research on parent-child communication and adjustment, and coping and adjustment, no studies have directly tested coping as a mediator of the relationship between communication and adjustment.

The Role of Executive Function in Children's Adjustment to Cancer

In addition to the support and scaffolding provided by parents, children draw upon their own cognitive abilities in order to cope with and adjust to cancer. Cognitive development may play a key role in children's adaptation to the diagnosis and treatment of cancer in several ways. Specifically, a child's level of cognitive development may affect the mental resources from which the child can draw when coping with a stressor,

and therefore may affect the types of coping strategies the child uses (Compas, Campbell, Robinson & Rodriguez, 2009). Further, a child's cognitive development may affect how parents communicate with the child about the disease, including the type and amount of information (e.g., details of treatment and prognosis) that parents discuss with their child, as well as the language (e.g., linguistic complexity) that parents use when discussing cancer.

Coping and Executive Function

Reviews of the coping literature indicate that developmental level plays a role in children's use of coping strategies (e.g., see reviews by Fields & Prinz, 1997; Skinner & Zimmer-Gembeck, 2006; Zimmer-Gembeck & Skinner, 2011). Cognitive abilities, and specifically executive function abilities, have been linked to adjustment in youth; however, models of coping have only recently begun to consider the role of executive function in adjustment (e.g., Campbell et al., 2009; Compas et al., 2009).

Executive function is broadly defined as the cognitive underpinnings of the self-regulation of goal-directed behavior (Banich, 2009). Specific types of executive function include working memory/updating (the ability to store information in short term memory while manipulating, or updating it), inhibitory/impulse control (the ability to inhibit prepotent responses), verbal and visual fluency (the ability to generate multiple items within a given category), sustained attention (the ability to maintain concentration for extended periods of time), and flexibility/shifting (the ability to switch between mental sets or performing different tasks). Two factor analytic studies of the structure of executive function demonstrated comparable subcomponents of executive function in

college-aged adults and school-aged children/adolescents (Lehto, Petri, Kooistra & Pulkkinen, 2003; Miyake et al., 2000). These studies identified three components of executive function – working memory (or updating), shifting (or flexibility), and inhibition. Klenberg, Korkman, and Lahti-Nuuttila (2001) identified an additional factor, fluency, from their data on executive function in children ages 7 to 12 years.

Both executive function and coping involve processes of self-regulation. The development of executive function is strongly linked to the development of self-regulatory processes (Carlson, 2003), while coping specifically involves self-regulation under stress (Compas et al., 2009). Coping may be conceptualized as a specific instance of using executive function skills under stress.

Several empirical studies with a variety of child and adolescent populations also support the notion that executive function may be a cognitive underpinning of coping, and that problems in executive function are related to poorer coping and adjustment problems. Executive function deficits are related to academic problems and ADHD symptoms (Alloway, Gathercole, Kirkwood, & Elliot, 2009), and executive functioning abilities positively predict adaptive functioning in adolescents with ADHD and ODD/CD (Clark, Prior & Kinsella, 2002). Furthermore, several studies with non-clinical populations have examined the relations between executive function, emotional self-regulation, and internalizing symptoms. For example, Elliman, Green, Rogers, and Finch (1997) found that, for high-anxious individuals, processing time increased as difficulty increased for a sustained attention and working memory task, suggesting that trait anxiety may decrease the efficiency of working memory as task difficulty increases. Furthermore, Schmeichel, Volokhov, and Demaree (2008) examined working memory and controlled

emotional expression (specifically, suppression of facial emotions when instructed) in college undergraduates. They found a positive relationship between working memory and emotional expression (i.e., a greater ability to suppress emotions when instructed).

The relation between adjustment, coping and executive function may be especially significant for pediatric cancer patients, who may suffer from executive function deficits as a result of highly toxic treatments for their cancer (see Campbell et al., 2007). However, only one study (Campbell et al., 2009) has examined the role of executive function in the relation between coping and adjustment in this population. The findings indicated that poorer executive function was related to higher levels of behavior problems, and that secondary control coping accounted for the variance between deficits in executive function (working memory, cognitive flexibility, and monitoring) and total behavior problems in these children.

The findings from studies of both clinical and non-clinical populations suggest a relationship between executive function and adjustment, such that better executive function is positively related to adjustment. Although research has just begun to explore the mechanisms behind this relation, it appears that executive function may be a resource from which to draw when appropriate coping strategies are needed (e.g., during a stressful event).

Communication and Executive Function

In addition to the association of executive function with coping and adjustment, executive function also appears to be related to communication, especially early in development. Conceptually, executive function is essential to self-regulation and self-

regulation is thought to develop in part through self-speech and language development. Zelazo, Carter, Reznick, and Frye (1997) propose that executive function develops through language, and specifically develops when children begin to understand complex, embedded rules in language. Furthermore, Carlson (2003) suggests that parental scaffolding, and specifically, parent-child communication, helps in the development of child self-talk, which helps children to develop self-regulation.

Studies have found that language and communication deficits are specifically linked to poorer executive function. For example, in a study of executive function and language competence in adolescents with conduct disorder, poorer language was related to poorer executive function as well as more aggression (Giancola & Mezzich, 2000). In another study, Im-Bolter, Johnson, and Pascual-Leone (2006) examined attentional capacity, interruption/inhibition, shifting/flexibility, and updating/working memory in children with specific language impairment (SLI) compared to children with typical language development, and found impaired attentional capacity, interruption, and updating in the SLI group. These findings are consistent with the hypothesis that language and self-talk play a role in the early development of emotion regulation and executive function, and suggest that poorer language/communication abilities in children are related to lower executive function. Executive function impairments may partly explain the relation between poor communication/language abilities and poor adjustment, especially given the evidence that executive function may also influence the ability to use appropriate coping strategies.

Cognitive development, and specifically, the development of executive function, may play a key role in children's adaptation to the diagnosis and treatment of cancer in several

ways. Children's executive functioning may affect the mental resources they can draw on when coping with a stressor, and therefore may affect the types of coping strategies they use. Further, children's development may affect parent-child communication about cancer. Previous research suggests that parents may manage the content of their communication about cancer, such as details of treatment and prognosis, based on their children's level of development (e.g., Chesler, Paris & Barbarin, 1986; Clarke, Davies, Jenney, Glaser & Eiser, 2002). However, it is also important to understand *how* parents manage and respond to their children in communication (e.g., by soliciting or providing information, by reflecting, validating, or trying to reframe their child's statements, or by sharing their own emotional experiences), especially with the goal of developing interventions for improving parent-child communication and coping with cancer. In addition, based on their children's executive functioning abilities, parents may also manage the complexity of information they discuss with their child by adjusting their language (e.g., linguistic complexity). The results of studies with both clinical and non-clinical populations suggest that executive function may play an important role in coping with stress and communicating with others.

The Current Studies

The current research encompassed two studies. In the first study I examined the associations between macro- and micro- levels of analysis of parent-child communication about cancer. Specifically, I examined the correlations between global ratings of parents' behaviors, and data on parents' conversational discourse and language, during an interaction in which the parent and child had a conversation about the child's cancer. Due

to the minimal research integrating macro- and micro-level coding systems, the analyses for the first part of the study were exploratory in nature, and no specific hypotheses were tested. The analyses are intended to describe a newly developed micro-level coding system (referred to as "Contingency" Coding), and how the micro-level codes were related to codes from a well-established macro-level coding system (the IFIRS).

In the second study, I examined how children's cognitive development, and specifically their executive function, was related to the child's coping with his/her illness. Furthermore, I examined the relation between parent-child communication and children's level of executive function. Specifically, I examined the degree to which parents tailored their language to their children's executive functioning abilities when discussing cancer. Figure 1 describes the hypothesized directions of the relationships between executive function, coping, and communication for the current study, although directional hypotheses were not tested in the current study because longitudinal data was not available for all participants. In the second study, the following specific hypotheses were tested:

Hypothesis 1: Children's executive functioning will be associated with children's coping and emotional distress after a diagnosis of cancer. Specifically, better executive function will be positively correlated with higher levels of primary/secondary control coping and lower levels of adjustment problems (see paths A1 and A2 in Figure 1). Furthermore, coping will account for significant variance in the relationship between children's executive function and emotional distress (see path A3).

Hypothesis 2: Children's executive function will be related to parents' communication during observed parent-child interactions. Specifically, greater linguistic

complexity in the parents' communication will be positively correlated with better executive functioning (see path B in Figure 1).

Hypothesis 3: The "match" between children's executive function and parents' linguistic complexity will be associated with children's cancer-related coping and adjustment. The "match" is specifically defined as the difference between children's executive function and parents' linguistic complexity, when parents' linguistic complexity and children's executive function are converted to standard scores (i.e., z-scores). Smaller "match" scores (i.e., smaller difference scores) will be positively related to more secondary control coping and fewer adjustment problems.

Study 1 and Study 2 were both embedded within an ongoing longitudinal study of coping, communication, and adjustment in families of children with cancer. Although there was significant overlap among participants in each study, Study 1 utilized data from two sites, while Study 2 utilized data from only one site. Furthermore, Study 1 only utilized data from one phase of the study (observations of mother-child interactions) and only included mothers, while Study 2 utilized data from several phases of the study (completion of questionnaires, observations, and assessment of children's executive functioning) and included fathers. Therefore, the participants, measures, and procedures are described separately below.

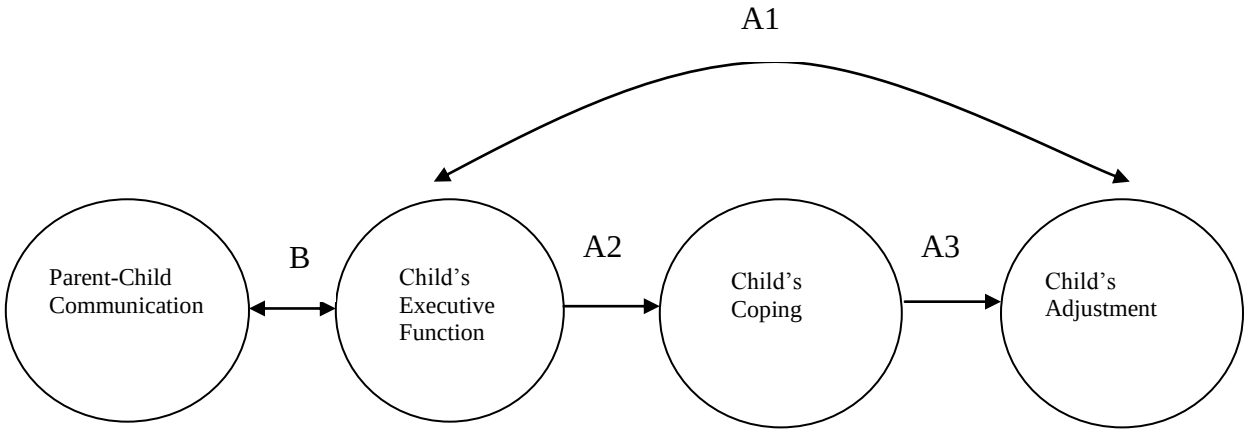

Figure 1. Model of Hypothesized Relations Between Parent-Child Communication, Children's Executive Function, Children's Coping, and Adjustment in Children with Cancer.

CHAPTER II

STUDY 1

Method

Participants

Sixty-two mother-child dyads completed an observational study of communication about cancer. Mothers and children were recruited from registries at two pediatric oncology centers in the Midwestern and Southern United States. These dyads were recruited from a larger sample of mothers and children who participated in a longitudinal study of coping and adjustment to pediatric cancer. Eligible families had children who: (a) had a new or relapsed cancer diagnosis; (b) were ages 5 to 17 years old at the time of the child's diagnosis; (c) were receiving treatment through the oncology division; and (d) had no pre-existing developmental disability.

Children in the study were on average 10.1 years old (*SD* = 4.0); 57% of the sample was male; and 84% were White/Caucasian, 10% Black/African-American, and 3% Hispanic/Latino. Children had received diagnoses of leukemia (50%), lymphoma (12%), brain tumor (8%), and other solid tumor (31%). Five percent were recruited into the study following a relapse of their original cancer. Mothers were on average 38.6 years old (*SD* = 8.3). The families represented a variety of annual income levels: 26% earned $25,000 or under, 21% earned between $25,001 and $50,000, 11% earned between $50,001 and $75,000, 15% earned between $75,001 and $100,000, and 27% earned over

$100,000.

Measures

Iowa Family Interaction Rating Scales (IFIRS). The IFIRS is a macro-level coding system that was used to code mothers' and children's verbal and non-verbal communication, behaviors, and emotions during a videotaped parent-child interaction (Melby & Conger, 2001). Codes were assigned a value from 1 to 9, with 1 reflecting the absence of the behavior or emotion, and 9 indicating a behavior or emotion that is "mainly characteristic" of the parent or child during the interaction (Melby & Conger, 2001). The frequency and intensity of each behavior or emotion were combined to determine the global rating for each code.

Twenty-four codes were scored for mothers, and 15 codes were scored for children. Codes that were included in analyses for both mothers and children in the current study were two emotion codes (anxiety and positive mood) and two dyadic codes (hostility and listener responsiveness). Three additional parenting codes were also analyzed for mothers only (neglect/distancing, inconsistent discipline, and child-centeredness). See Table 1 for code definitions and examples drawn from the IFIRS manual (Melby & Conger, 2001).

All observations were coded by a trained team of graduate and undergraduate students at one of the study sites. Coders had to score at least 80% correct on a written test of code definitions, clarifications, and examples, and meet weekly with the research team to discuss questions. All observations were viewed five times by each coder, and every observation was coded independently by two coders. Coders then met to discuss ratings and reach consensus on each code. If scores by the two coders on a code differed

by one point on the scale, the higher score was used as the final score. If coders' scores differed by two or more points, coders discussed the score and reviewed examples and code definitions before reaching a final score. Reliability (calculated as intraclass correlations) for individual codes ranged from .32 for children's anxiety to .80 for children's positive mood (see Table 2).

Contingency Coding System. The contingency coding system is a micro-level coding system that was developed for this study to code mothers' conversational discourse with their children (Contingency Coding Manual; Rodriguez, Zuckerman, Saylor, Schuele & Compas, 2011). This coding system was based on research regarding parents' conversational discourse and management during their children's early language development, such as the use of repetitions, recasts, and expansions of children's speech (Fey, Krulik, Loeb, & Proctor-Williams, 1999; Lasky & Klopp, 1982; Saxton, 2005). Due to the specific nature of the conversation task in the current study (i.e., a conversation about cancer), the wide developmental range of the children (ages 5- to 17-years old), and the types of responses observed during a similar pilot study, the system used in the current study also included several additional categories of responses. Parents' and children's speech was transcribed and divided into utterances. As defined by McLaughlin, Schutz, and White (1980) an utterance is "a unit of speech with complete semantic and syntactic content." The first two parent utterances following each utterance by the child were assigned one of the following codes: reflection, expansion, reframe, solicit, provision of information, disclosure, imperative, validation, other, uncodeable, or no code (see Table 1 for code definitions and examples). We based certain codes (i.e., reflections and expansions) on the literature on child language development

(e.g., Fey et al., 1999; Lasky & Klopp, 1982). Other codes were developed inductively by examining pilot data on a similar cancer conversation task. Preliminary attempts at coding pilot data indicated that independent coders could reliably group parental responses into one of the above 11 categories (once all code definitions were finalized, percent agreement exceeded 80% on pilot transcripts).

Similar to the IFIRS coding, all observations were contingency coded by a trained team of graduate and undergraduate students at one of the study sites. Coders had to achieve a score of at least 80% correct on a written test of code definitions and examples. All observations were coded independently by two coders, who then met to discuss ratings and reach consensus on utterances for which there was initially disagreement. Percent agreement for all codes on each transcript was 87% on average, and percent agreement for individual codes ranged from 61% agreement for reframes, to 95% agreement for imperatives.

Procedure

The Institutional Review Boards approved the study protocol. Families were compensated $50 for participating and children also received a $30 gift card. Families were approached by phone or in person at the hospital about enrolling in the observation study, which consisted of being videotaped while the parent and child had a conversation about the child's cancer. Parents were given several prompts in order to facilitate the discussion: (1) What have we each learned about cancer and how it is treated? (2) What parts of your cancer and its treatment have been the hardest for each of us? (3) What kinds of feelings or emotions have we each had since we found out you have cancer? (4) What

Table 1. Definitions and Examples of Contingency and IFIRS Codes.

Contingency Codes	**Definition**	**Examples**
Reflections	Parent repeats some or all of the child's utterance with no additional content.	Child: "I like the nurses." Mother: "You like them." Child: "I'm tired." Mother: "You're tired?"
Reframes	Parent corrects or disagrees with the child, or states an alternate viewpoint.	Child: "None of my friends want to spend time with me anymore." Mother: "They can't visit you here because they might make you sick." Child: "My last treatment is in July." Mother: "Actually you won't be done until August."
Expansions	Parent repeats some or all of the child's utterance but also adds additional content.	Child: "I like the nurses." Mother: "You like the people who work here." Child: "I'm tired." Mother: "You're feeling tired after not sleeping well last night."
Disclosures	Parent expresses something about his/her own emotional experience.	Child: "I was scared before the surgery." Mother: "I was scared too." Child: "It's been hard for me to miss school." Mother: "The hardest part for me was seeing you sick."
Solicits	Parent asks a question in order to elicit a response from the child.	Child: "I can't wait until I'm off treatment." Mother: "What are you looking forward to the most?" Child: "I was sad." Mother: "Did you feel scared too?"

Table 1, continued.

Contingency Codes	**Definition**	**Examples**
Provisions of Information (POIs)	Parent conveys a fact or opinion to the child.	Child: "What's it called again?" Mother: "The cancer you have is called leukemia." Child: "We've spent a lot of time together in the hospital." Mother: "I think it's made us closer."
Imperatives	Parent directs the child to do something or stop doing something.	Child: "What's the next question?" Mother: "You read it." Child: "Let's play a game!" Mother: "Come back and sit down."
Validations	Parent confirms, empathizes, or praises the child's utterance without adding new content.	Child: I don't like the shots." Mother: "I know." Child: "The treatment is called chemo." Mother: "That's right."
Other	Parent response does not fit into one of the above categories (includes popular expressions)	Child: "I was mad." Mother: "Oh my goodness!"
Uncodeable	Parent response is not able to be coded due to insufficient verbal content from the parent.	Child: I don't like the shots. Mother: {nods} Child: "The treatment is called chemo." Mother: "You -- "
No Code	Parent response is not able to be coded due to insufficient verbal content from the child.	Child: {nods} Mother: "What else?" Child: "When we -- " Mother: "We'll be finished soon."

Table 1, continued.

IFIRS Codes	Definition	Examples
Anxiety	Verbal or non-verbal indications of fear, nervousness, worry, tension, or concern.	**Non-verbal:** Shaking foot. Nervous laughter. **Verbal:** "I'm worried about our next check-up." "I was scared before the surgery."
Positive Mood	Verbal or non-verbal indications of contentment, happiness, and optimism.	**Non-verbal:** Smiling. Laughing or giggling. **Verbal:** "I can't wait for our Make-A-Wish." "I think you'll beat this cancer."
Hostility	Angry, critical, disapproving, or rejecting verbal or non-verbal behavior toward the other person.	**Non-verbal:** Frowning or scowling at the other person. Hitting the other person. **Verbal:** "Shut up." "You always do it wrong."
Listener Responsiveness	The extent of responsiveness when the other person is speaking through verbal and non-verbal behaviors that show attentiveness.	**Non-verbal:** Nodding or facial expression in response to the other person's statements. **Verbal:** Saying "yeah" while the other person speaks.

Table 1, continued.

IFIRS Codes	**Definition**	**Examples**
Neglect/Distancing	The extent that the parent ignores, distances, or minimizes his/her contact or involvement with the child.	**Non-verbal:** Staring into space while the child says or shows something to the parent. Pushing the child away when the child tries to hug the parent. **Verbal:** "That's not important." "Don't bother me."
Inconsistent Discipline	The extent to which the parent does not follow through with rules or standards set for the child's behavior.	**Non-verbal:** Cleaning up the child's mess after directing the child to do it. **Verbal:** "Stop that!" {laughs at child's misbehavior}.
Child-Centeredness	Parental behavior and responses toward the child that support the child and encourage independence, success, and self-regulation.	**Non-verbal:** Moving the prompt card so the child can look on as the parent reads questions. **Verbal:** "It seems like you feel sad about that." "Would you like to talk about another question now?"

are the ways we each try to deal with these feelings and emotions? (5) What is it about cancer that has most affected each of our lives? (6) How do we each feel about what might happen in the next year? And after that? (7) If we were writing a book about cancer for other children and parents, what would we each include? What would we want to be sure to tell other children and parents? The observation study typically took 45 minutes for families to complete and all interactions took place in the hospital in an outpatient clinic room or the child's inpatient room.

Interactions were coded using both the IFIRS and the Contingency coding system, and analysis of MLU and Contingency codes was conducted on transcribed interactions using Systematic Analysis of Language Transcripts software (SALT; Miller, 2004). All interactions were transcribed by a trained research assistant. Transcription training included reviewing SALT guidelines (e.g., SALT tutorial and manual), practicing transcription, and meeting with experienced transcribers to review questions. Research assistants were required to reach 80% agreement (on utterance boundaries, punctuation, etc.) with the transcript of a trained and reliable transcriber before transcribing independently.

Statistical Power and Data Analyses

Means, standard deviations, and ranges were calculated for Contingency and IFIRS codes. All contingency codes were calculated as the percentage of total coded mother utterances. Pearson correlations among Contingency codes were calculated to examine the associations between different codes. Pearson correlations were also conducted between Contingency codes and IFIRS codes. With the sample of 62 families, power was

.80 to detect correlations of .35 or greater with .05 significance.

Results

Descriptive Analyses

Mean scores, standard deviations, and ranges of the IFIRS and Contingency codes are presented in Table 2. The mean of mothers' MLU was 8.5 words per utterance. Means for all contingency means are presented as the percentage of total coded mother utterances. For contingency codes, means ranged from 4.1 percent of total coded utterances (disclosures) to 26.6 percent of total coded utterances (provisions of information). For mothers' IFIRS codes, mean scores ranged from 1.9 (inconsistent discipline) to 6.6 (listener responsiveness) on a 9-point scale. For children's IFIRS codes, mean scores ranged from 3.1 (hostility) to 5.8 (listener responsiveness).

Correlational Analyses Between Contingency Codes, Children's Age, and Mothers' MLU

Table 3 presents the correlations among Contingency codes, children's age, and mothers' MLU. As noted above, all contingency codes were calculated as the percentage of total coded mother utterances. Results indicate that reflections were positively correlated with expansions (r = .25, p = .047) and negatively correlated with reframes (r = -.33, p = .008), disclosures, (r = -.26, p = .04), and provisions of information (r = .34, p = .006). Reframes were also negatively correlated with expansions (r = -.30, p = .02) and positively with imperatives (r = .33, p = .009). Solicits were negatively correlated with disclosures (r = -.39, p = .002) and provisions of information (r = -.54, p < .001).

Table 2. Means, Standard Deviations, Ranges, and Reliability ([a]percent agreement or [b]intraclass correlations) of Mothers' Contingency and IFIRS Codes and Children's IFIRS Codes, and Mothers' MLU.

	Mean (SD)	Range	Reliability
Reflections	9.1 (7.8)	0 – 29.0	90[a]
Reframes	6.2 (5.3)	0 – 33.3	61[a]
Expansions	5.9 (3.4)	0 – 12.7	69[a]
Disclosures	4.1 (4.2)	0 – 18.8	78[a]
Solicits	23.7 (13.0)	0 – 61.9	93[a]
Provisions of Information	26.6 (12.1)	6.1 – 58.5	84[a]
Imperatives	2.0 (3.8)	0 – 26.3	95[a]
Validations	3.5 (3.2)	0 – 13.0	82[a]
Mother Anxiety	4.7 (1.6)	2 – 8	.72[b]
Mother Positive Mood	5.7 (1.3)	2 – 8	.66[b]
Mother Hostility	2.8 (1.6)	1 – 8	.64[b]
Mother Listener Responsiveness	6.6 (1.2)	3 – 9	.60[b]
Mother Neglect/Distancing	2.8 (1.6)	1 – 7	.34[b]
Mother Inconsistent Discipline	1.9 (1.6)	1 – 7	.73[b]
Mother Child-centeredness	6.5 (1.3)	2 – 9	.55[b]
Child Anxiety	5.4 (1.3)	2 - 8	.32[b]
Child Positive Mood	5.3 (1.7)	2 – 9	.80[b]
Child Hostility	3.1 (1.8)	1 – 7	.76[b]
Child Listener Responsiveness	5.8 (1.3)	3 – 8	.65[b]
Mother Mean Length of Utterance	8.5 (2.4)	4.2 - 15.8	--

Note: All contingency codes were calculated as the percentage of total coded mother utterances.

Imperatives were also negatively correlated with provisions of information (r = -.34, p = .007).

Children's age was positively correlated with mothers' MLU (r = .45, p < .001), disclosures (r = .37, p = .003), and provisions of information (r = .46, p < .001), and negatively correlated with reflections (r = -.51, p < .001), solicits (r = -.60, p < .001), and imperatives (r = -.28, p = .03). Mothers' MLU was positively correlated with disclosures, and negatively correlated with reflections, solicits, and imperatives. All other correlations were non-significant at the p < .05 level, but other trends (p < .10) are noted in Table 3. When controlling for children's age with partial correlations several correlations became non-significant: the correlations between reflections and disclosures (r = -.09, p = .49), reflections and provisions of information (r = -.14, p = .27) reflections and MLU (r = -.10, p = .45), disclosures and solicits (r = -.23, p = .08), disclosures and MLU (r = .13, p = .31), solicits and MLU (r = -.09, p = .48), and imperatives and MLU (r = -.17, p = .18). All other significant correlations remained significant at the p < .05 level.

Correlational Analyses Between Contingency Codes and Mothers' IFIRS Codes

Table 4 presents the correlations between mothers' contingency and mothers' IFIRS codes. Results indicate that reflections were positively correlated with mothers' listener responsiveness (r = .38, p = .002) and child-centeredness (r = .29, p = .02) and negatively with mothers' neglect/distancing (r = -.29, p = .02). Reframes were positively correlated with mothers' hostility (r = .50, p < .001) and neglect/distancing (r = .27, p = .03), and negatively correlated with mothers' positive mood (r = -.34, p = .007), listener responsiveness (r = -.43, p < .001), and child-centeredness (r = -.30, p = .02). Expansions

Table 3. Correlations Between Mothers' Contingency Codes, Children's Age, and Mothers' MLU.

	1	2	3	4	5	6	7	8	9
1. Reflections	--								
2. Reframes	-.33**	--							
3. Expansions	.25*	-.30*	--						
4. Disclosures	-.26*	.01	.12	--					
5. Solicits	.13	.02	-.17	-.39**	--				
6. POIs	-.34**	.06	-.14	.19	-.54**	--			
7. Imperatives	-.05	.33**	-.19	-.12	.18	-.34**	--		
8. Validations	-.03	-.25+	.05	.03	-.10	.03	-.10	--	
9. Child Age	-.51**	.10	.05	.37**	-.60**	.46**	-.28*	-.10	--
10. Mother MLU	-.30*	-.03	-.14	.28*	-.33**	.23+	-.28*	.10	.45**

Note: POI = Provisions of Information. All contingency codes were calculated as the percentage of total coded mother utterances. +$p < .10$; * $p < .05$; **$p < .01$.

Table 4. Correlations Between Mothers' Contingency Codes and Mothers' IFIRS Codes.

	AX	PM	HS	LR	ND	ID	CC
Reflections	-.22+	.17	-.11	.38**	-.29*	.14	.29*
Reframes	.08	-.34**	.50**	-.43**	.27*	.06	-.30*
Expansions	-.04	.31*	-.27*	.15	-.10	-.11	.07
Disclosures	.56**	.10	-.15	-.12	.07	-.29*	-.07
Solicits	-.30*	-.18	.21	.06	.16	.34**	.06
POIs	.15	.03	-.14	-.23+	-.01	-.24+	-.15
Imperatives	-.14	-.54**	.50**	-.22+	.22+	.49**	-.33**
Validations	-.05	.31*	-.19	.17	.01	-.19	.10

Note: POI = Provisions of Information. AX = Anxiety. PM = Positive Mood. HS = Hostility. LR = Listener Responsiveness. ND = Neglect/Distancing. ID = Inconsistent Discipline. CC = Child Centeredness. All contingency codes were calculated as the percentage of total coded mother utterances. +$p < .10$; * $p < .05$; **$p < .01$.

were positively correlated with mothers' positive mood (r = .31, p = .01), and negatively correlated with mothers' hostility (r = -.27, p = .04). Disclosures were positively correlated with mothers' anxiety (r = .56, p < .001) and negatively correlated with mothers' inconsistent discipline (r = -.29, p = .02). Solicits were positively correlated with mothers' inconsistent discipline (r = .34, p = .008) and negatively correlated with mothers' anxiety (r = -.30, p = .02). Imperatives were positively correlated with mothers' inconsistent discipline (r = .49, p < .001), and negatively correlated with mothers' positive mood (r = -.54, p < .001) and child-centeredness (r = -.33, p = .009). Validations were positively correlated with mothers' positive mood (r = .31, p = .01). All other correlations were non-significant at the p < .05 level, but because of the preliminary nature of these analyses, other non-significant trends (p < .10) are noted in Table 4.

Correlational Analyses Between Contingency Codes and Children's IFIRS Codes

Table 5 presents the correlations between mothers' contingency and children's IFIRS codes. Results indicate that mothers' reframes were positively correlated with children's hostility (r = .49, p < .001) and negatively correlated with children's positive mood (r = -.29, p = .02) and listener responsiveness (r = -.27, p = .03). Mothers' disclosures were positively correlated with children's anxiety (r = .32, p = .01), positive mood (r = .31, p = .02) and listener responsiveness (r = .39, p = .002). Mothers' imperatives were positively correlated with children's hostility (r = .30, p = .02) and negatively correlated with children's listener responsiveness (r = -.32, p = .01). All other correlations were non-significant at the p < .05 level, but other trends (p < .10) are noted in Table 5.

Table 5. Correlations Between Mothers' Contingency Codes and Children's IFIRS Codes.

	AX	PM	HS	LR
Reflections	-.21	-.05	-.20	-.11
Reframes	.22+	-.29*	.49*	-.27*
Expansions	-.03	.13	-.21	.18
Disclosures	.32*	.31*	-.17	.39**
Solicits	.04	-.08	.18	-.12
POIs	.02	-.11	.03	-.01
Imperatives	-.11	-.14	.30*	-.32*
Validations	-.14	.24+	-.22+	.17

Note: POI = Provisions of Information. AX = Anxiety. PM = Positive Mood. HS = Hostility. LR = Listener Responsiveness. All contingency codes were calculated as the percentage of total coded mother utterances. +$p < .10$; * $p < .05$; **$p < .01$.

Summary of Findings

These results present some of the first data regarding the associations between micro- and macro-level analyses of mother-child communication. Mothers' solicits and provisions of information were the most common contingent responses to their children, while imperatives were the least frequent. Children's age was significantly correlated with several types of responses: mothers used more reflections, solicits, and imperatives with younger children, and more disclosures and provisions of information with older children. Mothers' MLU was also significantly negatively correlated with reflections, solicits, and imperatives, and positively correlated with disclosures, although these correlations became non-significant when controlling for children's age.

The correlations between mothers' contingent responses and ratings of mothers' global emotions and behaviors indicate that a greater proportion of reflections correlated with higher levels of listener responsiveness and child-centeredness, and lower levels of neglect/distancing and anxiety. More frequent use of expansions was associated with higher positive mood and less hostility, and more frequent validations were associated with higher positive mood. In contrast, more frequent reframes and imperatives were associated with lower positive mood, as well as lower listener responsiveness and lower child-centeredness. More frequent reframes were also associated with higher hostility and higher neglect/distancing, while more frequent imperatives were associated with higher inconsistent discipline. More frequent solicits were associated with higher levels of inconsistent discipline and lower anxiety, while more frequent disclosures were associated with higher levels of anxiety and lower inconsistent discipline. In the associations between mothers' contingent responses and children's global emotions and

behaviors, the results indicate that more frequent reframes were associated with lower child positive mood and listener responsiveness, and higher hostility, while more frequent imperatives were associated with higher hostility and lower listener responsiveness. More frequent maternal disclosures were associated with higher child listener responsiveness as well as higher child anxiety and positive mood. These findings are considered in greater detail in the overall Discussion section below.

CHAPTER III

STUDY 2

Method

Participants

Parents and children were recruited from registries at a pediatric oncology center in the Southern United States. Families were first recruited into the initial questionnaire study, in which parents completed measures about their children's coping and adjustment, and children ages 10 and older provided self-report data on their coping and adjustment. Eligible families for the questionnaire study had children who: (a) had a new or relapsed cancer diagnosis; (b) were ages 5 to 17 years old at the time of the child's diagnosis; (c) were receiving treatment through the oncology division; and (d) had no pre-existing developmental disability. Families of children who were at least 1 week post-diagnosis or post-relapse were eligible for recruitment into the preliminary questionnaire study. On average, families returned questionnaires 79.0 days (*SD* = 71.6) after the child's diagnosis.

All families who completed the questionnaire study were eligible to participate in the subsequent observation study, in which parents and children had a conversation about the child's cancer. Out of the 113 families who completed the questionnaire study, 56 (50%) consented to participate and completed the observation study. On average, families participated in the observation study 159.2 days (SD = 91.8) after the child's diagnosis.

Families who completed the questionnaire study were also approached to participate in the subsequent cognitive assessment study. However, due to slightly different eligibility criteria, not all families who completed the questionnaire study were eligible or available to participate in the cognitive assessment study. In order to be eligible, children needed to be ages 8 or older at the time of testing and families needed to have completed or declined participation in the observation study. In addition, some families were not approached for enrollment in the assessment. Reasons for not approaching families for the cognitive testing study were: the child was not old enough (n = 10; 22%); the family withdrew from the questionnaire or observation study before being eligible to be recruited for the assessment study (n = 8; 17%); the child passed away (n = 12; 26%); the family moved (n = 2; 4%); or the family had not yet completed or declined the observation (n = 14; 30%). Of the 67 families who were eligible, 37 (55%) completed the assessment, 23 (34%) families declined, and 7 (11%) families agreed to participate but did not complete the assessment within the timeframe of the study.

In the cognitive assessment study, children completed testing on measures of their executive functioning, and parents provided questionnaire reports of their children's executive functioning abilities. On average, families participated in the cognitive assessment study 325.0 days (SD = 213.0) after the child's diagnosis.

Out of 113 families who completed the initial questionnaire study, a sample of 56 families completed the observation study and a sample of 37 families completed the cognitive assessment study. There was partial, but not complete, overlap in the samples of families who completed the observation study and the cognitive assessment study: 31 families completed all three studies (questionnaire, cognitive assessment, and

observation) and provided additional data on parents' linguistic complexity.

For the families who participated in the questionnaire and cognitive assessment studies, children were on average 12.8 years-old (*SD* = 3.6), 62% male, 76% White/Caucasian, 14% Black/African-American, 6% Hispanic/Latino, 2% Asian-American, and 2% American Indian/Native American. They had diagnoses of leukemia (40%), lymphoma (16%), brain tumor (5%), and other solid tumor (38%). Eight percent were recruited into the study following a relapse of their original cancer. For the subgroup of children who provided self-report data (19 children who were ages 10 and older), children were on average 15.1 years old (*SD* = 2.5), 53% male, 94% White/Caucasian, 6% Black/African-American and 6% Hispanic/Latino. They had diagnoses of leukemia (32%), lymphoma (21%), and other solid tumor (e.g., osteosarcoma, Wilm's tumor; 47%), and five percent had relapsed disease.

Thirty-five mothers and two fathers participated. Parents were on average 39.5 years old (*SD* = 6.4). Parents on average reported having 17.4 years (*SD* = 4.1) of education. The families represented a variety of annual income levels: 23% earned $25,000 or under, 23% earned between $25,001 and $50,000, 8% earned between $50,001 and $75,000, 14% earned between $75,001 and $100,000, and 31% earned over $100,000.

Measures

Demographic and medical data. Parents provided demographic information including age, race, ethnicity, marital status, family income, education level, and employment. Participants gave permission for the research staff to access medical data,

where the child's diagnosis and relapse status was extracted.

Children's adjustment. Symptoms of internalizing and externalizing problems were assessed by the Youth Self-Report (YSR; Achenbach & Rescorla, 2001), completed by children and adolescents, and the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001), completed by parents. Both of these measures have been shown to have excellent internal consistency and test-retest reliability (all greater than .75) and construct validity. These measures allowed for direct comparisons of the reports of adolescents about their own emotional and behavioral problems with reports of their adjustment obtained from their parents. In addition, the normative samples for the YSR and CBCL are representative of the US population, providing adequate data on levels of emotional and behavioral problems in minority youth (Achenbach & Rescorla, 2001). The Anxious/Depressed, Internalizing Problems, and Externalizing Problems raw scores were used as the primary measures of adjustment. The Anxious/Depressed scale is a measure of anxiety and depression symptoms, such as feeling worried and crying. The Internalizing Problems subscale includes anxiety and depression symptoms as well as somatic complaints (e.g., headaches, stomachaches). The Externalizing Problems subscale includes problems such as rule-breaking behaviors, lying, and aggression.

Children's coping. Parents and children completed the Pediatric Cancer Version of the Responses to Stress Questionnaire (RSQ). The RSQ contains 57 items that ask the child or the parent to report how their child responded during the past 6 months to the stressors they endorsed. Factor analyses of the RSQ have identified five primary factors (Connor-Smith et al., 2000): *primary control engagement coping* (problem solving, emotional expression, emotional modulation), *secondary control engagement coping*

(cognitive restructuring, positive thinking, acceptance, distraction), *disengagement coping* (avoidance, denial, wishful thinking), *involuntary engagement* (emotional arousal, physiological arousal, rumination, intrusive thoughts, impulsive action), and *involuntary disengagement* (cognitive interference, emotional numbing, inaction, escape). The first three factors reflect voluntary coping processes, and the latter factors reflect involuntary stress responses. The RSQ has demonstrated good internal consistency, test-retest reliability, and convergent and discriminant validity with a variety of diverse samples (e.g., Connor-Smith & Calveta, 2003; Connor-Smith et al., 2000; Wadsworth, Rieckmann, Benson, & Compas, 2004). In the current study, only primary and secondary control coping were examined. Internal consistency for primary control coping was .69 for parent report of child and .88 for child self-report; internal consistency for secondary control coping was .89 for parent report of child and .91 for child self-report.

Linguistic complexity. Parent linguistic complexity was measured by the mean length of utterance in words; i.e., the average number of words across all parent utterances. An utterance was defined as a unit of speech with sufficient semantic and syntactic content to stand alone (McLaughlin, Schutz, & White, 1980). Mean length of utterance is a commonly used measure of syntactic complexity, and has been used to measure linguistic complexity of adults' communication with children of different ages (e.g., Snow 1972).

Overall Intellectual Functioning. Children's verbal and non-verbal intelligence was measured using the Vocabulary and Block Design subtests of the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV; Wechsler, 2003). On the Vocabulary subtest, children must define words. On the Block Design subtest, children are presented

with a two dimensional picture and must recreate the picture using three dimensional blocks under a certain time limit. These subtests have a mean score of 10, with a standard deviation of 3, in the general population. These two subtests have been shown to correlate with general intelligence (r's > .60) as measured by full scale IQ (Wechsler, 2003).

Executive Functioning. Children's executive function was assessed using the Working Memory Index (WMI) of the WISC-IV. Standard scores for this index have a mean of 100 and a standard deviation of 20 for the US population. This index is composed of the Digit Span and Letter-Number Sequencing subtests, which require short-term and working memory abilities. On the Digit Span subtest, children are told a string of digits (e.g., 1-5-8-9-2) by the examiner and must repeat them, first in the same order (1-5-8-9-2), and then backwards (2-9-8-5-1). These subtests also have a mean score of 10, with a standard deviation of 3. Test-retest reliability and internal consistency for both subtests are high.

Children's executive function was also assessed using several subtests of the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001). The D-KEFS is a neuropsychological test battery comprised of nine stand-alone tests that comprehensively assess components of executive function. Since its publication in 2001, the D-KEFS has been used extensively in developmental neuropsychology research as a measure of executive function. The D-KEFS battery was standardized on 1,750 individuals ages 8-89 with demographic characteristics based on the U.S. Census data (Delis et. al, 2001). Each subtest measures one or more aspects of executive function and can be administered individually or as part of a battery with other subtests. Scaled subtest scores have a mean of 10 and a standard deviation of 3, and norms are age-

adjusted. The subtests used in the current study were the D-KEFS Trail Making: Letter-Number Sequencing, D-KEFS Sorting, and D-KEFS Color-Word Interference: Inhibition subtests. These tests have adequate test-retest reliability (ranging of .49 for Sorting to .78 for Trail Making) and internal consistency (ranging from .43-.84) for ages 8-19. The D-KEFS Trail-Making Test: Letter-Number Sequencing condition is a measure of attentional shift that requires the participant to draw a line to connect letters and numbers in order, but alternating between letter and number (e.g. A-1-B-2-C-3 etc). The D-KEFS Sorting Test is a measure of cognitive flexibility that requires the participant to place 6 cards (each with a word printed on them) into 2 categories of 3 cards each. The cards can be categorized based on perceptual features (color, shape, etc.) or verbal/semantic features (i.e., the words on the cards. The D-KEFS Color-word Interference: Inhibition subtest is a measure of cognitive inhibition similar to the Stroop test. Participants must name the ink color of page of words, in which names of colors (e.g., "red," "green") are printed in incongruous colors of ink; therefore, naming the ink colors requires inhibiting the pre-potent response of reading the word.

Parents completed the Behavioral Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy & Kenworthy, 2000). The BRIEF measures executive functioning abilities in several domains, including working memory, shift, and inhibition, as well as monitor, emotional control, and organization of materials. The items reflect how weaknesses in these domains might cause problems in everyday situations, such as difficulty staying on task to complete homework or chores (the Working Memory subscale), difficulty accepting changes in routines (the Shift subscale), and lacking awareness of one's effect on others (the Monitor subscale). Higher scores on the BRIEF

indicate more problems. The BRIEF has been tested for internal consistency (.80-.98) and test-retest reliability (r = .82), and has convergent validity with other measures of executive function (Gioia et al., 2000). In the current study, internal consistencies for the index and composite scores on the BRIEF were acceptable (.80-.91).

Procedure

The Institutional Review Boards approved the study protocol. Families were compensated $50 for completing the questionnaire and observation studies, and $15 for completing the cognitive assessment study. Children also received a $30 gift card for completing the observation study and a $10 gift card for completing the cognitive assessment study. Families were identified from the cancer registry at a hospital in the Southern United States. Parents were approached in the clinic or hospital by a member of the research team to introduce the questionnaire study and determine interest in participating. If interested, parents completed an informed consent form, and children completed an assent form. Questionnaire packets were given to participants to complete at the hospital or in the home.

After completing the questionnaire study, families were approached about enrolling in the observation study, which consisted of being videotaped while the parent and child had a conversation about the child's cancer (see Study 1 for more information about the procedure of the observation study).

After either completing or declining participation in the observation study, eligible families were recruited for the cognitive assessment study. The assessment study typically took place in an outpatient clinic room or the child's inpatient room, and lasted

from 1.5 to 2 hours. The parent who had completed the questionnaire study (and the observation study when applicable) was asked to complete the BRIEF questionnaire while the child was doing testing.

Data Analysis

*Hypothesis 1***:** Children's executive functioning will be associated with children's coping and emotional distress after a diagnosis of cancer. Specifically, better executive function will be positively correlated with higher levels of primary/secondary control coping and lower levels of adjustment problems. Furthermore, coping will account for significant variance in the relationship between children's executive function and emotional distress. Raw scores on the WISC-IV, DKEFS, BRIEF, CBCL, and YSR were used, due to the greater precision of measurement and the lack of scaled scores for the full sample. Ratio scores from the RSQ were used. Composite scores of child executive function were also computed by converting raw scores to z-scores and summing the z-scores for each test. A working memory composite score was created using scores from the WISC-IV Digit Span and Letter-Number Sequencing subtests, the D-KEFS Trail Making: Number-Letter Switching subtest, and the BRIEF Working Memory subscale. An inhibitory control composite score was created using scores from the D-KEFS Color-Word Interference: Inhibition subtest and the BRIEF Inhibit subscale. A cognitive flexibility composite score was created using scores from the D-KEFS Sorting test and the BRIEF Shift subscale. Pearson correlations were calculated using both raw scores and composites scores.

Hypothesis 2: Children's executive function will be related to parents' communication during observed parent-child interactions. Specifically, greater linguistic complexity in the parents' communication will be positively correlated with better executive functioning. Raw and composite scores were used for children's executive function (see data analyses for Hypothesis 1). Parent linguistic complexity was measured by parents' mean length of utterance (MLU) during the parent-child interaction. Pearson correlations were used to examine the relationship between children's executive function and parents' linguistic complexity.

Hypothesis 3: The "match" between children's executive function and parents' linguistic complexity will be associated with children's cancer-related coping and adjustment. The "match" is specifically defined as the difference between children's executive function and parents' linguistic complexity, when parents' linguistic complexity and children's executive function are converted to standard scores (i.e., z-scores). Smaller difference scores will be positively related to more secondary control coping and fewer adjustment problems. This hypothesis and related analyses were examined in four steps:

1. Raw scores on children's executive function tests were converted to z-scores and summed to create composite scores of children's executive function. Two composite scores were created: a testing composite score, created by averaging the z-scores of the raw scores on all subtests of the WISC-IV and DKEFS, and a BRIEF composite score, creating by using the z-score of the BRIEF Global Executive Composite raw score.

2. The difference between these composite scores and parents' linguistic complexity composite score was calculated. Children's executive function composite scores were subtracted from the parent linguistic complexity z-score, creating a difference score. Difference scores ranged from negative to positive values, with a score of 0 indicating an exact match between children's executive function and parents' linguistic complexity. Negative difference scores (scores below 0) indicate that parents' linguistic complexity scores are lower than their children's executive function abilities, and that parents are "undershooting" their children's cognitive abilities. Positive difference scores (scores above 0) indicate that parents' linguistic complexity scores are higher than their children's executive function abilities, and that parents are "overshooting" their children's cognitive abilities.
3. The distributions of the difference scores were examined to determine if they approximated a normal distribution. Skewness and kurtosis were calculated and described for the distributions. Skewness indicates if most of the difference scores are concentrated close to or at 0 or tend toward a negative or positive value. The Standardized Skew Index ($SSI = Skew/2SD^2$; Malgady, 2007) was used to interpret the skewness; a negative SSI value indicates that most difference scores are above 0; a positive SSI value will indicate that most difference scores are below 0. Kurtosis indicates the "flatness" of the distribution; raw scores above 0 indicate a curve that is "sharper" than a perfectly normal distribution and that difference scores are clustered closer to the mean of 0.

4. Pearson correlations were conducted between these difference scores and measures of children's primary and secondary control coping and adjustment. A negative correlation with coping (and a positive correlation with adjustment problems) indicates that as difference scores become greater (i.e., move from negative to positive values) and parents use more complex language, there are worse outcomes for children's coping and adjustment.

Statistical Power

The study enrolled and completed the questionnaire and cognitive assessment studies on 37 participants. This yielded a sample of 37 parents who completed reports of their children and 19 children who completed self-reports. Furthermore, 31 families completed all three studies (i.e., the questionnaire, cognitive assessment, and observations studies). With a sample of 37, power was .80 to detect correlations of .40 or greater with .05 significance. With a sample of 19, power was .80 to detect correlations of .54 or greater with .05 significance. With a sample of 31, power was .80 to detect correlations of .43 or greater with .05 significance. Thus, these analyses were relatively underpowered for testing most of the hypotheses.

Results

Preliminary Descriptive Analyses

Mean standard scores/scaled scores/*T*-scores on the WISC-IV, D-KEFS, and BRIEF are presented in Table 6. Scores were in the average range compared to

established norms; scaled scores ranged from 8.1 (DKEFS Trail-Making Condition 4: Letter Number Sequencing) to 11.4 (WISC-IV Letter Number Sequencing). Mean *T*-scores on the BRIEF were in the non-clinical range and ranged from 51.4 (Inhibit subscale) to 54.8 (Initiate subscale). Mean *T*-scores on the CBCL and YSR were in the non-clinical range and ranged from 47.5 (CBCL Externalizing Problems) to 54.1 (CBCL Internalizing Problems). The clinical cutoff for the Internalizing and Externalizing Problems scales is a *T*-score > 63, and nationally normed data indicate that 10 percent of children have scores above this cutoff. Notably, 30% of children had scores above this cutoff on the CBCL Internalizing Problems scale, although percentages above the cutoff for the CBCL Externalizing Problems scale and the YSR Internalizing and Externalizing Problems scales were consistent with national norms. These results indicate that three times as many children were above the clinical cutoff for internalizing problems in the current sample compared to national norms, as rated by their parents. Ratio scores for the parent report of child RSQ and child self-report RSQ are also included in Table 7. Results indicate that on average, 18% of children's responses to stress involved primary control coping and 28-29% of their responses involved secondary control coping according to both parent and child report. Parents' mean length of utterance (MLU) was 8.7 words per utterance (*SD* = 1.9; range 5.8 – 13.2).

Preliminary Correlational Analyses Between Executive Function Measures

Table 7 presents correlations among WISC-IV, DKEFS, and BRIEF raw scores. Results indicate that correlations among children's scores on the WISC-IV and DKEFS were all positive, significant (all *p*'s < .01), and medium to large in size (correlations

Table 6. Means and Standard Deviations of Children's Cognitive Functioning, Distress, and Coping.

	Raw Scores M (SD)	Scaled/Standard/T-scores Mean (SD)
WISC-IV		
WISC-IV Vocabulary	37.8 (12.6)	9.9 (3.2)
WISC-IV Block Design	36.7 (15.1)	9.9 (3.4)
WISC-IV Digit Span	15.4 (3.5)	9.3 (2.54)
WISC-IV Letter-Number Sequencing	18.7 (2.9)	11.4 (2.03)
WISC-IV WMI		101.2 (11.5)
DKEFS		
D-KEFS Color-Word Interference Condition 3: Inhibition	70.4 (20.2)	10.5 (2.7)
D-KEFS Trail-Making Condition 4: Letter Number Sequencing	114.5 (53.6)	8.1 (4.0)
D-KEFS Sorting: Confirmed Correct Sorts	9.5 (3.2)	10.4 (2.5)
BRIEF		
BRIEF Inhibit	14.5 (3.9)	51.4 (10.1)
BRIEF Shift	12.5 (3.3)	53.2 (11.1)
BRIEF Emotional Control	17.4 (4.9)	54.8 (11.6)
BRIEF Behavioral Regulation Index	44.4 (10.2)	53.8 (10.7)
BRIEF Initiate	14.0 (3.2)	54.5 (10.0)
BRIEF Working Memory	16.2 (4.0)	53.2 (10.0)
BRIEF Plan/Organize	19.5 (5.2)	51.6 (11.3)
BRIEF Organization of Materials	12.1 (3.0)	52.9 (8.8)
BRIEF Monitor	13.9 (3.6)	51.9 (11.8)
BRIEF Metacognition Index	75.7 (16.1)	53.3 (10.8)
BRIEF Global Executive Composite	120.1 (24.8)	53.7 (10.5)

Table 6, continued.

	Raw Scores M (SD)	Scaled/Standard/T-scores Mean (SD)
CBCL/YSR		
CBCL Anxious-Depressed	4.9 (9.5)	52.1 (13.7)
CBCL Internalizing	11.3 (11.8)	54.1 (14.5)
CBCL Externalizing	7.6 (13.2)	47.5 (13.3)
YSR Anxious-Depressed	3.3 (3.5)	52.9 (5.0)
YSR Internalizing	9.7 (9.5)	49.4 (11.4)
YSR Externalizing	6.9 (8.4)	44.6 (11.2)
RSQ		
Parent CRSQ – Primary Control Ratio Score		.18 (.04)
Parent CRSQ - Secondary Control Ratio Score		.28 (.06)
CRSQ – Primary Control Ratio Score		.18 (.03)
CRSQ- Secondary Control Ratio Score		.29 (.06)

Note. WISC-IV = Wecshler Intelligence Scale for Children- 4th edition; DKEFS = Delis-Kaplan Executive Function System; BRIEF = Behavioral Rating Inventory of Executive Function; CBCL = Child Behavior Checklist; YSR = Youth Self-Report; Parent CRSQ = Parent report of child Response to Stress Questionnaire; CRSQ = Child self-report Response to Stress Questionnaire. For DKEFS, BRIEF, CBCL, and Parent CRSQ, n = 37. For WISC-IV scaled/standard scores, n = 31. For YSR and CRSQ, n = 19.

ranged from .44 to .64). In contrast, correlations among children's scores on the WISC-IV and DKEFS with parent reports on the BRIEF were in the expected direction but mostly non-significant, although there were significant negative correlations between the BRIEF Emotional Control score and the WISC-IV Digit Span (r = -.36, p = .03) and DKEFS Sorting: Confirmed Correct Sorts (r = -.35, p = .04), the BRIEF Behavioral Regulation Index and DKEFS Sorting: Confirmed Correct Sorts (r = -.35, p = .03), and the BRIEF Organization of Materials and WISC-IV Digit Span (r = -.41, p = .01). There were also several non-significant trends in the expected direction (see Table 7).

Preliminary Correlational Analyses Between Children's Coping and Adjustment

Table 8 presents correlations among children's and parents' reports of children's coping and adjustment. Cross-informant correlations between children's and parents' reports of children's adjustment were all positive and significant, with effect sizes ranging from .74 to .91. Cross-informant correlations between children's and parents' reports of children's primary and secondary control coping on the RSQ were non-significant, but in the expected direction, with small effect sizes (.30-.31).

Correlations between children's self-reported anxiety/depression on the YSR and children's reports of secondary control coping were significantly negatively correlated (r = -.58, p = .01). Children's reports of internalizing problems on the YSR were negatively correlated with children's reports of primary control (r = -.42, p = .08) and secondary control (r = -.62, p = .005). Children's reports of externalizing problems on the YSR were also significantly negatively correlated with children's self-reported primary control (r = -.49, p = .03) and secondary control (r = .64, p = .003). However, correlations between

Table 7. Correlations Among Measures of Children's Executive Functioning.

	1	2	3	4	5
1. WISC Digit Span	--				
2. WISC Letter Number Sequencing	.71**	--			
3. DKEFS Color Word: Inhibition	-.49**	.47**	--		
4. DKEFS Trail-Making: Letter Number Sequencing	-.44**	-.59**	.61**	--	
5. DKEFS Sorting Confirmed Correct Sorts	.57**	.64**	-.57**	-.43**	--
6. BRIEF Inhibit	-.18	-.11	.23	.14	-.27
7. BRIEF Shift	-.26	-.29+	.07	.08	-.27
8. BRIEF Emotional Control	-.36*	-.28+	.12	.18	-.35*
9. BRIEF Behavioral Regulation Index	-.31+	-.27	.16	.17	-.35*
10. BRIEF Initiate	-.13	.06	.01	.11	-.29+
11. BRIEF Working Memory	-.17	-.13	.08	.21	-.20
12. BRIEF Plan/Organize	.03	.04	-.26	-.08	-.10
13. BRIEF Organization of Materials	-.41*	-.30+	.11	.14	-.30
14. BRIEF Monitor	-.18	-.06	.09	.11	-.27
15. BRIEF Metacognition Index	-.17	-.10	-.02	.10	-.25
16. BRIEF Global Executive Composite	-.24	-.17	.05	.13	-.31+

Note. $+p < .10$; $*p < .05$; $**p < .01$.

Table 8. Correlations Among Parents' and Children's Reports of Children's Adjustment and Coping.

	1	2	3	4	5	6	7	8	9
1. CBCL Anxious-Depressed	--								
2. CBCL Internalizing	.90**	--							
3. CBCL Externalizing	.90**	.89**	--						
4. YSR Anxious-Depressed	.83**	.83**	.84**	--					
5. YSR Internalizing	.84**	.82**	.85**	.91**	--				
6. YSR Externalizing	.80**	.74**	.85**	.79**	.91**	--			
7. Parent CRSQ Primary Control	-.16	-.25	-.17	-.31	-.22	-.07	--		
8. Parent CRSQ Secondary Control	-.19	-.32+	-.20	-.24	-.13	.01	.23	--	
9. CRSQ Primary Control	-.41+	-.34	-.40	-.22	-.42+	-.49*	.30	.00	--
10. CRSQ Secondary Control	-.70**	-.64**	-.70**	-.58*	-.62**	-.64**	.35	.31	.62**

Note. +$p < .10$; *$p < .05$; **$p < .01$. n = 37 for parent-parent report correlations; n = 19 for parent-child report correlations.

parents' reports of children's coping and children's self-reports of adjustment on the YSR were non-significant.

Correlations between parents' reports of children's adjustment were mostly significantly correlated (or approaching significance) with children's self-reports of primary control coping and secondary control coping; however, parents' reports of adjustment were not significantly correlated with parents' reports of children's coping, although the correlation between internalizing problems and secondary control approached significance (r = -.32, p = .06).

Correlational Analyses Between Children's Executive Function and Children's Coping

Hypothesis 1 predicted that children's executive functioning would be positively correlated with children's coping and adjustment. Results indicated that correlations between children's executive functioning as measured by the testing data and children's coping and adjustment were generally non-significant, although a positive correlation was found between parents' reports of secondary control coping and the DKEFS Sorting: Confirmed Correct Sorts raw score (r = .37, p = .02).

However, correlations between children's executive functioning as measured by parent report on the BRIEF were significantly correlated with children's secondary control coping according to both child and parent reports (see Table 6). Parents' reports on the BRIEF were also significantly correlated with parents' reports of children's adjustment in most cases, and some correlations between parents' reports on the BRIEF and children's self-reports of adjustment were also significant (see Table 9). Executive function composite scores using both testing data and BRIEF scores were created, but

were not found to be significantly related to children's coping and adjustment, possibly due to the lack of significant correlations between children's testing data and children's coping and adjustment.

Linear regression analyses were conducted to determine if coping accounted for some or all of the association between children's executive function and adjustment, using parents' reports on the BRIEF (the Global Executive Composite raw score), children's self-reported secondary control coping, and parents' reports on the CBCL (Internalizing and Externalizing Problems raw scores). However, when using the Internalizing Problems subscale with the subsample of parents whose children also completed the RSQ, the variance in internalizing problems accounted for by executive function on the BRIEF was non-significant (β = -.35, p = .16) even before including coping in the regression equation, due to the decreased sample size. Furthermore, when including secondary control coping in the equation, coping was the only uniquely significant predictor of internalizing problems (β= -.65, p = .02). In contrast, regression analyses indicated that for Externalizing Problems subscale on the CBCL, the variance in externalizing problems accounted for by executive function on the BRIEF remained marginally significant even with the subsample of children (β = .41, p = .09) before including coping; however, when including secondary control coping in the equation, coping became the only significant predictor of externalizing problems (β = -.68, p = .009).

Table 9. Correlations Among Parents' Reports of Children's Executive Functioning and Children's Coping and Adjustment.

	Parent CRSQ Primary	Parent CRSQ Secondary	CRSQ Primary	CRSQ Secondary	CBCL Anx-Dep	CBCL Int	CBCL Ext	YSR Anx-Dep	YSR Int	YSR Ext
BRIEF Inhibit	-.03	-.04	-.15	-.34	.18	.26	.40*	.44+	.36	.36
BRIEF Shift	-.19	-.36*	-.25	-.50*	.22	.33+	.33+	.38	.22	.14
BRIEF Emotional Control	.03	-.43**	.01	-.45+	.29+	.39*	.40*	.44+	.26	.25
BRIEF Behavioral Regulation Index	-.06	-.33*	-.13	-.49*	.27	.39*	.44**	.49*	.32	.29
BRIEF Initiate	-.19	-.46**	-.19	-.45+	.15	.36*	.31+	.19	.12	.04
BRIEF Working Memory	-.06	-.30+	-.19	-.28	.20	.36*	.37*	.26	.20	.10
BRIEF Plan/Organize	-.17	-.34*	-.43+	-.62**	.32+	.42*	.45**	.39	.40+	.28
BRIEF Organization of Materials	-.12	-.40*	-.24	-.35	.12	.35*	.31+	.18	.15	.04
BRIEF Monitor	-.01	-.18	-.27	-.58**	.31+	.40*	.46**	.60**	.50*	.39
BRIEF Metacognition Index	-.13	-.39*	-.33	-.55*	.27	.44**	.46**	.39	.35	.22
BRIEF Global Executive Composite	-.11	-.39*	-.27	-.56*	.29+	.45**	.48**	.45+	.36	.26

Note. +$p < .10$; *$p < .05$; **$p < .01$. . n = 37 for parent-parent report correlations; n = 19 for parent-child report correlations.

Correlational Analyses Between Parents' Language and Children's Executive Function, Coping, and Adjustment

Hypothesis 2 predicted that children's executive functioning would be positively correlated with parents' linguistic complexity (measured by MLU) during the observed parent-child interaction. Results indicated that correlations between children's executive functioning as measured by the testing data and parents' linguistic complexity were non-significant. Results also indicated that correlations between children's executive functioning as measured by parent report on the BRIEF were correlated in the opposite direction than expected, with higher parental linguistic complexity related to poorer executive functioning on the BRIEF. Exploratory analyses also indicated that parents' linguistic complexity was not significantly correlated with children's coping and adjustment. Additionally, no significant results were found using composite scores of children's testing data and parents' BRIEF scores.

The Match Score: Difference Scores Between Parents' Language and Children's Executive Function

As described above, the match score was calculated by transforming all raw scores of executive function on the WISC-IV, DKEFS, and BRIEF, into z-scores. These z-scores were then subtracted from the z-score of the parents' MLU scores to create the match scores. Two match scores were created: the testing-composite match score (by using the average z-score of WISC-IV and DKEFS scores) and the BRIEF match score (by using the z-score of BRIEF global executive composite). Positive scores indicate that parents are "overshooting," or using language that may be too complex for their

children's executive functioning abilities, while negative scores indicate that parents are "undershooting," or using language that may less complex than is suitable for their children's executive functioning abilities. Scores of zero indicate an exact match between parents' linguistic complexity and children's executive functioning abilities. Means, standard deviations, skewness and kurtosis values for each of the match scores are presented in Table 10. The testing match score distribution had a Standard Skewness Index (SSI) of -.20, indicating that the distribution was negatively skewed and most testing match scores were above zero. The BRIEF match score had an SSI of .23, indicating that the distribution was positively skewed and most testing match scores were below zero. Kurtosis values for both distributions were between -3 and 3, which indicates the data was acceptable to be analyzed (Maxwell & Delaney, 2004).

Correlations Between the Match Score and Children's Coping and Adjustment

Table 10 also presents the correlations between the match scores and children's coping and adjustment. Results indicated that the testing match score was not significantly correlated with measures of children's coping or adjustment, although there was a trend for a negative correlation with parents' reports of children's secondary control coping (r = -.34, p = .06). In contrast, the BRIEF match score was negatively correlated with children's self-reports of secondary control coping (r = -.50, p = .04), and parents' reports of children's secondary control coping (r = -.35, p = .05), and positively correlated with parents' reports of children's anxiety-depression problems (r = .37, p = .04), internalizing problems (r = .49, p = .006), and externalizing problems (r = .65, p < .001). That is, higher scores on the BRIEF match, indicating that parents "overshot" their

Table 10. Means, Standard Deviations, Skewness, and Kurtosis of Match Score Distributions and Correlations Between Match Scores and Children's Coping and Adjustment.

	Testing Match Score	BRIEF Match Score
Mean (SD)	-0.18 (1.6)	0.01 (1.7)
SSI (Skew)	-0.20 (-1.0)	.23 (1.3)
Kurtosis	1.7	1.1
Correlations		
CRSQ Primary Control	.00	.13
CRSQ Secondary Control	-.20	-.50*
Parent CRSQ Primary Control	-.03	-.18
Parent CRSQ Secondary Control	-.34+	-.35+
YSR Anxious-Depressed	.16	.35
YSR Internalizing	.11	.02
YSR Externalizing	.20	.00
CBCL Anxious-Depressed	.11	.37*
CBCL Internalizing	.21	.49**
CBCL Externalizing	.04	.64**

Note. +$p < .10$; *$p < .05$; **$p < .01$. SSI = Standard Skewness Index. n = 30 for parent report correlations; n = 17 for child report correlations.

children's executive functioning abilities, were correlated with less adaptive coping and higher levels of emotional and behavioral problems.

Summary of findings

The results of this study provide support for Hypotheses 1 and 3. Specifically, as hypothesized, children's executive functioning problems as measured by parent report were negatively correlated with more secondary control coping and better adjustment. Furthermore, when examining the match between parents' linguistic complexity and children's executive functioning, results suggested that parents who "overshot" their children's level of executive functioning by using language that was too complex had children who used less secondary control coping and had poorer adjustment. However, the results did not provide support for the hypothesis that parents' linguistic complexity would be positively associated with children's executive functioning.

CHAPTER IV

DISCUSSION

The studies presented here examined the relationships between parent-child communication, children's executive function, children's coping, and children's adjustment to cancer. In Study 1, mother-child communication about cancer was coded using both micro- and macro-levels of analysis, in order to examine the associations between mothers' conversational discourse, and mothers' and children's patterns of emotion and behavior during the interaction. Prior to this study, little research in pediatric or clinical psychology had examined parent-child communication at a micro-level of analysis. In Study 2, children's executive function was examined in relation to their coping and adjustment, as well as their parents' linguistic complexity when communicating about cancer. Previous research with both clinical and non-clinical populations has indicated that deficits in executive functioning may be associated with poorer coping and more adjustment problems. The results of these studies are especially relevant to a pediatric cancer population, due to these children's increased risk for executive functioning deficits from treatment late effects (Campbell et al., 2007) and the limited empirical research on how parents can effectively communicate with their children about cancer.

The focus of Study 1 was on mother-child interactions during a conversation about cancer. The recommendation by the National Cancer Institute that parents communicate openly and honestly with their children about cancer suggests that it may be important to

examine both macro- and micro-level aspects of parent-child communication. However, pediatric cancer research has focused on macro-level aspects of communication (e.g., Dunn et al., 2011). The results from Study 1 present some of the first data using a micro-level analysis of mother-child communication about illness, as well as the associations between micro- and macro-level analyses of mother-child communication. Significant findings include the correlations between children's age and several types of maternal responses. Specifically, mothers used more reflections, solicits, and imperatives with younger children, and more disclosures and provisions of information with older children. Mothers' MLU was also significantly negatively correlated with reflections, solicits, and imperatives, and positively correlated with disclosures, although these correlations became non-significant when controlling for children's age. The results suggest that children's age, and possibly children's cognitive and emotional level of development, may influence how mothers choose to respond to their children when talking about cancer.

In addition, the correlations between mothers' conversational responses and ratings of mothers' global emotions and behaviors during the interaction provide insight into how conversation management and discourse is related to patterns of dyadic interaction and parenting. The results showed that greater use of reflections, expansions, and validations were correlated with higher levels of positive dyadic and parenting behaviors (e.g., listener responsiveness and child-centeredness), and lower levels of negative maternal behaviors (e.g., neglect/distancing and hostility). In contrast, mothers' use of reframes and imperatives was associated with negative patterns of maternal behavior, such as lower positive mood, listener responsiveness, and child-centeredness, and higher

hostility, neglect/distancing, and inconsistent discipline. Interestingly, solicits and disclosures showed opposite patterns of associations with mothers' global behaviors and emotions: solicits occurred more often with higher levels of inconsistent discipline and lower anxiety, while disclosures occurred more often with higher levels of anxiety and lower inconsistent discipline. This may suggest that mothers who were focused on their own emotions (e.g., anxiety) were less concerned with their children's behaviors during the task, as the inconsistent discipline code requires parents to set a standard for their children's behavior and then inconsistently enforce it. However, increased maternal disclosures and less attention towards children's behavior is not necessarily maladaptive during a conversation about a highly emotional topic such as cancer.

There were also several significant correlations between mothers' conversational responses and children's global emotions and behaviors. The results indicate that mothers' use of reframes was associated with lower child positive mood and listener responsiveness, and higher hostility. Further, mothers' use of imperatives was associated with higher child hostility and lower listener responsiveness. In contrast, maternal disclosures were related to higher child listener responsiveness and positive mood, as well as higher child anxiety, suggesting that maternal disclosures may encourage children to attend more to the conversation and express their own emotions (both positive and negative).

The correlations between mothers' contingent responses, and mothers' and children's global emotions and behaviors, suggest a theoretical model of parental contingency in which certain types of communicative responses are characteristic of certain behavioral and parenting styles. Mothers' reframes and imperatives accompany

negative maternal behaviors and emotions (e.g., more neglect/distancing and hostility, lower child-centeredness), while mothers' reflections, expansions, and validations accompany positive maternal behaviors and emotions (e.g., more listener responsiveness, child-centeredness, and positive mood, less neglect/distancing). A similar pattern for reframes and imperatives emerges for the associations between mothers' contingency codes and children's behaviors and emotions: mothers' reframes and imperatives accompany children's negative behaviors (e.g., lower listener responsiveness and higher hostility). These results suggest that, while reframing may be an adaptive secondary control coping skill, it may not be helpful to children for parents to immediately reframe what their children tell them, and that other types of parental conversational responses may better support the development of children's secondary control coping. These findings imply that micro-level analyses can provide valuable information about the types of communicative responses characteristic of global behaviors during a mother-child interaction, and that it may be helpful to teach parents *specific* types of communicative responses (e.g., reflections, expansions, and possibly disclosures), while discouraging other types of responses (e.g., reframes, imperatives) as part of an adaptive parent-child interaction style, when intervening with these families.

Study 2 focused primarily on parent-child communication and children's executive function, coping, and adjustment to cancer. These are important variables to examine in children with cancer, because they are faced with significant disease-related stress (Rodriguez et al., 2011) and are at increased risk for executive function deficits due to the late effects of their cancer treatment (Campbell et al., 2007). Only one other study has examined these associations in a pediatric cancer population (Campbell et al., 2009). The

current study extended this line of research by measuring executive function in children with cancer using testing data and parent report data, and examining the associations between executive function and parent and child reports of children's coping and adjustment. It was hypothesized that better executive function would be positively correlated with more primary and secondary control coping and better adjustment, and that coping would account for the variance between executive function and adjustment. The results indicate that, as expected, parent reports of executive function problems were significantly negatively correlated with children's secondary control coping (using both parent and child reports) and children's adjustment problems (using parent report). Furthermore, the regression analyses indicate that the relationship between parent reports of executive function and children's externalizing problems were significantly accounted for by secondary control coping. However, testing data from the WISC-IV and the D-KEFS measuring children's executive function was not significantly correlated with coping or adjustment, nor was it correlated with parent reports of executive function problems on the BRIEF. Although caution must be used in interpreting null findings with a small sample, the lack of findings may be due to the relative lack of deficits in executive function in the current sample.

Previous research that found an association between executive function and coping or adjustment has focused on populations with executive function deficits, such as survivors of pediatric cancer with neurocognitive late effects (e.g., Campbell et al., 2009) and children with working memory deficits (e.g., Alloway et al., 2009). The children in the current study performed in the average range on all testing measures of executive function, and did not show evidence of deficits. The lack of deficits is likely due to the

timing of the assessment (just under one year from time since diagnosis, when most children were still on active treatment); deficits in this population are more likely to occur several years after treatment ends. It may be that the relationship between coping and executive function is moderated by the actual level of executive function, and emerges only when executive function deficits are present. In contrast, the current findings regarding the significant negative correlation between executive function problems on the BRIEF and children's coping and adjustment may be due to the fact that the BRIEF measures executive function problems across a longer timeframe (vs. a single moment in time) and that most questions on the BRIEF ask about how executive function problems impact daily living skills. This suggests that the BRIEF may be measuring a construct closer to adjustment or emotion regulation problems (i.e., executive function problems in the "real world") than a pure index of cognitive functioning such as the WISC-IV or D-KEFS. Notably, this possibility is supported by data from the current study showing positive correlations between problems on the BRIEF and parents' reports of children's internalizing and externalizing problems on the CBCL (see Table 9).

Study 2 also examined how one specific aspect of parent-child communication (linguistic complexity) was related to children's adjustment. Study 2 examined communication at a micro-level of analysis, using parents' mean length of utterance as a measure of linguistic complexity. In the current study, it was predicted that parents' linguistic complexity would be positively associated with children's executive functioning. However, correlational analyses indicated that there was no significant association between parents' linguistic complexity and children's executive function using the cognitive testing data, and that the correlation between parents' linguistic

complexity and children's executive function as reported on the BRIEF was not in the expected direction, such that more executive function *problems* were positively correlated with higher parent MLU. Again, this finding could be due to the possibility that the BRIEF measures a construct closer to adjustment or emotion regulation problems than pure executive functioning deficits. Therefore, the positive correlation between parents' MLU and children's executive function problems could suggest that children with more executive function problems may have parents who are less able to regulate their own communication with their children, and as a consequence use language that is overly complex for their child's level of cognitive development.

The current study also specifically examined the "match" between children's executive function and parents' linguistic complexity while talking about cancer with their child, and how this match was related to children's adjustment. "Match" scores were calculated using the z-scores of two executive function composites (a testing composite and the BRIEF Executive Global Composite). Analyses indicated that, when using the BRIEF composite, parents typically matched their children's executive functioning abilities and difference scores were on average close to zero. Furthermore, correlational analyses demonstrated that there was a negative linear relationship between difference scores and secondary control coping, and positive linear relationships between difference scores and internalizing and externalizing problems. These findings suggest that parents with smaller difference scores who "undershot" their children's executive function, had children who used more secondary control coping and had fewer internalizing and externalizing problems. These results are also consistent with the unexpected finding that higher parental linguistic complexity is associated with less

secondary control coping and poorer adjustment outcomes. The findings suggest that children with more executive function problems and adjustment difficulties may be doubly at risk because their parents communicate less effectively with them. The results also suggest that it may be better for parents to "undershoot" with the complexity of their language when talking with their children, especially when it comes to a complex and emotionally-charged topic such as cancer.

A limitation of the Study 2 is the small sample, which decreased the ability to detect smaller statistically significant effects. Acceptability and feasibility data indicated that fifty-five percent of eligible families completed the cognitive assessment study, suggesting that a sizable minority of families did not find participation acceptable. Another limitation is that longitudinal data was not used in the analyses, making it impossible to determine the true direction of the relationships between executive function, coping, and adjustment. Nevertheless, Study 2 provides some of the first data on the associations between executive functioning, coping, adjustment, and parent-child communication in children currently being treated for cancer. The study utilized cross-informant data on children's coping and adjustment, multiple measures of children's executive function, and observational data on parent-child communication. The multiple methods, measures, and informants provide evidence that some of the findings are less likely to be due to method variance.

Taken together, the results of the Study 2 suggest that executive functioning deficits/problems in children with cancer may be a risk factor for less adaptive coping (i.e., using less secondary control coping) and adjustment problems in these children. In addition, the results suggest that parents' use of more complex language during parent-

child communication about cancer is also associated with executive function problems, and that parents who "overshoot" with their language have children who show less secondary control coping and more adjustment problems. As with Study 1, these findings provide initial information about who and what to target for clinical interventions with these families. For example, children with executive function deficits that impact their daily living skills and emotion regulation may be at increased risk for adjustment problems, and interventions designed to teach secondary control coping may improve adjustment outcomes in these children. Similarly, parents may be taught specific strategies to improve communication with their children (e.g., "keep it short and simple").

The findings of the current studies suggest several directions for future research. These results represent an important first step in linking micro-level analyses of parent-child communication with global measures of parents' and children's behavior, and children's executive functioning, coping, and adjustment. Future research should examine the structure of parents' conversational responses, in order to better understand the constructs underlying the organization of these types of responses and why these responses may be related to emotions and behaviors. Furthermore, research on the development of coping would benefit from examining how certain parental conversational responses (e.g., reframes, disclosures) may be related to parents' and children's coping strategies (e.g., cognitive restructuring, emotional expression). This would provide much needed information about how coping develops and the potential role of parent-child interaction processes in the development of children's coping. In addition, further research is needed on the relationship between executive function and

coping, and how this relationship may differ based on the level of executive functioning deficits. It is possible that children's coping is most affected by executive functioning when children have measureable deficits in executive function. When children have intact executive functioning, it is possible that other factors, such as parent-child processes, have a greater effect on children's coping and adjustment.

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