

Children Coping with Cancer:
Associations with Stress Reactivity, Age and Gender

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Abstract

The present study focuses on how gender, age, and stress reactivity are associated with the ways that children cope with cancer. The sample consisted of 336 families; parents and children completed questionnaires near the time of the child's cancer diagnosis. Bivariate correlations, independent samples t-tests and linear multiple regression analyses were performed. The results showed that stress reactivity, but not age or gender, was associated with the type of coping a child used. Children who reported less reactivity to stress used more primary control and secondary control coping, while children who were more stress reactive used more disengagement coping.

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In the United States, cancer is the second most common cause of death in children under 15 years of age (Siegel, Miller & Jemal, 2018). According to the American Cancer Society (2016), childhood cancer rates have been rising slightly for the past few decades. This has been slowly increasing by a rate of about 0.6% every year since 1975 (Siegel, Miller & Jemal, 2018). Siegel, Miller and Jemal (2018) state that, approximately 10,590 children (birth to 14 years old) will be diagnosed with cancer and 1,180 will die from the disease each year. Cancer is not only a physical illness but it can also have major impacts on the mental health of those who are diagnosed with the disease. For example, Stuber et al. (2010) showed that about 9% of the adults who were survivors of childhood cancer developed posttraumatic stress disorder (PTSD). Side effects caused by the treatment could include hair loss, not being able to attend school, bones not forming properly, cognitive impacts and numerous other potential issues.

Leukemia, lymphoma, and brain tumors are among the most common for both children and adolescents. For example, leukemia accounts for 29% of childhood cancers and 13% of adolescent cancers. Survival ratings vary a great deal depending on the type of cancer the child has. For all cancers, 5-year relative survival rates have improved greatly over the last 30 years due to early diagnosis, better treatment, overall management of these diseases, and more. Since the mid-1970s these rates have changed from about 58% to 83% in children and from 68% to 84% in adolescents (Siegel, Miller & Jemal, 2018).

Even if one is fortunate enough to survive pediatric cancer, due to the current methods of treatment, the impacts can continue on throughout a child's life. Pediatric cancer disturbs many other aspects of health due to the intensity and duration of existing treatments. Currently,

childhood cancer is commonly treated using chemotherapy, surgery and radiation. Pediatric cancer survivors are more likely to get cancer a second time and to have other adverse health impacts caused by the disease (Hudson et al., 2013; Mertens et al., 2008). As the number of children diagnosed with cancer increases, it is important to explore the factors that are associated with better vs. worse mental health among children with cancer. There are many factors that may impact a child's ability to cope with cancer; this study primarily focuses on the relationships between age, gender, stress reactivity, and coping.

Coping

The literature surrounding coping is vast and there are a number of different theories, concepts, and definitions used to understand it, however, there are consistent themes and features among these approaches (Compas et al., 2017). Coping is defined as “conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstance” (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001). There are several ways in which a person can cope with a stressor. The quality of a person's coping, including children with cancer, depends on the affect the strategy they have chosen has on the desired outcome (Aldridge & Roesch, 2007). Coping has been broken down into many different categories or types throughout the history of research. Folkman and Lazarus (1980, 1985; Lazarus & Folkman, 1984) broke coping down into two categories: Emotion-focused and problem-focused. Emotion-focused coping is when one focuses on alleviating stress, problem-focused coping is when one focuses on altering the source of stress. In some cases, such as having cancer, problem-focused coping is less effective because the situation cannot be altered. Another popular classification of coping is categorizing methods based on whether the strategy is behavioral or cognitive (Roth & Cohen, 1986). Different researchers use different

terms for these two categories but overall they stem from this overall categorization. Coping activities that are directed towards a stressor are typically termed approach, while activities that attempt to deflect a stressor are termed avoidance (Holahan & Moos, 1987; Moos & Schaefer, 1993). While most researchers accept and utilize the categories of approach and avoidance coping some feel that these categories are not mutually exclusive and they do not have clear definitions.

According to Skinner et al. (2003), coping is multidimensional and these are not good higher order categories because they do not allow for categories such as aggression to be considered. From these criticisms came more research that resulted in 12 higher-order families of coping (Skinner et al., 2003; Skinner & Zimmer-Gembeck, 2007). Each family signifies different ways of coping that serve the same adaptive roles and are functionally homogeneous. These twelve families are: problem-solving, information-seeking, helplessness, escape, self-reliance, support-seeking, delegation, social isolation, accommodation, negotiation, submission, and opposition (Zimmer-Gembeck & Skinner, 2011). In more recent research some have chosen to use a few of these families in their analysis of participants.

The following are the three scales of coping that will be utilized for analysis in this paper: primary control coping, secondary control coping and disengagement coping (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Most people tend to use different coping strategies depending on the situation (Eschenbeck, Kohlmann & Lohaus, 2007). Primary control coping involves the use of problem solving, emotional modulation and emotional expression. These skills are good in some situations. Secondary control coping includes cognitive reappraisal, acceptance, and positive thinking. Secondary control coping has been found to be the most effective way to cope with uncontrollable stressors. Compas et al. (2014) showed that

children who use secondary control coping in response to the stress of a cancer diagnosis and cancer treatments have fewer symptoms of anxiety and depression than children who use disengagement coping. Disengagement coping is the least effective of the three for coping with an uncontrollable stressor. This type of coping occurs when people choose to avoid and deny their problems. It can involve wishful thinking as well, which is when a person wishes for something different than what they have or they wish things were different than they are (Compas et al., 2001; Connor-Smith et al., 2000).

Coping and Cancer in Children and Adolescents

Receiving a cancer diagnosis is often stressful for children due to a number of reasons. These include disruption of normal functioning, psychological effects of treatment, uncertainty about disease, fears about the future, and more. For example, children who have cancer have to miss school, may not understand what is happening, are faced with the possibilities of death, might lose their hair, must endure painful and frightening treatments, etc. Even after the cancer has been cured a child or adolescent can have a hard time reintegrating into their school, community, work, and home (American Cancer Society, 2006). This is why the American Cancer Society wrote in 2006 that there was a lack of adequate psychosocial care and support for childhood cancer survivors.

Research has shown that the way in which a child copes with stress can affect their future psychopathology (Compas et al., 2017). The children in the current study were coping with the stress of having cancer. Over time chronic stress can lead to major health issues such as cardiovascular problems (Connor-Smith & Compas, 2004; Manuck, 1994). Stress causes dendrites and neurons in the brain to withdraw; this results in less connectivity in the brain (Reising et al., 2017). Adverse effects from chronic stress often impact the prefrontal cortex

(PFC), which plays an important role in executive functioning. In situations where stress is chronic the glucocorticoids released when one is stressed can cause the hippocampus to break down (Sapolsky, 2000). The hippocampus is primarily associated with memory and learning. All of this can make it more difficult for a child to employ proper coping skills. Since cancer treatment is commonly a long process, if one cannot effectively cope with their stress they may encounter health issues like the ones previously stated. However what this study is primarily concerned with is the psychological impacts of stress, specifically levels of anxiety and depression.

Compas et al. (2014) found that in children with cancer, secondary control coping was negatively correlated with symptoms of anxiety and depression, while disengagement coping was positively correlated with symptoms of anxiety and depression. This shows that children who utilize secondary control coping had less stress and anxiety but children who utilized disengagement coping had more stress and anxiety when the groups were compared. The paper states that the use of secondary control coping appears to be especially important during early phases of diagnosis and treatment.

Amongst many populations of children and adolescents who are exposed to high levels of stress, coping skills and the ability to regulate emotions has been shown as an important foundation for resilience (Compas et al., 2014; Eisenberg, Spinrad & Eggum, 2010) This suggests learning how to utilize secondary control coping strategies may protect children with cancer from emotional, behavioral, and physical problems. Typically, these skills emerge and are taught throughout the course of childhood, adolescents, and young adulthood. Scaffolding theory, according to Vygotsky (1978), is the idea that parents show a child how to do something and help them to learn how to do it. Then as the child learns, the parents slowly remove their

guidance and instruction until the child can do it on their own. When a child is born their parents cope for them and show them how to cope until one day the child is expected to cope all on their own. Power (2014) believes that parents play an important role in ensuring that their child is gradually introduced to stress. This way the parents can help their child to learn how to deal with larger amounts of stress slowly, as opposed to being overwhelmed all at once. When a child encounters an unexpected and uncontrollable stressor like cancer it may interrupt the child's process of learning how to cope.

Coping and Gender

The findings on gender and coping in children are somewhat inconsistent, mostly due to methodological differences. Baruch, Biener, and Barnett (1987) claim that progress in this area of study has been dwarfed because for many years men were more commonly studied, the variable of gender was often neglected. This is why it is important for more research to be done in this area (Roecker, Dubow, & Donaldson, 1996). It is unclear when gender differences appear in coping and how they change throughout a person's lifetime (Flannery, Vannucci, & Ohannessian, 2018). A person's gender can affect their stress reactivity, which can change how they cope with different stressors (Sontag & Graber, 2010). These differences are a result of both external and internal factors (Reay, Bignold, Ball, & Cribb, 1998). Charbonneau, Mezulis, and Hyde (2009) found that gender causes significant differences in reactivity; the paper suggests that gender differences in childhood temperament might be able to explain an adolescent's reactivity.

Compas et al. (2001) found that males tend to report using less coping mechanisms overall when compared with females. The type of coping that females tend to report using is active coping, which is an umbrella that both primary and secondary control coping fall under

(Frydenberg & Lewis, 1993; Griffith, Dubow, & Ippolito, 2000). Instead of using a tactic like avoidance, they are actively doing something to cope with the stressor. For example they may be using distraction techniques or trying to think about the situation in a more positive way. One way that females typically do this is through seeking social support (Frydenberg & Lewis, 1993; Hampel & Petermann, 2005; Patterson & McCubbin, 1987). Reay, Bignold, Ball and Cribb (1998) conducted in depth interviews with families after a child was diagnosed with cancer. Their research found that men commonly distanced themselves emotionally and were less willing to talk about their emotions or the situation, they were overly optimistic and played down the impact of the diagnosis. On the other hand, women were very emotionally expressive and engaged with the situation. This finding suggests that men utilized more disengagement coping while women engaged in more primary control coping and possibly secondary control coping.

On the other hand, Flannery, Vannucci, and Ohannessian (2018) found that men and women both use denial about the same amount and overtime its frequency of use is fairly consistent. They did, however, find further evidence to support the idea that women use more active, primary and secondary control, coping. According to their paper, between ages 15 and 19 there is the greatest difference in coping between males and females. Females use more active coping, social support seeking, planning, and venting emotions at an early age. Men's use of these coping mechanisms slowly increase overtime and by the time they are about 20 years old males use these about the same amount.

There have also been mixed results in research regarding whether men or women experience more stress. Matud (2004) found that women had higher levels of chronic stress than men did, even though there was no difference in the number of stressful life events that the men and women in the study had experienced over the last two years of their lives. While examining

the specifics of this stress in adults, Matud (2004) found that women listed family and health related stressors, while men listed finance, relationship, and work related stressors. Other research that focuses on children and adolescents has shown that girls report more interpersonal, romantic and peer stressors than boys do. When it comes to academic stressors, however, they have about the same amount of stress (Charbonneau, Mezulis & Hyde, 2009; Prinstein & Aikens, 2004; Rudolph & Hammen, 1999; Shih, Eberhart, Hammen & Brennan, 2006).

Coping and Age

Approximately 30 years ago theories about coping in children and adolescents were based on research that was done on adults (Skinner & Zimmer-Gembeck, 2007). They did not account for developmental changes that occur throughout childhood or adolescence. Conducting research on coping in children and adolescents is a relatively new concept. Overall, there is a need for more studies that examine age and coping, especially studies that look at differences in coping across childhood. There have been studies that observe how children cope at different ages but there is a lack of knowledge about how coping changes throughout development.

Skinner and Zimmer-Gembeck (2007) found that there have been two advancements that will help to form a developmental framework for coping. These are that dual process models show that there are links between development and coping and within families there is evidence of differences in coping at different ages. This second finding has helped to support the notion that as one ages their cognitive abilities strengthen and help to facilitate coping. In the article Skinner and Zimmer-Gembeck (2007) use the example of a child in a family using a behavioral method of distraction such as playing with a ball while a teenager might use a cognitive method such as meditation. This cognitive secondary control coping often emerges in late childhood (Band & Weisz, 1990).

Further research done by Zimmer-Gembeck and Skinner (2011) found that as children get older their ability to seek social-support, problem-solve and distract themselves improves; they also become better at deployment of different coping strategies. This is in part because as one gets older they learn how to be more self-reliant and how to use more cognitive strategies instead of only behavioral strategies. As children become older they learn how to use different types of coping and may use a wider spread of coping, when they are younger they may only know how to cope in one or two ways. While there are mixed results from research on distraction in children, it seems that from ages four to six there is little change in behavioral distraction, from age 6 to 12 behavioral distraction increases, and then from ages 12 to 18 there is not much change. This may be due to an increase in cognitive distraction, which is used more often as a child becomes older (Skinner & Zimmer-Gembeck, 2007).

Skinner and Zimmer-Gembeck (2007) suggest that there are no changes in problem-solving from ages 10 to 20 when the child is faced with an uncontrollable stressor or interpersonal stressor. This would mean that there would be little change in primary control coping seen in children with cancer. This paper also puts forth the idea that children of all ages, including infants, use coping mechanisms like problem-solving and distraction, it is simply the expression that changes. For example, an infant staring at a shiny object and ceasing to cry may be an early form of distraction; someone in late adolescence may attempt to think pleasing thoughts to distract him or herself.

Skinner and Zimmer-Gembeck (2007) and Zimmer-Gembeck and Skinner (2011) did not find clear results regarding the use of escape, or in other words, disengagement coping. They did, however, identify differences in the use of disengagement coping between 4 year olds and 12 year olds. Age declines in the use of disengagement coping were seen when children and

especially adolescents focused on uncontrollable stressors, like having cancer. These findings show that there is either no difference in the use of disengagement coping as one ages or the use of disengagement coping decreases. Disengagement coping was not used frequently among the participants in this study. The only exception was seen in young children, some of them used behavioral escape to cope with uncontrollable stressors or peer issues.

Coping and Stress Reactivity

There are two processes that distinguish people's response to stress, automatic and controlled responses (Compas et al., 2001). Stress reactivity is how people tend to automatically or involuntarily respond to a stressor. According to Compas et al. (2001), behaviors that occur in response to threats or challenges are automatic stress responses; these responses are theorized to be motivated by unpredictable differences in arousal, reactivity, and recovery (Connor-Smith et al., 2000). These responses can also vary depending on what the stressor is and the context in which it is presented. These behaviors are thought to be based in temperament and reflective of habituated responses to stress; they include physiological arousal, emotional arousal, intrusive thoughts, automatic biases in attention, impulsive responses, and involuntary escape behavior (Compas et al., 2001). Reactivity might make it more difficult for a person to cope with something and possibly even harder for them to learn how to cope with something. Children who are highly reactive are vulnerable to the negative impacts that stress can have on one's life.

Compas (2016) argued that child stress reactivity directly impacts a child's coping/emotion regulation. Primary and secondary control coping are considered to be positive ways to cope with stress that are adaptive, while involuntary responses to stress are considered maladaptive and automatic. This ability for a child to cope and regulate their emotions directly impacts the child's mental health. The reason that reactivity has such an impact on the ability to

cope is because it is the way that they automatically respond. As mentioned earlier, it is going to be much more difficult for someone to accept a situation and view it in a positive light if they have a natural tendency to become upset and see things in a negative way. Chang (2002) found that a person's reactivity can be just as important as the stressful event that is occurring in their life. The perception and reaction to the event changes how many psychological symptoms the research participants had. Temperament and reactivity have been closely tied. According to Skinner and Zimmer-Gembeck (2007), there is not much research that links dimensions of temperament to specific ways of coping. There is much more research to be done in the area of reactivity to see how much it affects a child's ability to cope and learn how to cope.

There are two ways this study has used to measure a child's stress reactivity: involuntary engagement and involuntary disengagement. Both of these are uncontrolled ways that a person can react to stress. Involuntary engagement responses are intrusive and unregulated thoughts; rumination and emotional arousal are examples of this. Involuntary disengagement responses are when one withdraws unintentionally from stress. For example, when some children are faced with an uncontrollable stressor like cancer they may cognitively withdraw or engage in unregulated escape behaviors (Monti, Jackson, Vannatta, 2018). Not much research has been done in the area of reactivity and coping with an illness such as cancer. What research there is, though, seems to suggest that involuntary engagement and involuntary disengagement are both related with more internalizing symptoms (Compas et al., 2006; Thomsen et al., 2002).

Past research has focused on certain variables that are being included in this study but not all of them. For example, studies in the past have observed age differences in coping but many tend to focus on the difference between young and old adults, not children. This study will expand

upon the research that has already been done, since there is not a wide breadth of it at this time and clear conclusions have not yet been drawn. There are four questions primarily being asked about these variables:

1. What type of coping is used most commonly in children who are younger versus older?
2. What type of coping is used most commonly in children who are high or low in reactivity?
3. Does a child's gender correlate with which type of coping they primarily use?

Based on previous research, which is stated above, the following hypotheses have been proposed: (a) Girls will utilize more primary and secondary control coping mechanisms than boys; (b) Children who are older will employ more primary and secondary control coping than younger children; (c) Children's primary and secondary control coping will be negatively correlated with stress reactivity (involuntary engagement and disengagement).

Methods

Participants

Overall, 336 families participated in the study; this is 87% of the eligible participants who were asked to participate. These participants were found through cancer registries at two separate hospitals. The possible participants were then invited to join this study by one of the research team members either in the hospital or clinic. The children who participated in this study were all between the ages of 5 and 18. The distribution of ages is relatively even with the most children being five (11.7%) and the least being 18 (0.9%). These children had recently been diagnosed with cancer. They were receiving treatment through the pediatric oncology division of a hospital near one of the two labs involved in the study. No children with established developmental disabilities or who were in hospice care were allowed to participate in the study.

Whether the cancer was a new diagnosis or relapse did not matter. Father's responses were excluded from the present analysis because of how few participated at T1 (n = 170).

The parents' races were White/Caucasian (81.2%), Black/African American (9.1%), Asian American (0.9%), American Indian/Native Alaskan (0.3%), other (3.2%), and 5.3% chose not to respond. There was greater participation of mothers (n = 320) than fathers (n = 170). The average age of the mothers in the study was 37.7 years old. Parental income levels varied, with 27% earning \$25,000 or less, 26.4% earning \$25,001 to \$50,000, 14.4% earning \$50,001 to \$75,000, 10.6% earning \$75,001 to \$100,000, and 14.4% earning \$100,000 or more. About 7% of these respondents chose not to include annual family income.

The average age of children in the study was 10.7 years old. The demographics of the children did not vary much. Most of the children were White/Caucasian (80.9%), with the rest being Black/African American (9.4%), Asian (0.3%), American Indian/Native Alaskan (0.3%) and other ethnicities (4.7%). 4.4% of participants elected not to state their race on the questionnaire. A majority of the children were male (n = 174). The children's cancer diagnosis varied. They had leukemia (36%), lymphoma (26%), brain tumor (9%), and other solid tumors (e.g., Osteosarcoma, Wilm's tumor; 30%). 10% of the overall participants were relapse patients.

Procedures

The institutional review boards (IRB) at two hospitals in United States approved the protocol for this study. This study was conducted in two separate psychology research labs, one in Columbus, Ohio and the other in Nashville, Tennessee. Participants were identified through cancer registries and then approached by one of the research team members in the hospital or clinic and asked to participate. Parents who agreed to participate filled out an informed consent form, and children between the ages of 10 and 17 years old completed an assent form. If only

one parent was present then a questionnaire and a consent form was sent home for the other parent. Participants engaged in an interaction task and also filled out a questionnaire packet. The participants either completed the packet at home or in the hospital. The families received compensation for participating in the study on one occasion at least one of the parents or the child had completed the measures.

Measures

Demographic and medical data. Participants reported demographic information, including race, age, gender, education level, and family income. Parents provided permission for the research staff in the Stress and Coping Lab to access medical data.

Children's coping and reactivity. The Responses to Stress Questionnaire-Pediatric Cancer version (RSQ-PC; Connor-Smith et al., 2000; Miller et al., 2009; Rodriguez et al., 2012) was used to assess the children's reactivity and coping. This questionnaire contains different scales for both involuntary and voluntary responses to stress. The voluntary responses to stress are considered coping styles and the involuntary responses are considered stress reactivity. The measure yields five factors: primary control coping, secondary control coping, disengagement coping, involuntary engagement, and involuntary disengagement. Ratio scores were calculated for each of these factors by dividing the total score for each factor by the total score for the entire RSQ; the standard method for scoring the RSQ was used in this. Ratio scores were used to control for any response bias and individual differences in base rates of endorsing items (Compas et al., 2014; Connor-Smith et al., 2000; Osowiecki & Compas, 1998, 1999; Vitaliano, DeWolfe, Maiuro, Russo, & Katon, 1990).

There are different versions of the questionnaire; this study employed the mother, father and adolescent/child pediatric cancer versions. This questionnaire requires that the child be at

least nine years old to complete it. There are 57 items that reflect voluntary and involuntary stress responses to 12 cancer related stressors. These cancer related stressors are things that children who have cancer typically have to deal with like missing school or losing hair. Each response is rated on a scale from one to four based on how often the participant feels they did what the questionnaire is asking about, one through four stands for not at all to a lot. This study reports data on the three voluntary coping scales, primary, secondary and disengagement coping, and the two involuntary coping scales, involuntary engagement and involuntary disengagement.

Design

In this study the independent variables being measured are child's reactivity, child's age, and child's gender. The dependent variable being measured is child's coping (primary control coping, secondary control coping, and disengagement coping). This study is a within subjects design because all the participants engage in each part of the study; there is no control group or random assignment. This is a longitudinal study where data was collected at four separate time points after baseline. This paper, however, will only be using data from the first time point. Time point one occurred about two months after the patient's diagnosis.

To test the first hypothesis an independent samples t-test was conducted on primary control coping, secondary control coping and disengagement coping with the grouping variable being the child's gender. The second hypothesis was tested through correlational analysis looking at all of the variables in the study. Lastly, the third hypothesis was tested through multiple linear regression analyses.

Results

Descriptive Statistics

In this study, more mothers ($n = 320$) than children ($n = 159$) completed the RSQ. This is because a child must be at least nine years old to fill out the questionnaire but children were allowed to participate in the study as long as they were at least five years old. This means that in some cases there is RSQ data on the child that the mother has filled out but the child was too young to complete the questionnaire. As shown in Table 1, gender was evenly distributed among the participants. The mother's means and children's means are very similar, showing that the mother's are most likely accurately reporting their child's coping. All standard deviations appear to be in range.

Cross-Informant Correlations of Child and Mother's Reports on the Child's Coping

Ratio scores were used in this analysis to facilitate the comparison of the three different coping styles. As shown in Table 2, correlational analyses found significant positive correlations among child's reports of disengagement coping with involuntary disengagement ($r = .198, p < .05$) and involuntary engagement ($r = .199, p < .05$), but significantly negative correlations among child's reports of secondary control coping with involuntary disengagement ($r = -.308, p < .01$) and involuntary engagement ($r = -.661, p < .01$). Child's reports of primary control coping are also significantly negatively correlated with involuntary disengagement ($r = -.534, p < .01$) and involuntary engagement ($r = -.426, p < .01$).

For the most part, mother's reports on their children mirrored the results written above. Correlational analyses found a significant positive correlation among mother's reports of disengagement coping with involuntary disengagement ($r = .346, p < .01$) but a non-significant negative correlation between their reports of disengagement coping with involuntary engagement ($r = -.005$). This is the only instance where the results did not show similar findings to that of the child's reports. Strong significantly negative correlations were found among child's reports of

secondary control coping with involuntary disengagement ($r = -.686, p < .01$) and involuntary engagement ($r = -.782, p < .01$). Mother's reports of primary control coping are also significantly negatively correlated with involuntary disengagement ($r = -.603, p < .01$) and involuntary engagement ($r = -.324, p < .01$). The only statistically significant correlation with child's age was mother's reports of child's secondary control coping ($r = .155, p < .01$).

Independent Samples Tests of Gender and Coping

An independent-samples t-test was conducted to compare primary control coping, secondary control coping, and disengagement coping in male and female conditions. Equal variance was assumed for all variables except child's reports of primary control coping. As shown in Table 1, there was not a significant difference found when male and female mean scores were compared for child's reports of primary control coping, $t(151.125) = 1.001, p = 0.318$; secondary control coping, $t(157) = -0.539, p = 0.591$; disengagement coping, $t(157) = -1.607, p = 0.110$; or mother's reports of the child's primary control coping, $t(314) = 0.522, p = 0.602$; secondary control coping, $t(318) = -0.491, p = 0.624$; and disengagement coping, $t(318) = -1.170, p = 0.243$.

Linear Multiple Regression

The association between child's primary control coping, secondary control coping, disengagement coping and involuntary engagement and disengagement are analyzed through multiple linear regressions. In all regressions, coping was entered in the first step, age was entered in the second step, gender was entered in the third step, involuntary engagement was entered in the fourth step and involuntary disengagement was entered in the fifth and final step. Cross informant reports were used for all regressions. As shown in Table 3, in all of the regressions involuntary disengagement remained a significant predictor, except in the regression

where mother's reports of child's disengagement coping were used to predict coping. In this regression involuntary engagement was significant but not involuntary disengagement. In both regressions predicting mother's reports of child's secondary control coping and child's reports of secondary control coping both involuntary disengagement and involuntary engagement were significant. In all of the regressions predicting primary control, secondary control, and disengagement coping, either involuntary engagement or involuntary disengagement remained a significant predictor in the final step, indicating that there is an interaction between what type of coping a child uses and how reactive they are to stress. In all of the regressions predicting primary control, secondary control, and disengagement coping, neither age nor gender emerged as significant at any step. In each regression potential issues with multicollinearity were identified.

Discussion

It is vital to identify factors that are associated with what type of coping children utilized when faced with uncontrollable stressors like cancer. This study presents findings on the associations between gender, age and stress reactivity in a child's coping. Overall, we found that there does not appear to be any association between a child's gender or age and which coping style they utilize. There was strong evidence, however, that a child's stress reactivity interacts with which type of coping they use.

Hypothesis 1: Girls will utilize more primary and secondary control coping mechanisms than boys. An independent-samples t-test was conducted to compare coping in male and females. There was not a significant difference found when male and female mean scores were compared for child's reports or mother's reports of child's coping. In all of the regressions predicting primary control, secondary control, and disengagement coping, gender

was never found to be significant. This shows that, overall, the types of coping the males in this study reported are about the same as the types of coping that the females in the study reported.

Hypothesis 2: Children who are older will employ more primary and secondary control coping than younger children. In all of the regressions age was never found to be significant. In the correlational analysis age was only significant with mother's reports of child's secondary control coping. Therefore, a child's use of secondary control coping increases as they get older, according to mothers. Overall, this means that children reported using similar types of coping regardless of their age. This could be due to the fact that this study was only analyzing ratios of type of coping a child used. Perhaps a child's ability to use these methods of coping improves overtime but they utilize approximately the same types throughout childhood.

Hypothesis 3: Children's primary and secondary control coping will be negatively correlated with stress reactivity (involuntary engagement and disengagement). Correlations between mother and child's reports showed that primary control and secondary control coping is negatively correlated with stress reactivity, while disengagement coping is positively correlated with stress reactivity (involuntary engagement and disengagement). Either involuntary engagement or disengagement was always a significant predictor of coping in the multiple linear regressions. In both of the regressions using mother and child cross informant reports, it was shown that being low in involuntary disengagement and involuntary engagement could be used to predict a child's use of secondary control coping. Similarly, in both of the regressions using mother and child cross informant reports, it was shown that being low in involuntary disengagement could be used to predict a child's use of primary control coping. High involuntary disengagement was used to predict a child's disengagement coping when child's reports of coping were used. High involuntary engagement was used to predict a child's disengagement

coping when mother's reports of coping were used. These results show that stress reactivity is associated with a child's coping. Children who were less reactive to stress reported using more secondary control coping, children who were in the middle used more primary control coping, and children who were more stress reactive reported using more disengagement coping.

Limitations and Future Studies

There were several potential limitations presented in the current study. First, fathers were not included in this study, which reduces the depth of the results. According to Jacob and Johnson (2001), fathers may communicate with their children differently than mothers and they may view how the child is coping in different ways. Therefore, fathers may provide certain insights into their child's coping process that mother's may not see. Second, children five through eight (n=161) were not providing their own responses and their mothers may not have accurately represented their coping and reactivity. Third, our study was limited in racial diversity. A majority of the participants in this study were Caucasian, 80.9%, yet in the United States only 61.3% of the population is Caucasian. Blacks/African Americans, Asians, and American Indians/Native Alaskans were all slightly under represented.

These results only provide correlations and not a definitive cause and effect relationships. While these findings provide additional information about these variables there could be other factors influencing these results. Future studies should focus on the applied aspect of the study. For example, it would be beneficial to explore why children with reactivity utilize more disengagement coping and how this affects their ability to use other types of coping. Other studies could also investigate whether or not these variables affect the ability for children to learn how to cope. Another possibility would be to explore how these factors change throughout the child's treatment. As stated earlier, Compas et al. (2014) shows that the use of secondary control

coping appears to be especially important during early phases of diagnosis and treatment. This study utilized only data collected at time point one, future studies should look to see if the results change overtime.

Currently the Caner, Coping and Communication team within the Stress and Coping Lab at Vanderbilt University, is constructing a program entitled the Families Coping with Cancer Program. It will teach children who are diagnosed with cancer and their parents how to better cope with stress. The program shows parents how to effectively communicate with their children about cancer. It teaches them skills like how to set up the right amount of structure, how to have difficult conversations, the importance of validating, etc. This program will be comprised of eight modules, which will be completed over the span of eight weeks. Looking at how the child's gender, age and stress reactivity affect coping in these children is important because it can be used to form better interventions in the future. In conclusion, teaching children who are highly stress reactive how to utilize proper coping skills may help them reduce their stress reactivity overtime.

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Appendix

Table 1
Descriptive Statistics

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Male</i>			<i>Female</i>		
				<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
Child's Age	336	10.7	3.7	174	10.44	4	162	11	4
Child's Report									
Primary Control Coping (PC _C)	157	0.18	0.04	77	0.18	0.03	80	0.18	0.04
Secondary Control Coping (SC _C)	159	0.29	0.06	77	0.29	0.06	82	0.29	0.06
Disengagement Coping (D _C)	159	0.15	0.03	77	0.15	0.03	82	0.15	0.03
Involuntary Disengagement (ID _C)	159	0.17	0.03	77	0.17	0.03	82	0.17	0.04
Involuntary Engagement (IE _C)	159	0.21	0.04	77	0.21	0.05	82	0.21	0.04
Mother's Reports									
Primary Control Coping (PC _M)	316	0.19	0.03	165	0.19	0.03	151	0.19	0.03
Secondary Control Coping (SC _M)	320	0.28	0.06	167	0.28	0.06	153	0.27	0.06
Disengagement Coping (D _M)	320	0.14	0.03	167	0.14	0.03	153	0.14	0.03
Involuntary Disengagement (ID _M)	320	0.17	0.03	167	0.17	0.03	153	0.17	0.03
Involuntary Engagement (IE _M)	320	0.23	0.04	167	0.23	0.04	153	0.23	0.05

Note. Sample sizes: n =159 children; n =320 mothers.

Table 2
Correlations Among Mother and Child Self-Reports

	PC_C	SC_C	D_C	ID_C	IE_C	PC_M	SC_M	D_M	ID_M	IE_M
Child's Report										
Primary Control Coping (PC_C)	–									
Secondary Control Coping (SC_C)	.28**	–								
Disengagement Coping (D_C)	-.49**	-.44**	–							
Involuntary Disengagement (ID_C)	-.53**	-.31**	.20*	–						
Involuntary Engagement (IE_C)	-.43**	-.66**	.20*	.45**	–					
Mother's Reports										
Primary Control Coping (PC_M)	.23**	.25**	-.20*	-.29**	-.18*	–				
Secondary Control Coping (SC_M)	.13	.50**	-.15	-.34**	-.44**	.24**	–			
Disengagement Coping (D_M)	-.21*	-.32**	.28**	.22**	.25**	-.60**	-.39**	–		
Involuntary Disengagement (ID_M)	-.32**	-.31**	.19*	.41**	.24**	-.60**	-.69**	.35**	–	
Involuntary Engagement (IE_M)	.00	-.44**	.04	.23**	.38**	-.32**	-.78**	-.01	.42**	–
Child's Age	-.01	.11	-.07	-.05	-.05	-.01	.16**	-.07	-.07	-.10

Note. Sample sizes: n =159 children; n =320 mothers.

*p < .05. **p < .01.

Table 3
 Summary of Linear Multiple Regression Analyses Predicting Child Coping

	β	<i>t</i>
Equation 1: Child Self Reports of Primary Control Coping		
$F(4, 146) = 5.87^{***}$; adjusted $R^2 = .12$		
Child Age	-.00	-1.04
Child Gender	-.01	-1.52
Mother Reports of Involuntary Engagement	.12	1.61
Mother Reports of Involuntary Disengagement	-.42 ^{***}	-4.60
Equation 2: Child Self Reports of Secondary Control Coping		
$F(4, 148) = 10.58^{***}$; adjusted $R^2 = .20$		
Child Age	.00	1.14
Child Gender	.00	.14
Mother Reports of Involuntary Engagement	-.53 ^{***}	-4.74
Mother Reports of Involuntary Disengagement	-.29*	-2.05
Equation 3: Child Self Reports of Disengagement Coping		
$F(4, 148) = 2.44$; adjusted $R^2 = .04$		
Child Age	.00	-.35
Child Gender	.01	1.87
Mother Reports of Involuntary Engagement	-.03	-.46
Mother Reports of Involuntary Disengagement	.18*	2.32
Equation 4: Mother Reports of Child Primary Control Coping		
$F(4, 145) = 4.95^{**}$; adjusted $R^2 = .10$		
Child Age	.00	1.91
Child Gender	-.01	-1.13
Child Reports of Involuntary Engagement	-.05	-.74
Child Reports of Involuntary Disengagement	-.25 ^{**}	-3.05
Equation 5: Mother Reports of Child Secondary Control Coping		
$F(4, 148) = 11.04^{***}$; adjusted $R^2 = .21$		
Child Age	.00	1.39
Child Gender	.00	.23
Child Reports of Involuntary Engagement	-.49 ^{***}	-4.41
Child Reports of Involuntary Disengagement	-.31*	-2.25
Equation 6: Mother Reports of Child Disengagement Coping		
$F(4, 148) = 3.54^{**}$; adjusted $R^2 = .06$		
Child Age	-.00	-.92
Child Gender	.00	.77
Child Reports of Involuntary Engagement	.12*	2.03
Child Reports of Involuntary Disengagement	.12	1.67

Note. Child gender, age, involuntary engagement and involuntary disengagement were entered in all of the regression analyses.

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