

**EXECUTIVE FUNCTION AND LEARNED HELPLESSNESS IN  
ADOLESCENTS WITH CHRONIC ILLNESS**

A Dissertation

by

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## **ABSTRACT**

Previous research has revealed that children with chronic illnesses are significantly more likely to experience academic, behavioral, and emotional difficulties. The current study hypothesized that these difficulties could be impacted by the development of learned helplessness and/or difficulties with executive functioning. The proposed theoretical model suggests that chronic illness variables have an effect on learned helplessness and executive functioning. In addition, it was hypothesized that these factors lead to an increased risk of depressive symptomatology.

The current study revealed significant differences between the chronic illness and control group in parent-reported executive function abilities; however, there were no significant differences in self-reported executive function, learned helplessness or depressive symptomatology. Parent-reported control of illness predicted parent- and self-reported executive function and parent-reported depression. It did not predict learned helplessness or self-reported depression. The number of medications taken by the chronic illness group did not predict executive function, learned helplessness, or depression. In addition, learned helplessness predicted parent- and self-reported depression. Several strong correlations were found, including associations between parent-reported executive function and self-reported executive function, and parent-reported depression and parent- and self-reported executive function. In addition, there were strong associations between self-reported executive function and parent- and self-reported depression. The model of learned helplessness, executive function, and parent-

reported control of illness did not significantly predict parent-reported depression. This information may be used to improve intervention efforts directed at children with chronic illnesses.

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## **CHAPTER I**

### **INTRODUCTION**

A chronic illness is a medical condition that lasts three months or more, affects typical activities, and requires frequent hospitalizations and/or extensive medical care (Mokkink, van der Lee, Grottenhuis, Offringa, & Heymans, 2008). Additionally, chronic illnesses in children are defined as medical conditions that prevent a child from attending school, completing school work, or engaging in typical childhood activities (Van Cleave, Gortmaker, & Perrin, 2010). Chronic health conditions are common in children, diagnosed in approximately 1 in 4 children ages 17 years and younger (Van Cleave et al., 2010). Asthma and epilepsy are two common chronic illnesses that occur in children and adolescents.

#### **Epilepsy**

An individual is considered to have epilepsy if they have experienced two or more unprovoked seizures. Russ, Larson, and Halfon (2012) reported that 1% of children between the ages of 0 and 17 years have had a diagnosis of epilepsy or a seizure disorder. In the United States, 0.7% (479,341) of children between the ages of 0 and 17 have active epilepsy and 0.5% (355,756) had epilepsy in the past (National Survey of Children's Health, 2012). Overall, it has been reported that 10.5 million children under the age of 15 have active epilepsy worldwide (Forsgren, 2004).

Seizures are defined as “atypical electrical discharges in the brain that may cause a variety of effects including loss of consciousness, loss of muscle tone or increased muscle tone, and automatisms” (Roberts & Steele, 2009, p. 352). In the case of more

than one seizure that is not caused by a particular event or insult, a diagnosis of epilepsy is made (Cascino & Sirven, 2011; Hauser & Beghi, 2008). There are multiple types of seizures that are classified according to the type of onset (generalized versus partial) and the effects of the seizures (Berg et al., 2010). Generalized seizures involve both hemispheres of the brain, as well as a loss of consciousness. On the other hand, partial seizures involve single areas of the brain.

### **Asthma**

Asthma is another prevalent chronic health condition in childhood, with reports indicating a prevalence of 9.5% in children between the ages of 0 and 17 (Schenker, et al., 2010). According to the National Heart, Lung, and Blood Institute (2007), asthma is a chronic inflammatory disorder of the airway which can cause recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. Airway inflammation is a major feature of asthma, frequently resulting from stimulation by allergens (Louis et al., 2000).

### **Prognosis and Outcomes**

#### **Academic Issues in Epilepsy**

Children with epilepsy are at particular risk for poor school achievement even after accounting for the child's intellectual ability (Fowler, Johnson, & Atkinson, 1985; Hermann et al., 2006; Seidenberg & Berent, 1992; Seidenberg et al., 1986; Sturniolo & Galleti, 1994). Research comparing the academic achievement of children across various chronic conditions demonstrates that children with epilepsy are one of the most vulnerable groups (Austin, Huberty, Huster, & Dunn, 1999; Howe, Feinstein, Reiss, Molock, & Berger, 1993). As a result, children with epilepsy are significantly more

likely to experience school failure and grade retention (Bailet & Turk, 2000; Sturniolo & Galleti, 1994).

Moreover, special education services are utilized more frequently by children with epilepsy than children in the general population. In a sample of children with epilepsy, approximately half exceeded the cutoff for a learning disability in one or more academic domains (Berg et al., 2005; Fastenau, Juanzhao, Dunn, & Austin, 2008; Oostrom, Smeets-Schouten, Kruitwagen, Peters, & Jennekens-Schinkel, 2003). These rates are significantly higher than the rates of special education services for the general population, which are approximately 27% (Oostrom et al., 2003). Berg et al. (2005) reported that at five years after initial diagnosis, 58% of children with epilepsy received special education services.

Children with chronic epilepsy continue to have deficits in academic performance over time and despite improvements in their seizure conditions (Austin, Huberty, Huster, & Dunn, 1998; Austin et al., 1999). After being seizure-free for years, a large number of individuals have only a primary level education (Sillanpää, Jalava, Kaleva, & Shinnar, 1998). These results indicate that a diagnosis of epilepsy still should be considered when planning treatment and intervention even years after the initial diagnosis or if conditions have improved significantly. It should be noted, however, that these results are controversial, as other studies have reported improvements in academic performance when seizure conditions improve (McNelis, Dunn, Johnson, & Austin, 2007).

Academic success may in part be attributed to epilepsy-related factors such as age of onset, years since onset, level of control, type of seizures, and medication status (Austin et al., 1998; Dunn et al., 2010; Seidenberg et al., 1986; Seidenberg et al., 1988; Vanesse, Béland, Carmant, & Lassonde, 2005). Although epilepsy-factors may contribute to academic difficulties, children exhibit considerable academic problems early in the course of epilepsy (Jackson et al., 2013). Across studies that indicate continued academic difficulties (Black et al., 2010; Blair & Razza, 2007; Bull & Scerif, 2001; Protopapas, Archonti, & Skaloumbakas, 2007; St. Clair-Thompson & Gathercole, 2006), executive function emerges most consistently as an area of concern. Executive function is a global construct that includes a set of self-regulatory processes including behaviors such as planning, initiation, organization, self-monitoring, purposive actions, and self-regulation (Lezak, Howieson, Loring, Hannay & Fischer, 2004). Longitudinal research has shown that executive function abilities contribute to academic achievement in typically developing children (Bull, Espy, & Wiebe, 2009; George & Greenfield, 2005; Hitch, Towse, & Hutton, 2001; Miller & Hinshaw, 2010). It is not surprising that executive function deficits account for variance in academic achievement among children with epilepsy (Blair & Razza, 2007; Bull & Scerif, 2001; Protopapas et al., 2007; St. Clair-Thompson & Gathercole, 2006).

### **Psychosocial Issues in Epilepsy**

As with academic difficulties, epilepsy is a risk factor for psychological problems. Children with epilepsy are five times more likely to experience psychopathology than children in the general population (McDermott, Mani, &

Krishnaswami, 1995; Oostrom et al., 2003). In addition, they are two times more likely to experience psychopathology than children with other chronic conditions that were not related to the central nervous system (Austin & Caplan, 2007; McDermott et al., 1995). Parent and teacher reports indicate that children with epilepsy are more likely to display both internalizing and externalizing behavior problems; thus, seizures are not the only issue children with epilepsy display (Austin et al., 2001; Oostrom et al., 2003). Although reports of behavior problems in this population were also higher before the onset of epilepsy, these problems were most evident in those who had previous ‘events’ that were likely seizures, but not identified as such (Austin et al., 2001; Dunn, Harezlak, Ambrosius, Austin, & Hale, 2002). The previous events could have had an effect on overall function before the diagnosis was made and would suggest an earlier age of onset than when the diagnosis was made. The behavior problems most frequently seen in children with epilepsy are inattention and other symptoms of Attention Deficit Hyperactivity Disorder (ADHD; Braakman et al., 2011; Dunn et al., 2002; Guimarães et al., 2007; Jones et al., 2007).

In addition to ADHD, of particular note, children with epilepsy are at an increased risk for symptoms of depression and anxiety, suicidal thoughts, and lifetime major depression (Hermann, Seidenberg, & Jones, 2008; Tellez-Zenteno, Patten, Jette, Williams, & Wiebe, 2007; Wagner & Smith, 2006). Prevalence rates for clinically significant depressive symptoms and diagnosis of depression for children with epilepsy range from 10-30% (Alwash, Hussein, & Matloub, 2000; Wagner & Smith, 2006). Many children with epilepsy report higher internalizing problems in the areas of anxiety

and depression before the diagnosis of epilepsy is made; however, many of these children had prior unrecognized seizures (Dunn et al., 2002; Jones et al., 2007). Factors contributing to depressive and anxious symptoms include the child's self-efficacy, locus of control, family relationships, and coping skills (Austin, MacLeod, Dunn, Shen, & Perkins, 2004; Caplin, Austin, Dunn, Shen, & Perkins, 2002; Dunn et al., 1999; Matthews et al., 1982). Associated with depression and problems with self-efficacy is a sense of helplessness. Based on these findings, these are areas that need to be examined during assessment and targeted as possible areas for intervention.

### **Adult Outcomes in Epilepsy**

Childhood epilepsy continues to have an effect on social, academic, and occupational outcomes across the life span. Adults who had childhood epilepsy who remained on medication as adults, whether they were in remission or not, are more likely to have lower scores on measures of quality of life than their healthy peers or those who no longer took antiepileptic medication (Sillanpää, Haataja, & Scholomo, 2004). The quality of life of these individuals could be impacted by several factors.

Many studies have found that individuals with epilepsy in childhood are less likely than others to be employed as adults (Callaghan, Crowley, & Goggin, 1992; Camfield & Camfield, 2007; Kobau et al., 2007; Hart & Shoryon, 1995; Sillanpää et al., 2004; Sillanpää et al., 1998; Strine et al., 2005). The difference in employment is drastic; among individuals who are actively attempting to participate within the job market, those with epilepsy are unemployed 46% of the time, compared to 19% for healthy peers of the same age (Elwes, Marshall, Beattie, & Newman, 1991). Individuals

with epilepsy also receive social security benefits at a higher rate (Hart & Shoryon, 1995). Low employment rates could be due to these individuals having lower levels of educational attainment and frequently working in unskilled positions (Elwes et al., 1991; Kobau et al., 2004; Kobau et al., 2007; Kokkonen, Kokkonen, & Saukkonen, & Pennanen 1997; Olsson & Camphausen, 1993; Sillanpää et al., 1998; Strine et al., 2005). In conjunction with low employment rates, this population is significantly more likely to have lower household incomes (Callaghan et al., 1992; Elwes et al., 1991; Kobau et al., 2004; Kobau et al., 2007). Socioeconomic status and education level could have a significant impact on quality of life, individuals' feelings of self-efficacy and success, and sense of helplessness. It is important to provide early intervention efforts in childhood in an attempt to prevent these potential negative effects in the long term.

Adults with epilepsy also experience challenges with social relationships. Significantly fewer individuals who had epilepsy in childhood are married or have children as adults (Callaghan et al., 1992; Camfield & Camfield, 2007; Elwes et al., 1991; Kobau et al., 2007; Sillanpää et al., 2004; Sillanpää et al., 1998). Additionally, this population is more likely than their peers to have poor social maturation, deficits in social relationships, and dependent lifestyle factors such as living with their parents (Camfield & Camfield, 2007; Kokkonen et al., 1997). These factors further contribute to the lower quality of life for adults with epilepsy.

### **Academic Issues in Asthma**

Children with asthma are also at risk for poor academic achievement. Students with asthma have been shown to perform lower in reading (Liberty, Pattermore, Reid, &



Tarren-Sweeney, 2010) and mathematics (Krenitsky-Korn, 2011). Research has also demonstrated that asthma has a negative impact on standardized test performance; however, this performance is primarily due to lower levels of school attendance (Moonie, Sterlings, Figgs, & Castro, 2008). In addition, children with asthma demonstrate lower academic achievement and disparities in grade point average due to higher levels of absenteeism and lower school connectedness (Basch, 2011; Moonie, Cross, Guillermo, & Gupta, 2015).

A significant amount of research indicates that children with asthma have higher rates of school absenteeism (Doull, Williams, Freezer, & Holgate, 1996; Moonie et al., 2015; Silverstein, Mair, Katusic, Wollan, O'Connell, & Yungigner, 2001; Taras & Potts-Datema, 2005). Moonie et al. (2015) report that students with asthma are at significantly increased risk of missing more than 10 days of school per year. Other research has demonstrated that students with asthma miss 1.5 (Moonie et al., 2006) to 2.21 (Silverstein et al., 2001) more days of school than their healthy peers. Research has been divided on whether absences are impacted by asthma severity (Basch, 2011; Krenitsky-Korn, 2011; Taras & Potts-Datema, 2005).

Research has demonstrated that students with asthma are more likely to be retained a grade in school, primarily associated with increased levels of absenteeism (Fowler, Davenport, & Garg, 1992; Fowler et al., 1985). Students with asthma are more likely to demonstrate lower school readiness when entering school (Haltermann et al., 2001). This risk is correlated with limitation of activities (Haltermann et al., 2001). Other school concerns for children with asthma include an increased risk of diagnosis

with a learning disability (Fowler et al., 1992; Fowler et al., 1985) and less participation in school activities (Krenitsky-Korn, 2011).

### **Psychosocial Issues in Asthma**

As with epilepsy, asthma is a risk factor for psychological problems. Individuals with asthma are significantly more likely to experience psychopathology than those in the general population. Research has demonstrated that 55-65% of individuals with asthma had a psychological disorder in comparison to 36.4% in a healthy control group (Asnaashari, Talei, & Baghban Haghghi, 2012; Prins, van Son, van Keimpema, Meijer, Buhning, & Pop, 2015).

Of particular note, children with asthma are at an increased risk for depression (Bruzzeze, Fisher, Lemp & Warner, 2009; Bussing, Burket, & Kelleher, 1996; Goodwin, Fergusson, & Horwood, 2004; Goodwin, Pine, & Hoven, 2003; Katon et al., 2007; Katon, Richardson, Lozano, & McCauley, 2004; Ortega, McQuaid, Canino, Goodwin, & Fritz, 2004) and anxiety (Goodwin et al., 2013). Diagnoses of depression and anxiety are also significantly more prevalent in adults with asthma (Alati, et al., 2005; Goodwin et al., 2004; Kotrotsiou et al., 2011; Vuillermin et al., 2010). Prevalence rates for depressive symptoms and diagnosis of depression for children with asthma are approximately 30% (Morrison, Goli, Van Wagoner, Brown, & Khan, 2002). Prevalence rates of anxiety for those with asthma are also significant, with 20-40% meeting the criteria for at least one anxiety disorder (Ross, Davis, & Hogg, 2007; Vila, Nollet-Clemenc, de Blic, Mouren-Simeoni, & Scheinmann, 2000). Factors contributing to depressive and anxious symptoms include the perception that asthma negatively impacts

one's life and is difficult to control (McGrady, Cotton, Rosenthal, Humenay, Roberts, Britto, & Yi, 2010), increased asthma severity (Asnaashari et al., 2012; Katon et al., 2007; McGrady et al., 2010; Wood et al., 2006; Wood et al., 2007), and asthma-related functional impairment (McCauley, Katon, Russo, Richardson, & Lozano, 2007).

### **Adult Outcomes in Asthma**

Asthma also has continued effects on social, academic, and occupational outcomes across the life span. Adults with asthma are significantly more likely to report lower scores on measures of quality of life (Dyer, Hill, Stockley, & Sinclair, 1999) and health related quality of life (Chen et al., 2007; Siroux et al., 2008; Sullivan et al., 2013; Vollmer et al., 1999). In addition to quality of life, research on adults with asthma indicate that asthma effect employment.

Individuals with asthma report that having asthma has an impact on the job effectiveness (Blanc et al., 1993; Blanc et al., 2001; Blanc, 2000). Asthma has also been demonstrated to have an effect on employment rates (Blanc et al., 1993; Blanc et al., 2001; Blanc, 2000), including a small increased negative effect of employment in young adults (Sibbald, Anderson, & McGuigan, 1992). Asthma also appears to lead to an increased likelihood of being on work disability. Research has shown that of those with asthma, complete work disability is reported by 7-14% (Blanc, Cisternas, Smith, & Yelin, 1996; Eisner et al., 2006). Based on self-reports of adults with asthma, 38% change jobs, work hours, or work duties, and 65% take days off of work due to their asthma diagnosis (Blanc et al., 1993; Blanc et al., 2001; Blanc, 2000; Mancuso, Rincon, & Charlson, 2003). Employment related difficulties in adults with asthma are reported

to cause a loss of 2.1 million days of work productivity and \$222.1 million in the United States each year (Smith et al., 1997). These factors may contribute to the reported lower quality of life in adults with asthma.

### **Factors that Affect Outcome in Epilepsy**

The cause of the academic and psychological impairments associated with epilepsy is multifactorial, involving a combination of neurologic, seizure, family, and child variables, as well as factors in the contexts in which the individual with epilepsy functions. For example, common pathogenic mechanisms for epilepsy and depression have been proposed (Kanner & Balabanov, 2002). Specific epilepsy-related variables known to affect outcome include age of onset, time since onset, level of seizure control, and number and type of anti-epileptic drugs (AEDs; Aldenkamp, Overweg-Plandsoen, & Arends, 1999; Altshuler, Devinsky, Post, & Theodore, 1990; Baker, Jacoby, & Chadwick, 1996; Baker, Nashef, & van Hout, 1995; Black et al., 2010; Bourgeois, Prensky, Palkes, Talent, & Busch, 1983; Callaghan et al., 1992; Currie, Heathfield, Henson, & Scott, 1971; Dikmen, Hermann, Witenky, & Rainwater, 1983; Dodrill & Batzel, 1986; Farwell, Dodrill, & Batzel, 1985; Glosser, Cole, French, Saykin, & Sperling, 1997; Hermann, Seidenberg, Haltiner, & Wyler, 1991; Indaco, Carrieri, Nappi, Gentile, & Striano, 1992; Jacoby, Baker, Steen, Potts, & Chadwick, 1996; Kogeorgos, Fonagy, & Scott, 1982; Lambert & Robertson, 1999; Meador, 2006; Mendez, Cummings, & Benson, 1986; Robertson, Trimble, & Townsend, 1987; Roth, Goode, Williams, & Faught, 1994; Roy, 1979; Schoenfeld et al., 1999; Seidenberg et al., 1988;

Strauss, Wada, & Moll, 1992; Victoroff, Benson, Graftson, Engel, & Mazziorra, 1994; Williams et al., 1996; Zelnik, Sa'adi, Silman-Stolar, & Goikhman, 2001).

At the interpersonal level, a significant factor related to levels of psychopathology is the social stigma that the individual with epilepsy encounters. Individuals with epilepsy report that stigma is one of the greatest challenges that they face (Scambler & Hopkins, 1990). Adolescents with epilepsy are more likely to have a pattern of selective disclosure than other chronically ill peers (e.g., those with asthma) and are less likely to have friends who know about their condition (Westbrook, Silver, Coupey, & Shinnar, 1991). There is limited familiarity and knowledge about epilepsy among adolescents. Austin, Shafer, and Deering (2002a) found that among adolescents, 52% had not heard about epilepsy, 67% did not know what to do if someone had a seizure, and only 31% would date a person with epilepsy. In addition, approximately three-fourths of adolescents believed that youth with epilepsy were more likely to be bullied than their peers. These results indicate that the lack of knowledge could be causing stigma for individuals with epilepsy. Social stigma related to epilepsy has been associated with depression, low self-esteem, anxiety, and negativity (Dunn, 2003; MacLeod & Austin, 2003). Finally, seizures are aversive, unpredictable, and uncontrollable events (Devillis, Devillis, Wallston, & Wallston, 1980); therefore, it would not be surprising if individuals with epilepsy experienced greater feelings of helplessness than typical peers.

## **Factors That Affect Outcome in Asthma**

The cause of the academic and psychological impairments associated with asthma is multifactorial, involving a combination of asthma, family, and child variables, as well as factors in the contexts in which the individual with asthma functions. Specific asthma-related variables known to affect outcome include age of onset, limitation of activity or functional impairment, asthma severity, and control (Asnaashari et al., 2012; Austin et al., 1998; Blackman & Gurka, 2007; Blanc et al., 1996; Chen et al., 2014; Conn, Swanson, McQuaid, Douthit, & Fisher, 2015; Eisner, Katz, Lactao, & Iribarren, 2005; Feitosa et al., 2011; Goldbeck, Koffmane, Lecheler, Thiessen, & Fegert, 2007; Goodwin et al., 2013; Halterman et al., 2001; Halterman et al., 2006; Katon et al., 2007; Krauskopf et al., 2013; Lavoie et al., 2010; Marco et al., 2010; McCauley et al., 2007; McGrady et al., 2010; Meuret, Ehrenreich, Pincus, & Ritz, 2006; Mirabelli, Beavers, Chatterjee, & Moorman, 2013; McQuaid, Kopel, & Nassau, 2001; Mrazek & Chuman, 1998; Mooni, Sterling, Figgs, & Castro, 2006; Prins et al., 2015; Reichenberg & Broberg, 2004; Rimington, Davies, Lowe, & Pearson, 2001; Sullivan et al., 2013; Verkleu et al., 2011; Wood et al., 2006; Wood et al., 2007).

### **Summary**

A large number of individuals have a diagnosis of epilepsy or asthma; having epilepsy or asthma places those individuals at increased risk for academic and psychosocial problems in childhood and poorer lifetime outcomes as adults as compared to the general population. Children with epilepsy and asthma utilize special education services more frequently and are more likely to experience deficits in academic

performance and grade retention, despite improvements in symptoms and control. These individuals are also at an increased risk for depression and suicidal ideation. Further, it may be that individuals with epilepsy or asthma experience feelings of helplessness, particularly if they are not symptom free.

Executive function is one area of interest as it is hypothesized that deficits in executive function may be a contributing factor to academic and behavioral difficulties. Research on executive function and learned helplessness in epilepsy or asthma is limited and for the most part outdated. In addition, there are few studies that examine executive function or learned helplessness in children with epilepsy and asthma. Executive function abilities affect both cognitive and behavioral outcomes (Bull et al., 2009; George & Greenfield, 2005; Goldberg & Seidman, 1991; Hitch et al., 2001; Miller & Hinshaw, 2010). Although considered in the psychosocial domains, depression also may have adverse effects on cognitive functioning (Paradiso, Hermann, Blumer, Davies, & Robinson, 2001) with a clear relationship between depression and learned helplessness (Nolen-Hoeksema, Girgus, & Seligman, 1986). Surprisingly, there are no studies that examine the relationship between executive function, depression, and learned helplessness.

Several factors have been reported to have an effect on the outcome of individuals with epilepsy, including age of onset, duration, level of seizure control, and number and type of anti-epileptic drugs. In individuals with asthma, illness-related factors such as age of onset, severity, control, and functional impairment have been reported to have an effect on outcome. These factors likely affect executive function

development, academic achievement, and psychological outcomes. The current study had the goals of a) clarifying the executive function deficits seen in children with epilepsy or asthma, b) documenting the level of learned helplessness in children with epilepsy or asthma, and c) examining if there is a relationship between executive function, depression, and learned helplessness. In addition, levels of executive function, learned helplessness, and depression in children with epilepsy or asthma will be compared to that of typically developing children. Thus, the extent to which children with epilepsy or asthma demonstrate increased deficits and difficulties in comparison to typically developing can be identified. Finally, variance accounted for by illness-related factors will be identified.

### **Implications for Practice**

The cognitive, emotional, and social problems of children who have epilepsy or asthma often lead to academic difficulties, which presumably can be attributed to a combination of illness-related factors as well as psychological reactions to having a chronic disorder. Knowledge of executive function impairment, learned helplessness, and depression will help in planning a comprehensive assessment, as well as in planning appropriate goals to improve health and educational outcomes for the child. Moreover, behavioral interventions for depression have the potential to reduce illness severity and symptom frequency in addition to improved psychological adjustment (Jones et al., 2003; Lewis, Salas, de la Sota, Chiofalo, & Leake, 2007). Therefore, it is critical to identify and treat depression symptoms in order to assist in the management of epilepsy and asthma. Identification of learned helplessness, executive function, and depression in



children with epilepsy and asthma, as well as the interaction between these domains, can inform preventative programming.

## **CHAPTER II**

### **LITERATURE REVIEW**

Epilepsy and asthma are two of the most common chronic illness in childhood and adolescence. Research evidence shows that chronic illnesses place individuals at increased risk for academic and psychosocial problems in childhood. In addition, these children are more likely to experience school failure and grade retention than other children (Austin et al., 1999; Bailet & Turk, 2000; Howe et al., 1993; Sturniolo & Galleti, 1994). Increased risk continues into adulthood, with poorer lifetime outcomes for those who manifested a chronic illness in childhood.

Several illness-related factors have been reported to have an effect on the outcome of individuals with epilepsy, including age of onset, duration, level of seizure control, and number and type of AEDs. Of those with asthma, illness-related factors such as functional impairment, age of onset, severity, and control have been reported to have an effect on outcome. Executive function is of interest, as it may be a contributing factor to academic and behavioral difficulties. Learned helplessness and depression are also of interest in children with chronic illness as these create significant behavioral difficulties and also may be a contributing factor to academic difficulty and impairments in executive function.

#### **Risk Factors and Epilepsy**

Epilepsy is defined as “a chronic neurologic condition characterized by recurrent epileptic seizures” (Blume et al., 2001, p. 1213). There are many subtypes for classification within the diagnosis of epilepsy. First, seizures are broken down into focal

(partial) and generalized (bilateral) seizures (Blume et al., 2001). Focal seizures are those in which the initial neurological activation is in only one part of the brain. On the other hand, seizures that demonstrate activation of both hemispheres are considered to be generalized.

Generalized seizures include absence seizures and generalized tonic-clonic seizures (Berg et al., 2010). Absence seizures are characterized by a pause in activity with a blank stare and a brief lapse of awareness (Berg et al., 2010). These seizures usually last between one to ten seconds (Berg et al., 2010). Generalized tonic-clonic seizures are characterized by a loss of consciousness, falling, and convulsions (Berg et al., 2010). These seizures generally last one to three minutes and are followed by confusion, fatigue, headaches, or soreness (Berg et al., 2010).

Focal seizures are classified based on whether there is impairment in consciousness or awareness (Berg et al., 2010). Focal seizures without impairment of consciousness or awareness, also known as simple partial seizures, can consist of rhythmic movements (e.g. isolated twitching), sensory symptoms (e.g. tingling, weakness, sounds, smells, or visual distortions), or psychic symptoms (e.g. hallucinations, anxiety; Berg et al., 2010). Focal seizures with impairment of cognition (complex partial seizures) are characterized by an inability to respond and automatisms (repetitive, purposeless motions; Berg et al., 2010). In addition, focal seizures can evolve into bilateral, convulsive seizures (secondary generalized tonic-clonic seizure; Berg et al., 2010).

Seizure type has been reported in many studies to be related to symptoms of depression. Depression appears to be more common in individuals with complex partial seizures than those with primary generalized epilepsy (Altshuler et al., 1990; Broomfield et al., 1992; Currie et al., 1971; Dikmen et al., 1983; Hermann et al., 1991; Indaco et al., 1992; Mendez et al., 1986; Robertson et al., 1987; Roy, 1979; Strauss et al., 1992; Victoroff et al., 1994). In addition, the number of seizure types that an individual has is correlated with a greater risk for psychiatric disorders (Dodrill & Batzel, 1986; Fiordelli, Beghi, Bogliun, & Crespi, 1993).

### **Localization**

A significant epilepsy factor relates to the localization of the seizure focus. Some studies implicate the temporal lobe (Altshuler et al., 1990; Strauss et al., 1992; Victoroff et al., 1994), while other studies implicate the frontal lobe (Broomfield et al., 1992; Hermann et al., 1991). There has been extensive amount of research conducted on the relationship between left temporal lobe epilepsy and symptoms of depression. Many studies report that individuals with left temporal lobe epilepsy experience significantly higher levels of depression compared to right temporal lobe or control groups (Altshuler et al., 1990; Brown, McGowan, & Reynolds, 1986; Currie et al., 1971; Dongier, 1959-60; Gibbs, 1951; Gureje, 1991; Koch-Weser et al., 1988; Perini & Mendius, 1984; Perini et al., 1996; Rodin, Rim, Kitano, Lewis, & Rennick, 1976). Other studies have not found increased depression to be associated with a temporal lobe focus when compared to other types (Dodrill & Batzel, 1986; Edeh & Toone, 1987; Kogeorgos et al., 1982; Manchaca, Schaefer, McLachlan, & Blume, 1992; Small, Milstein, & Stevens, 1962;

Standage & Fenton, 1975; Stevens, 1966; Trimble & Perez, 1980) or localization (Robertson et al., 1987). Overall, it is critical to examine epilepsy-related factors during assessment and intervention planning, and to monitor epilepsy factors over time.

### **Age of Onset**

One of the most frequently reported epilepsy-related factors is the age of onset. There are many reports that age of onset is the strongest and most significant predictor of cognitive effects and lower intelligence scores, with early onset causing more deficits (Bourgeois et al., 1983; Glosser et al., 1997; Schoenfeld et al., 1999). Younger age of onset is also a factor that predicts academic underachievement and special education needs (Seidenberg et al., 1986; Schoenfeld et al., 1999; Zelnik et al., 2001). Although many studies report that age of onset is a significant predictor of achievement, these results are not universal. Bailet and Turk (2000) found that age of onset was not related to neurocognitive or behavioral test scores. In addition, Sturniolo and Galletti (1994) found that age of onset had no effect on academic achievement. Similarly, most studies report that age of onset is not related to comorbidity with depression (Altshuler et al., 1990; Edeh, Toone, & Corney, 1990; Hermann & Wyler, 1989; Kogeorgos et al., 1982; Mendez, Doss, Taylor, & Salguero, 1993; Robertson, Channon, & Baker, 1994). On the other hand, Jacoby et al. (1996) found that age of onset was a significant predictor for depression.

Others have reported that duration of the seizure disorder (i.e., time since onset) contributes significantly to academic success and cognitive abilities, with longer duration predicting more impairment (Farwell et al., 1985; Seidenberg et al., 1988).

Although these findings could be related to duration of the disorder, they could also be related to the age of onset. As with differences in findings for age of onset, some studies have found that there is not a relationship between duration and achievement (Mitchell, Chavez, Lee, & Guzman, 1991; Sturniolo & Galletti, 1994). Additionally, there does not appear to be a relationship between duration of epilepsy and symptoms of depression (Edeh et al., 1990; Indaco et al., 1992; Roy, 1979; Standage & Fenton, 1975).

### **Level of Seizure Control**

Not surprisingly, the level of seizure control (i.e., frequency of seizures) is a significant predictor of lower academic achievement, special education needs, and cognitive ability (Aldenkamp et al., 1999; Black et al., 2010; Callaghan et al., 1992; Farwell et al., 1985; Williams et al., 1996; Zelnik et al., 2001). When seizures are not well controlled, children are more likely to have difficulties with attention, memory, and processing speed (Aldenkamp et al., 2000; Nolan et al., 2004). Seizure control is also a predictive factor for behavior problems. Children with poor seizure control have more difficulty with internalizing behaviors, withdrawn behavior, thought problems, and attention problems (Austin et al., 2002a; Williams et al., 1996). As adults, seizure control is predictive of social status and employability (Callaghan et al., 1992; Collings & Chappell, 1994). Callaghan et al. (1992) found that polytherapy (i.e., the use of more than one medication) is related to lower educational attainment. These results are confounded as individuals with poor seizure control typically take more than one AED.

Several studies have reported that increased frequency of seizures or increased perceived severity is related to the degree and pattern of psychiatric morbidity,

particularly depression (Baker et al., 1996; Baker et al., 1995; Dodrill & Batzel, 1986; Jacoby et al., 1996; Kogeorgos et al., 1982; Roth et al., 1994). Baker et al. (1996) and Jacoby et al. (1996) reported that individuals with more than one seizure per month were significantly more likely to demonstrate symptoms of depression. In addition, it has been demonstrated that perceived severity is related to symptoms of depression (Baker et al., 1996). Although several studies provide support for the relationship between increased severity and depression, other studies found no relationship (Attarian, Vahle, Carter, Hykes, & Gilliam, 2003; Indaco et al., 1992; Mendez et al., 1986; Robertson et al., 1987).

### **Treatment**

In individuals who have undergone surgery as a treatment for epilepsy, depression declined significantly only in patients who were completely seizure free after the surgery (Blumer, Wakhulu, Davies, & Hermann, 1998; Hermann, Wyler, Ackerman, & Rosenthal, 1989; Hermann, Wyler, & Somes, 1992; Hermann & Wyler, 1989; Kellet, Smith, Baker, & Chadwick, 1997; Rausch & Crandall, 1982; Seidman-Ripley et al., 1993; Stevens, 1990). Those who were not seizure free, despite decreased seizure frequency, did not experience significant changes in levels of depression (Bladin, 1992; Hermann, 1979; Hermann & Wyler, 1989; Hill, Pond, Mitchell, & Falconer, 1957; Jensen & Larsen, 1979; Seidman-Ripley et al., 1993).

Another factor contributing to quality of life in children with epilepsy are AEDs. Children on AEDs commonly experience adverse cognitive side effects (Meador, 2006). Other common side effects include fatigue, hyperactivity, attention problems, memory

problems, and headaches (Modi, Ingerski, Rausch, & Glauser, 2011). Although there are many studies of older AEDs that show negative cognitive side effects, studies are beginning to demonstrate that newer AEDs also can cause negative side effects. Arif et al. (2009) found that 21.5% of patients on topiramate experienced negative cognitive side effects that were severe enough for them to discontinue the medication. A significant amount of intolerable cognitive side effects were also found in carbamazepine, gabapentine, levetiracetam, lamotrigine, oxcarbazepine, and valproate (Arif et al., 2009). In fact, some reports indicate that the effects of AEDs can be more debilitating than seizures themselves (Gilliam, 2002). These commonly experienced cognitive side effects can contribute to academic underachievement and negative behavioral outcomes.

There also has been some indication of the role of medication in the relationship between epilepsy and depression. A few studies have reported clear relationships between barbituates (Lambert & Robertson, 1999) or phenobarbital (Hermann & Whitman, 1989; Smith & Collins, 1987) and depression; however, depression is reported after discontinuation of medications (Kendrick, Duncan, & Trimble, 1993; Ketter et al., 1994). Polypharmacy also has been associated with depression in individuals with epilepsy (Fiordelli et al., 1993; Mendez et al., 1993).

## **Risk Factors and Asthma**

### **Asthma Severity**

Asthma symptom severity is one of the most frequently cited asthma-related factors. Asthma severity has an impact on school and work attendance, with severity



predicting mean days absent and work disability rates (Blanc, et al., 1996; Mooni et al., 2006). Asthma severity is also associated with increased psychological distress and behavioral problems (Halterman et al., 2006). More specifically, increased asthma severity is associated with increased depressive symptomatology in children and adults (Asnaashari et al., 2012; Eisner et al., 2005; Katon et al., 2007; Wood et al., 2006; Wood et al., 2007). In addition, one study reported that asthma symptom severity at 5 years of age was associated with increased affective, anxiety, somatic, oppositional defiant, and conduct problems at the ages of 5 years to 17 years (Goodwin et al., 2013). Asthma severity has also been associated with executive function impairments (Austin et al., 1998; Blackman & Gurka, 2007; Halterman et al., 2001; Mrazek & Chuman, 1998).

### **Asthma Control**

The degree of asthma control is another frequently reported asthma-related factor. Poor control of asthma is associated with lower health related quality of life (Sullivan et al., 2013). Asthma control is associated with behavioral problems, including difficulties with emotional regulations and behavioral control (Feitosa et al., 2011; Goldbeck et al., 2007; Halterman et al., 2006; McQuaid et al., 2001; Meuret et al., 2006; Reichenberg & Broberg, 2004). Research has also indicated that asthma control has an impact on psychopathology (Prins et al., 2015). More specifically, poor asthma control is associated with negative illness perceptions (McGrady et al., 2010), anxiety (Krauskopf et al., 2013; Marco et al., 2010; McGrady et al., 2010; Rimington et al., 2001), depression (Krauskopf et al., 2013; Marco et al., 2010; Rimington et al., 2001;

Verkleu et al., 2011), withdrawal (Verkleu et al., 2011), and helplessness (Conn et al., 2015).

### **Age of Onset and Functional Impairment**

Additional factors that have been reported to impact the outcomes of individuals with asthma include age of onset and limitation of activity or functional impairment. Research has demonstrated that adults whose symptoms of asthma started before the age of 15 have more urgent care visits (Mirabelli et al., 2013). In addition, onset of asthma during adolescence leads to an increased risk of developing major depression, depressive disorders, and bipolar disorder later in life (Chen et al., 2014). Limitations in typical activities or functional impairments are associated with lower scores on measures of school readiness (Haltermann et al., 2001) and depression (McCauley et al., 2007).

### **Executive Function**

The term “executive function” is a broad construct which refers to cognitive skills that allow for purposeful, goal-directed behaviors including planning, organizing thoughts and activities, impulse control, selective attention, and making decisions (Chan, Shum, Touloupoulou, & Chen, 2007). Other definitions of executive function include set-shifting and set maintenance, interference control, inhibition, integration across space and time, planning, and working memory (Pennington & Ozonoff, 1996). Executive function abilities are important for many reasons.

Longitudinal research has shown that executive function abilities contribute to academic achievement (Lindgren et al., 2004). Children’s working memory and ability to inhibit are related to performance in math and reading (Blair & Razza, 2007; Bull &

Scerif, 2001; Protopapas et al., 2007; St. Clair-Thompson & Gathercole, 2006). Outside of academic achievement, it has been demonstrated that executive function is a reliable predictor of independent living abilities in older individuals (Cahn-Weiner, Boyle, & Malloy, 2002). In addition, there is a significant relationship between deficits in executive function and antisocial behavior (Morgan & Lilienfeld, 2000), behavioral impairments, and psychiatric impairment (Goldberg & Seidman, 1991).

### **Executive Function and Epilepsy**

It has been demonstrated that children have executive function deficits regardless of the type of epilepsy (Hernandez et al., 2002; Hoie, Mykletun, Waaler, Skeidsvoll, & Sommerfelt, 2006; Hommet, Sauerwein, De Toffol, & Lassonde, 2006; Nolan et al., 2004). For example, Nolan et al. (2004) found that children with absence epilepsy, frontal lobe epilepsy, and temporal lobe epilepsy were all at risk for memory difficulties. Children with epilepsy demonstrated lower scores on the Working Memory and Processing Speed Indexes of the Wechsler Intelligence Scale for Children-Fourth Edition (Wechsler, 2003) compared to scores for the Verbal Comprehension and Perceptual Reasoning Indexes, and when compared to a control group (Sherman, Brooks, Fay-McClymont, & MacAllister, 2012). In addition, Guimarães et al. (2007) found that children with epilepsy demonstrated impairment of abstract problem resolution, planning, perseveration, and lack of mental flexibility.

Although children with temporal lobe epilepsy demonstrated more memory impairment than children with idiopathic generalized epilepsy (Fedio & Mirsky, 1969), results are not as clear for the differences in memory function between children with

temporal lobe epilepsy and those with frontal lobe epilepsy. Children with temporal lobe epilepsy demonstrated impairment in mental flexibility and abstraction, alternate and sustained attention, control inhibition, mental search (Rzezak et al., 2009), verbal emotional memory (Jambaque et al., 2009), visual learning, verbal memory, and visual memory (Guimarães et al., 2007). Rzezak, Guimeraes, Guerreiro, and Vaente (2012) also found that children with temporal lobe epilepsy have deficits in focused attention, immediate and delayed recall, phonological memory, mental tracking, planning, and abstraction when compared to non-epilepsy controls. The extent to which impairment on executive function measures is affected by age of onset and number of medications is not clear but seems to be variable with severity the most likely to affect performance measures (MacAllister et al., 2012).

Studies on the effect of frontal lobe epilepsy also have been conducted; however, the results of these studies are less conclusive than those of temporal lobe epilepsy. Children with frontal lobe epilepsy may have more difficulties with organization (Hernandez et al., 2002; Luton, Burns, & DeFilippis, 2010), inattention (Hernandez et al., 2002), planning (Luton et al. 2010), problem solving (Mittan, 2010; Riccio, Pliego, Cohen, & Park, 2014), and switching attention (Mittan, 2010). A cognitive pattern of impaired motor coordination also appears to be characteristic of children with frontal lobe epilepsy (Helmstaedter, Kemper, & Elger, 1996; Hernandez et al., 2002).

Lendt, Gleissner, Helmstaedter, and Sassen (2002) did not find statistically significant differences in memory function between children with temporal lobe epilepsy and frontal lobe epilepsy. Similarly, other studies found no differences in cognitive

functions by seizure type (Williams, Griebel, & Dykman, 1998). In contrast, Nolan et al. (2004) found that children with temporal lobe epilepsy performed significantly lower on verbal memory tasks than children with frontal lobe epilepsy.

Across studies, other differences have emerged as well. For example, children with frontal lobe seizures evidence more executive function deficits on a number of tasks that look at problem-solving, processing speed, interference control, and planning in copying a complex figure than those with temporal lobe seizures (Hernandez et al., 2003; Powell, Krtja, & Voeller, 2004). Culhane-Shelburne, Chapieki, Hisock, and Glaze (2002) found that children with frontal lobe epilepsy have more prominent planning deficits, whereas children with temporal lobe epilepsy have more deficits in verbal and nonverbal memory.

Research studies have shown strong support for executive function deficits in many different types of epilepsy syndromes in adults (Glowinski, 1973; Laduvas, Umilia, & Provincially, 1979). The aspect of executive function affected varies by seizure classification, such that adults with temporal lobe epilepsy have greater memory impairment than those with frontal lobe epilepsy (Glowinski, 1973; Laduvas et al., 1979). Further, adults with frontal lobe epilepsy have issues related to response inhibition, memory, organization of information, and judgment of temporal order (McAndrews & Milner, 1991; McDonald, Grandner, Gihnore, & Roper, 2001; Swart, Halgren, & Simpkins, 1996). Although there is a lot of research on executive function in adults with epilepsy, the research on executive function in children with epilepsy is limited.

## **Executive Function and Asthma**

Research also shows support for deficits in executive functioning in individuals with asthma. The majority of the research demonstrates impairments in attention, including impaired sustained attention (Annett et al., 2000; McQuaid et al., 2008; Yuksel, Sogut, & Yilmaz, 2008), difficulty with interference control (Annett et al., 2000), impaired ability to shift attention between tasks (Fryt, Pilecka, & Smolen, 2013), and lower vigilance (Annet et al., 2000; McQuaid et al., 2008; Yuksel et al., 2008).

Another executive function ability that is impaired in individuals with asthma is the visualization and memory of spatial configurations (Dunleavy & Baade, 1980). Individuals with asthma also demonstrate deficits in incidental memory and planning and executing visual and tactile motor tasks (Dunleavy & Baade, 1980). Research has also demonstrated that individuals with asthma have significant difficulty with self-regulation, emotional regulation, and behavioral control (Fryt et al., 2013; Goldbeck et al., 2007; Halterman et al., 2006; McQuaid et al., 2001; Meuret et al., 2006; Reichenberg & Broberg, 2004).

## **Learned Helplessness**

Maier and Seligman (1976) proposed that exposure to uncontrollable, unpredictable, and aversive events resulted in a reliable pattern of motivational, cognitive, and emotional deficits that are called “learned helplessness” (p. 1). They argued that exposure to uncontrollable events make it more difficult to perceive contingent relationships between behavior and outcomes. In addition, uncontrollable aversive events cause more emotional disruption than controllable events do.

An individual's explanation of why events happen to them, also known as attributional style, is a crucial component of learned helplessness (Sweeney, Anderson, & Bailey, 1986; Needles & Abramson, 1990). If an individual has pessimistic explanations for good or bad events they are more likely to experience more adverse psychological impact from these beliefs (Colligan, Offord, Malinchoc, Schulman, & Seligman, 1994). The probability of depression and the development of learned helplessness increased to the degree that individuals have a pessimistic attributional style. A pessimistic attributional style is when an individual attributes causality for aversive events to internal, stable (likely to persist), and global causes and attribution of causality of positive events to external, unstable, and specific causes (Abramson, Seligman, & Teasdale, 1978; Seligman, Abramson, Semmel & von Baeyer, 1979). Individuals with learned helplessness feel as if things are out of their control. This is problematic because they may then stop trying to fix the situation, causing the problems to become more pronounced.

### **Learned Helplessness and Epilepsy**

Seizures are aversive, unpredictable, and uncontrollable events. As such, seizures seem to fall in line with the definition of aversive events that can lead to learned helplessness. There are few studies that have examined the relationship between epilepsy and learned helplessness, and even fewer that have examined the relationship in children. Wagner, Smith, Ferguson, Horton, and Wilson (2008) conducted one such study of children with epilepsy. The majority of the children had partial seizures and were on one AED. Children in the sample had an average of 12 seizures per year.

Individuals with a negative attitude toward epilepsy displayed increased depressive symptoms with hopelessness as the mediating variable.

Similarly, Matthews et al. (1982) compared children with epilepsy, children with diabetes, and a healthy control group. The children with epilepsy attributed significantly more control to unknown sources than the other two groups. These results demonstrate that children with epilepsy may have more learned helplessness than the general population and other chronic illness groups. Ferrari, Matthews, and Barabas (1983) proposed that children with epilepsy are aware of their lack of control over epilepsy and have difficulties in developing coping mechanisms that would be effective in the wide range of situations where seizures may occur. This potentially causes them to generalize feelings of helplessness to other aspects of their lives.

Devillis, Devillis, Wallston, and Wallston (1980) found that adults with epilepsy were substantially less internally controlled, believed that their health was a chance of fate, and were more depressed than the general population. In addition, it has been demonstrated that pessimistic attributional styles, depression, and attenuated expectations of control are seen more frequently in individuals with poorly controlled epilepsy (Devillis et al., 1980; Hermann, Trenerry, & Colligan, 1996). External views of control and learned helplessness have been implicated as contributing factors in the development of psychosocial problems in epilepsy (Ferrari et al., 1983; Hermann, 1979; Hermann, Whitman, Wyler, Anton, & Vanderzwagg, 1990; Matthews et al., 1982). In addition, long durations of uncontrolled seizures are significantly related to the development of a negative attribution style in individuals with epilepsy (Kanner, 2003).



Although there is limited research on learned helplessness in adults with epilepsy, it does appear that they are more likely to have an external locus of control, pessimistic attributional styles, and higher levels of depression. These results are particularly prevalent in individuals with poorly controlled epilepsy, the same individuals who are exposed to unpredictable, aversive events on the most frequent basis.

### **Learned Helplessness and Asthma**

Asthma attacks are another example of an aversive, unpredictable, and uncontrollable event. Therefore, asthma attacks also fall in line with the definition of aversive events that can lead to learned helplessness. Studies have speculated that the intermittent and unpredictable nature of asthma may precipitate ambiguous disease management-outcome agencies and negative disease outcome expectancies, thus leading to the experience of helplessness (Mullins, Chaney, Pace, & Hartman, 1997). Those with long-standing asthma demonstrate a pattern of increased internal attributions following response-noncontingent feedback failure and demonstrated increased risk of learned helplessness deficits and impaired problem solving (Chaney et al., 1999). In addition, research has demonstrated that feelings of helplessness diminish as symptom-free days increase (Conn et al., 2015), indicating a relationship between asthma attacks and feelings of helplessness. Overall, the available research on learned helplessness in individuals with asthma is significantly limited and needs to be examined further.

### **Depression and Epilepsy**

Examining the effects of depression on individuals with epilepsy is important in the current discussion for many reasons. First, studies have demonstrated that there is a

relationship between preoperative depression and external locus of control as well as between depression and external locus of control (Hermann & Wyler, 1989; Hermann et al., 1996). Therefore, when discussing learned helplessness, it is also important to consider the potential for depression. In addition, impairment on neuropsychological tests is associated with emotional and psychiatric problems in individuals with epilepsy (Dodrill & Batzel, 1986). Finally, some studies have suggested that depression may be a risk factor for epilepsy or that there may be a bidirectional relationship (Hesdorffer, Hauser, Olafsson, Ludvigsson, & Kjartansson, 2006; Kanner, 2003).

Children and adolescents with epilepsy are significantly more likely than their typically developing peers to have a psychiatric diagnosis, with rates of diagnosis at 60% (Ott et al., 2003). Caplan et al. (2005) found that 33% of children with epilepsy have affective and anxiety disorder diagnoses and 20% report suicidal ideation. The rate of depression in children with epilepsy ranges from 23% to 40% (Adewuya & Ola, 2005; Brent, Crumrine, Varma, Allan, & Allman, 1987; Dunn & Austin, 1999; Ettinger et al., 1998). These rates are significant in comparison to the 2% to 6% depression prevalence rate in children and adolescents in the general population (Fleming & Offord, 1990; Kashani et al., 1987; Lewinsohn, Clarke, Seeley, & Rohde, 1994).

How epilepsy factors have an impact on children varies slightly from how they affect adults. Dunn et al. (1999) found that an external locus of control is a predictor of depression. Another predictor of depression in children with epilepsy is the frequency of seizures (Austin et al., 2002b; Oguz, Kurul & Dirik, 2002). In addition, predictors of depression in children with epilepsy include polytherapy (Adewuya & Ola, 2005) and

adverse effects to AEDs (Cramer, 1994). It is important to consider that polytherapy is typically considered when seizures are frequent and poorly controlled. Austin et al. (2002b) and Oguz et al. (2002) reported that longer duration of seizures is an additional predictor of depression. As opposed to findings with adults, seizure type, lateralization of seizure foci, electroencephalographic findings, and age of onset have not been associated with depression (Dunn et al., 1999; Oguz et al., 2002).

Adults with epilepsy also have more emotional and psychological difficulties than healthy individuals and those with other neurological and chronic medical conditions (Dodrill & Batzel, 1986; Mendez et al., 1986; Mendez et al., 1993; Robertson et al., 1994; Rodin and Schmaltz, 1984; Standage & Fenton, 1975). Depressive disorders are reported to be the most common psychological disorder in individuals with epilepsy (Kanner, Kozak, & Frey, 2000). Depression is reported in 20% to 78% of adults with epilepsy (Blumer, Montouris, & Hermann; 1995; Indaco et al., 1992; Kogeorgos et al., 1982; Mendez et al., 1986; Standage and Fenton, 1975) and 3% to 9% of those with controlled epilepsy (Baker et al., 1996; Edeh & Toone, 1987; Indaco et al., 1992; Jacoby et al., 1996; Lambert & Robertson, 1999; Mendez et al., 1986; O'Donaghue, Goodridge, Redhead, Sander, & Duncan, 1999; Robertson & Trimble 1983). Depressive disorders are the most common reason for psychiatric hospitalization among individuals with epilepsy (Jacoby et al., 1996; Mendez et al., 1993), with rates of hospitalization for depression among those with epilepsy four times higher than individuals without epilepsy (Mendez et al., 1986; O'Donaghue et al., 1999; Robertson et al., 1994).

Although most studies report increased risk for depression in individuals with epilepsy, one study failed to find an increased risk (Fiordelli et al., 1993).

### **Depression and Asthma**

Individuals with asthma are significantly more likely to have depressive symptomology or a depression diagnosis than their typically developing peers (Cookson, Granell, Joinson, Ben-Shlomo, & Henderson, 2009; Cooper et al., 2007; Douwes, Brooks, & Pearce, 2011; Goldney, Ruffin, Fisher, & Wilson, 2003; Goodwin et al., 2004; Jiang, Qin, & Yang, 2014; Katon et al., 2007; Kewalramani, Bollinger, & Postolache, 2008; Lavoie et al., 2005; Loerbroks, Herr, Subramanian, & Bosch, 2012; Ortega, Huertas, Canino, Ramirez, & Rubio-Stipec, 2002; Scott et al., 2007; Scott et al., 2008; Trojan et al., 2014; Vuillermin et al., 2010; Wong, Rowe, Douwes, & Senthilselvan, 2013). Prevalence rates of depression in individuals with asthma are reported between 14% and 41% (Lavoie et al., 2006). When compared to their healthy peers, individuals with asthma are 1.6 to 6.1 times more likely to have a depressive disorder (Bahreinian, Boll, Colman, Becker, & Kozrisky, 2011; Chen et al., 2014; Lavoie et al., 2006; Melissa & Richard, 2009; Scott et al., 2007).

Research has also demonstrated an association between asthma and anxiety (Cooper et al., 2007; Goodwin et al., 2004; Goldney et al., 2003; Lavoie et al., 2005; Scott et al., 2007; Vuillermin et al., 2010; Weiser, 2007), with reports indicating that individuals with asthma are 1.5 times more likely to have anxiety than their healthy peers (Scott et al., 2007). In addition, asthma is associated with higher risk of panic disorder (Cooper et al., 2007) and seasonal allergies are associated with suicidal ideation

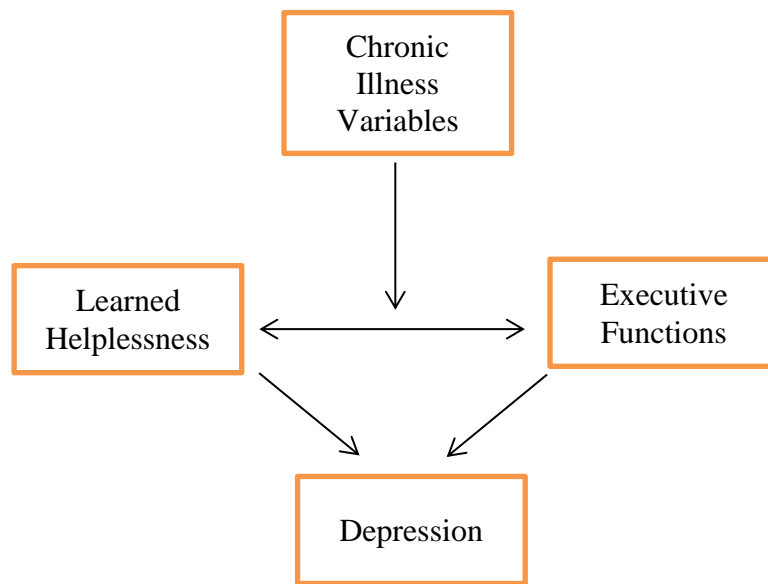
(Messias, Clarke, & Goodwin, 2010). Of particularly important significance, anxiety and depression are associated with poor control of asthma symptoms (Cluley & Cochrane, 2001; Goldney et al., 2003; Krauskopf et al. 2013; Lavoie et al., 2005; Lavoie et al., 2006; Marco et al., 2010; Rimington et al., 2001; Urrutia et al., 2012). In addition, remission from depression is associated with improvement in asthma symptoms (Loerbroks, Apfelbacher, Bosch, & Sturmer, 2010). Anxiety and depression in individuals with asthma are associated with several negative outcomes, including impaired asthma-related quality of life (Kullowatz, Kanniess, Dahme, Magnussen, & Ritz, 2007), higher asthma-related health resource utilization (Brinke et al., 2001; Kullowatz et al., 2007), increased asthma-related health costs (Kullowatz et al., 2007), less successful emergency treatment (Wainwright, Surtees, Wareham, & Harrison, 2007), and increased asthma hospitalization rates (Wainwright et al., 2007).

### **Current Study**

The available research indicates that children with chronic illnesses are significantly more likely to be in special education, be retained in a grade, and underachieve academically. In addition, children with chronic illnesses frequently have behavioral problems. Symptoms of depression, anxiety, and suicidality are the most common psychosocial problems seen in these populations. As adults, these individuals are less likely to be employed, married, have children, or be living independently. This could be due to the academic and psychosocial difficulties that they experience, and the development of learned helplessness over time. Executive function abilities or deficits also may be a contributing factor.

Individuals with asthma demonstrate executive functioning deficits. Adults with epilepsy also frequently demonstrate executive function deficits. There is less research on executive function in children with epilepsy; however, it is clear that there are some deficits associated with epilepsy. Some studies have proposed that depression is caused by learned helplessness in individuals with chronic illness. There only have been a couple of studies examining this relationship in adults and children, and the results are not conclusive. The purpose of the present study was to systematically examine executive function, learned helplessness, and depression in adolescents with chronic illness. It also examined the possible relationship between executive function and learned helplessness. A healthy control group was included in order to differentiate effects of chronic illness from healthy individuals during adolescence.

The proposed theoretical model suggests that chronic illness variables (e.g. duration, frequency, age of onset) have an effect on learned helplessness and executive function abilities (see Figure 1). It was proposed that learned helplessness and executive functioning are bidirectionally related. Executive functions include the ability to reason, problem solve, plan, and execute (Chan et al., 2007). These deficits may lead to increased levels of learned helplessness, as the ability to reason and solve problems is negatively affected. In addition, learned helplessness could cause individuals to not try, despite having the ability to do so, causing a cyclical relationship. These factors could then cause the individual to be at an increased risk for depression.



*Figure 1. Theoretical model.*

### **Research Questions and Hypotheses**

The research questions and hypotheses addressed were as follows:

1. Do children with chronic illness demonstrate deficits in executive functioning abilities as measured by the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000)? It is hypothesized that children with chronic illness will demonstrate patterns of impairment in executive functioning skills.
  - a. Is the level of executive impairment in children with chronic illness significantly different from that of typically developing children? It is hypothesized that children with chronic illness will demonstrate executive functioning impairment based on the BRIEF that is significantly different from that of typically developing children.

- b. For the chronic illness group, to what extent is this relationship predicted by chronic illness-related factors? It is hypothesized that if children/adolescents have poorly controlled seizures or asthma, as indicated by frequency of seizures or asthma attacks and number of medications, they will be more likely to demonstrate executive impairment.
2. Do children with chronic illness demonstrate or experience learned helplessness as measured by Children's Attributional Style Questionnaire – Revised (Kaslow & Nolen-Hoeksema, 1991) and the Locus of Control subscale of the BASC-2 Self-Report (Reynolds & Kamphaus, 2004)? It is hypothesized that children with chronic illness will demonstrate learned helplessness.
  - a. Is the level of learned helplessness in children with chronic illness significantly different from that of typically developing children? It is hypothesized that children with chronic illness will demonstrate significantly higher levels of learned helplessness than typically developing children.
  - b. For the chronic illness group, are illness-related factors predictive of learned helplessness? It is hypothesized that if children/adolescents have poorly controlled seizures or asthma, as indicated by the frequency of seizures or asthma attacks and number of medications, they will be more likely to demonstrate learned helplessness.



3. Do children with chronic illness demonstrate clinical levels of depression as measured by the Behavior Assessment System for Children Self-Report and Parent-Report (Reynolds & Kamphaus, 2004)? It is hypothesized that children with chronic illness will demonstrate clinical levels of depression (T-score > 70).
  - a. Is the level of depression in children with chronic illness significantly different from that of typically developing children? It is hypothesized that children with chronic illness will demonstrate significantly more symptoms of depression with significantly higher T-scores than the comparison group.
  - b. For the chronic illness group, to what extent are the symptoms of depression predicted by chronic illness-related factors? It is hypothesized that if children/adolescents have poorly controlled seizures or asthma, as indicated by frequency of seizures or asthma attacks and number of medications, they will be more likely to demonstrate symptoms of depression.
4. What is the relationship between executive functioning, depression, and learned helplessness across both groups? It is hypothesized that there is a significant relationship between learned helplessness, executive functioning abilities, and depressive symptoms. In addition, it is hypothesized that learned helplessness and executive function are predictive of significantly more symptoms of depression.

- a. For the chronic illness group, to what extent is this relationship predicted by illness-related factors?

## **CHAPTER III**

### **METHODS**

#### **Research Design**

The data for this study was obtained using a cross-sectional approach. There are two groups in the study: a chronic illness group comprised of adolescents with epilepsy or asthma and a healthy control group. Observed variables include illness variables such as age of onset, frequency of seizures or asthma attack, date of last seizure or asthma attack, and number and type of medications. Additional variables include executive function, learned helplessness, and depression. It is a sample of convenience; it was not feasible to obtain random samples.

#### **Participants**

A total of 103 packets were distributed for this study. Participants with epilepsy or asthma between the ages of 12 and 17 years were recruited from hospitals, pediatric neurologists, and epilepsy support groups locally, as well as in Austin, Houston, and San Antonio, TX. Individuals were included in the chronic illness group if they were currently being treated for tonic-clonic (i.e., grand mal) or focal seizures (simple partial or complex partial seizures) or were currently being treated for asthma or allergies or treated with an asthma preventative (e.g., singulair). Individuals with a history of febrile seizures were identified to be excluded from the study as febrile seizures occur exclusively in young children as a result of a high fever and do not significantly affect intellectual or academic ability (Nelson & Ellenburg, 1978). No participants had febrile seizures. Additionally, individuals with a history of absence seizures were to be

excluded from the study, as studies have reported significant differences between individuals with generalized versus absence seizures (Farwell et al., 1985; Kernan et al., 2012). No participants indicated absence seizures.

Additional recruitment focused on participants for the typically developing group. Participants were included in the typically developing group if they did not report a medical diagnosis and were not currently receiving special education services. Two participants were excluded; one reported kidney reflux, the other irritable bowel syndrome. Individuals with intellectual disabilities based on parent report were excluded from participation in order to control for cognitive ability as a potential confound. Typically developing participants were recruited through social networks, Boys and Girls Clubs, and churches.

Eleven parents and eight adolescents comprised the typically-developing control group and twelve parents and eleven adolescents comprised in the chronic illness group. The typically-developing group included predominantly females (54.5%) and ranged in age from 12 to 17 with a mean age of 14.9 ( $SD=1.97$ ). The control group also was primarily Caucasian (70%), with additional participants who were African American (10%) and of multiple races/ethnicities (20%). The mean grade of participants was 8.4 ( $SD=3.4$ ). Parent education ranged from high school diploma/GED to graduate degree.

For the chronic illness group, three reported a history of epilepsy. One individual reported a diagnosis of tonic-clonic seizures and two reported complex-partial seizures. Eight individuals reported having asthma or allergies but taking an asthma preventative (e.g., singulair). The chronic illness group included predominantly males (72.3%). The

chronic illness group ranged in age from 12 to 17, with a mean age of 14.8 (SD=1.6). The mean grade of participants in the chronic illness group was 9.2 (SD=1.6). The chronic illness group was primarily Caucasian (63.6%), with additional participants who were African American (9.1%), Hispanic (18.2%), or of multiple races/ethnicities (9.1%). Parent education ranged from high school diploma/GED to a four year undergraduate degree. Demographic information is provided in Table 1.

### **Procedures**

Approval was obtained from the Texas A&M University's Institutional Review Board (IRB) to conduct this study. Permission in the form of site authorizations or organizational Institutional Review Board were obtained before recruiting participants from hospitals, doctors, epilepsy support groups, or other community resources. Participants were recruited using a flyer that describes the study and gives instructions about how to obtain additional information (see Appendix A). Separate materials were used to recruit participants with epilepsy and asthma. Participants were offered the option to have a \$10 donation made to a charity of their choice upon completion.

Interested parents were given a packet with consent, permission, and assent forms, a cover letter explaining the option for a charitable donation, rating scales, and a demographic questionnaire. When the parent and child participants completed the packet, it was mailed back to the researcher in a postage paid mailer. After the packet was sent back in the mail, all data were scored, coded, and entered in a database without identifying information. Consent, permission, and assent forms were stored in a separate location in a locked cabinet. There is no link between the results and the consent/assent

forms. Participants were not compensated but had the option to be included in a drawing for a \$100 gift card.

Table 1  
*Demographic Summary*

Variable	Typically Developing Group (N=11)		Chronic Illness Group (N=12)	
	N	%	N	%
Gender				
Male	5	45.5	8	72.7
Female	6	54.5	3	27.3
Educational Level of Mother				
High School Diploma/GED	0	0	2	18.2
Community College	0	0	0	0
Some College	1	10	2	18.2
Four Year Degree	3	30	7	63.6
Graduate Degree	6	60	0	0
Educational Level of Father				
High School Diploma/GED	0	0	2	20
Community College	1	10	1	10
Some College	2	20	1	10
Four Year Degree	2	20	6	60
Graduate Degree	5	50	0	0
Race/Ethnicity				
Caucasian	7	70	7	63.6
African American	1	10	1	9.1
Hispanic	0	0	2	18.2
Biracial	2	20	1	9.1
Eligible for free/reduced lunch	2	18.20	3	25
Repeated a Grade	0	0	2	16.70
Received Special Education or 504 Services	0	0	4	33.30
	Mean	SD	Mean	SD
Age	14.90	1.97	14.80	1.60
Grade	8.40	3.40	9.20	1.60

Several different methods were used to try to recruit participants. In regards to adolescents with epilepsy, the Epilepsy Foundation was contacted in every state via email. The email requested the foundations to forward the flyer on to applicable adolescents. In addition, the Epilepsy Foundation of Central and South Texas and the Epilepsy Foundation of Virginia were contacted by phone to request distribution of flyers. The flyer was also posted on all accessible Epilepsy Foundation and epilepsy camp Facebook pages. Several individuals emailed the researcher to discuss participation in the study, but limited participants followed through with the study. Forty-three packets were distributed in this manner. Additionally, the researcher attended Epilepsy Foundation of Virginia picnics and support groups in order to recruit participants. Adolescent participation in these events was extremely limited.

In an attempt to recruit participants with asthma, the Asthma and Allergy Foundation of America was contacted to request distribution of the flyer. This request was denied by all of the foundations that were contacted. Several pediatricians and family practice doctors in Virginia Beach, Virginia, Bastrop, Texas, and Smithville, Texas were contacted to request that they post flyers in their offices. Three physicians in Bastrop, Texas agreed to post the flyers. No participants were recruited through this method. The flyer was also posted on several Facebook pages for asthma support groups. Twelve packets were sent out to participants that were recruited via this method. The researcher also contacted individuals who were previously known to have asthma in order to recruit additional participants. Ten packets were handed out to participants due to this method of recruitment. In addition, the Virginia Beach City Public School

District was contacted to request assistance in recruiting individuals with epilepsy or asthma. Unfortunately, this request was denied by the Virginia Beach City Public School's Institutional Review Board.

Typically-developing participants were recruited primarily by distributing packets to individuals the researcher previously knew. In addition, social networks were utilized to recruit additional typically-developing participants. Thirty-four packets were distributed to typically-developing individuals using this method of recruitment.

Several additional attempts to recruit participants were unsuccessful. The researcher visited the Boys and Girls Clubs in the cities of Virginia Beach, Virginia and Norfolk, Virginia. Limited numbers of adolescents attended these Boys and Girls Clubs. Churches in the cities of Virginia Beach, VA, College Station, Texas, Bastrop, Texas, and Austin, Texas also were contacted. Four packets were distributed through churches; however, many churches denied participation. Boy Scout and Girl Scout troops in the Virginia Beach area were contacted, but the researcher did not receive a response from these individuals.

### **Measures**

A number of different measures were used to obtain information on the variables of interest. These included a researcher-developed demographic questionnaire, the Behavior Rating Inventory of Executive Function (BRIEF) Parent-Report and Self-Report forms, the Children's Attributional Style Questionnaire-Revised (CASQ-R), and Behavior Assessment Scale for Children, Second Edition (BASC-2) Parent-Report and



Self-Report forms. Table 2 identifies the variables of interest to address the research questions for this study.

### **Demographic Questionnaire**

Each parent completed a demographic questionnaire that asks questions about variables such as child gender, age, race/ethnicity, and grade (see Appendix A). The study used mother's highest educational level as an approximation for socioeconomic status. The form asked whether the student attended a public or private school, grade retention status, whether they passed state mandated testing, and special education/504 status. There was a list of common childhood disorders including epilepsy, asthma, and depression. The parent was asked to indicate if their child had any of these disorders. The next section was completed only if the individual indicated a diagnosis of epilepsy or asthma. It included additional questions such as type, medications taken, age of onset, frequency of seizures/asthma attack, and date of last seizure/asthma attack.

### **Behavior Rating Inventory of Executive Function (BRIEF)**

The BRIEF Parent Form and Self-Report was used to assess executive function behaviors in the school and home environments (Gioia, Isquith, Guy, & Kenworthy, 2000). The BRIEF was used to assess the child's level of impairment in inhibition, shifting, emotional control, initiation, working memory, planning/organizing, organization of materials, and monitoring. Inhibition is the child's ability to control impulses and to stop engaging in a behavior. Shifting is the child's ability to move freely from one activity to another, to tolerate change, and to alternate attention.

Table 2

*Constructs and Measures Used*

Construct Measure	Illness-Related Factors	Executive Function	Learned Helplessness	Depression
Demographic Questionnaire	<ul style="list-style-type: none"> <li>• Age at Onset</li> <li>• Years Since Onset (Duration)</li> <li>• Number of Medications</li> <li>• Frequency of Seizures or Asthma Attacks</li> <li>• Time Since Last Seizure or Asthma Attack</li> <li>• Control of Symptoms</li> <li>• Limitation of Activities</li> </ul>			<ul style="list-style-type: none"> <li>• Previous Diagnosis of Depression</li> </ul>
Behavior Rating Inventory of Executive Function		<ul style="list-style-type: none"> <li>• Parent-Report</li> <li>• Self-Report</li> </ul>	<ul style="list-style-type: none"> <li>• Locus of Control from Self-Report</li> </ul>	
Children's Attributional Style Questionnaire-Revised			<ul style="list-style-type: none"> <li>• Self-Report</li> </ul>	
Behavior Assessment System for Children, Second Edition			<ul style="list-style-type: none"> <li>• Self-Report</li> </ul>	<ul style="list-style-type: none"> <li>• Parent Report</li> <li>• Self-Report</li> </ul>

Emotional control assesses the child's ability to regulate emotional responses appropriately. Initiation is the child's ability to begin an activity and to work and problem-solve independently. The child's ability to hold information when completing a task or when encoding information is assessed by working memory. The child's ability to anticipate future events, set goals, and plan steps is assessed by plan/organize. Organization of materials assesses the child's ability to put order in work, play, and storage spaces. Finally, the child's ability to check their work, to assess their own performance, and see the effect of their behavior on others is encompassed by the monitor section.

This study used the global executive composite, behavioral regulation index, and metacognition index as measures of executive function ability. The BRIEF consists of 86 items and takes approximately 10 to 15 minutes to administer. The BRIEF was used because it has a high internal consistency (.96 for self-report and .80 -.98 for parent report). In addition, the BRIEF has high inter-rater reliability between the self-report and parent-report ratings ( $r = .56$ ). Parrish et al. (2007) demonstrated that the BRIEF is significantly correlated to other measures of executive function, such as the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001). In addition, it has been demonstrated in the past that parent ratings on the BRIEF provide an effective assessment of executive function (Parrish et al., 2007). Protocols were used if there were enough item responses to calculate each scale (global executive composite, behavioral regulation, and metacognition) as specified by the manual.

The BRIEF has been used in previous studies of children and adolescents with epilepsy. MacAllister et al. (2012) reported that the BRIEF identified children with epilepsy who demonstrated executive function impairment with a high degree of sensitivity. In this study, the Metacognition Index was most frequently elevated, with specific deficits seen in the Working Memory and Plan/Organize scales. Similarly, Slick, Lautzenhiser, Sherman, and Eyrl (2006) demonstrated that children with intractable epilepsy display significant difficulties in executive functions as measured by the BRIEF. Elevated scores were seen most frequently on the Working Memory and Plan/Organize scales of the BRIEF. Slick et al. (2006) also conducted a factor analysis of the structure of the BRIEF scores in a sample of children with epilepsy, demonstrating validity of the constructs in children with epilepsy.

### **Children's Attributional Style Questionnaire-Revised**

The Children's Attributional Style Questionnaire-Revised (CASQ-R; Kaslow & Nolen-Hoeksema, 1991) is used to assess attributional style in children. The CASQ-R includes 24 items divided equally between positive and negative events. When completing the measure, respondents choose one of two possible causes for the event. Each choice represents a dimension of attribution. The CASQ-R provides a score for each dimension including internal, stable, or global responses. An overall score is determined by adding up the positive item scores and the negative item scores, and then taking the difference between the two subscores. The more positive the composite score, the less depressive attributional style. This study used the overall attribution score as a measure of attributional style because it has adequate internal consistency ( $\alpha=0.63$ ),

which improves when the dimensions are combined into a single composite (Thompson, Kaslow, Weiss, & Nolen-Hoeksema, 1998).

### **Behavior Assessment Scale for Children, Second Edition (BASC-2)**

The BASC-2 Parent Form and Self-Report was used to assess depressive symptoms (Reynolds & Kamphaus, 2004). The BASC-2 is a norm-referenced rating scale that is designed to assist in the identification of a variety of emotional and behavioral disorders of children. This study used the depression scale of the BASC-2 parent- and self-report rating scales as a measure of depressive symptoms displayed by the child. The depression scale asks about feelings of unhappiness or sadness. In addition, the locus of control scale was used to assess the child's beliefs that rewards or punishment are controlled by external stimulus.

The BASC-2 demonstrates high reliability coefficients for the individual scales ( $r=.85-.89$ ). Overall test-retest reliability of the BASC-2 self-report form is also adequate ( $r=.80$ ). Interrater reliability for the BASC-2 parent report form was adequate ( $r=.77$ ). Previous studies have reported moderate correlations between the locus of control and depression subscales of the BASC-2 ( $r=0.60$ ; Gilman & Huebner, 2006).

Research on the applicability of the BASC-2 in chronic illness populations is limited. Bender, Auciello, Morrison, MacAllister, and Zaroff (2008) reported significant agreement between the BASC-2 and Child Behavior Checklist. The highest correlations were seen on scales assessing externalizing behaviors, although correlations were also observed on scales assessing internalizing behaviors.

## CHAPTER IV

### RESULTS

This was a cross-sectional study, using a two-group design. The first step was to exclude all case related data based on the above mentioned exclusions. Any protocols that were not complete were identified and a decision made with regard to inclusion of the case. Cases with missing data on protocols were included if applicable scales were interpretable (e.g., required number of questions answered to determine depression and locus of control scale for the BASC-2). The groups were compared on age, gender, and other demographic variables to determine if there was a need to control for these differences in group comparisons. For each research question, appropriate analyses to test the hypotheses were completed.

#### Descriptive Results

The typically-developing control group was comprised of 11 participants and the chronic illness group was comprised of 12 participants. The control group had slightly more females than males, 6 versus 5, whereas the chronic illness group had more males, 8 males versus 3 females; however, there was no statistically significant difference between the gender distributions of the control group and chronic illness group [Fisher's Exact Test,  $p=.39$ ].

With respect to grade retention, more individuals were retained in the chronic illness group than in the control group, 2 versus 0. There was no statistically significant difference between the grade retention status of the control group and the chronic illness group [Fisher's Exact Test,  $p=.48$ ]. When comparing mother's highest level of

education, significantly more mothers in the typically-developing group had graduate degrees than the mothers in the chronic illness group. This result was statistically significant [Likelihood Ratio (13.03, 3),  $p=.005$ ]. In contrast, the difference between the father's educational level was not statistically significant [Likelihood Ratio (2.02, 3),  $p=.57$ ]. There was also no statistically significant difference in terms of individuals in the groups qualifying for free or reduced lunch [Fisher's Exact Test,  $p=.50$ ].

With respect to participants' age, individuals in each group ranged in age from 12 to 17. The mean age of participants in the control group was 14.9 years (SD=1.97) and the mean age of participants in the chronic illness group was 14.8 years (SD=1.6). This difference was not statistically significant ( $F(1, 19) = 0.11$ ;  $p=.92$ ). Participants in the typically-developing group had a mean grade of 8.4 (SD=3.4) and the chronic illness group had a mean grade of 9.2 (SD=1.6). The difference in grade was not statistically significant [ $F(1, 20) = .53$ ;  $p=.47$ ].

Of the individuals in the chronic illness group, three reported a history of epilepsy (27.3%) and eight individuals reported asthma or allergies and taking an asthma preventative (72.7%). Of the parents of adolescents with epilepsy, 0% reported the belief that their child's seizures were under control. Of the parents of adolescents with asthma, 40% reported the belief that their child's asthma attacks were under control. Overall, 25% of the participating parents believed that their children's chronic illness was under control.

To further investigate the level of control of the participants' chronic illness, the demographic questionnaire asked the number of months since the adolescent's last

asthma attack/seizure. Of the participating individuals, ratings indicated that it had been 0-8 months since the last asthma attack or seizure; however, several parents with asthma did not report the length of time since their child's last asthma attack. Parents of individuals with asthma reported a range of 1-8 months since their child's last asthma attack, and for those with epilepsy a range of 0-8 months since their last seizure.

Another factor to be considered when assessing level of control is the number of medications the child is currently taking. The participants in the chronic illness group each indicated taking an average of 0.88 medications. The individuals with epilepsy took more medications (mean=1.67, SD=.58) than the asthma group (mean=0.75, SD=.50). Overall, 62.5% of the participants in the chronic illness group were currently taking medications for their medical condition.

The age of onset in the chronic illness group ranged from 4 to 10 years of age with a mean age of onset for the chronic illness group was 5.25 years old (SD=2.86). Several individuals who reported a diagnosis of asthma did not indicate the age of onset.

### **Research Question One**

It was hypothesized that children with chronic illnesses would demonstrate patterns of impairment in executive functions. Descriptive data were examined in order to determine whether the group mean for the GEC composite of the BRIEF for the chronic illness group was within normal limits. As another indicator, the frequency with which children with epilepsy or asthma obtained scores on the BRIEF GEC in the clinically significant range ( $T > 70$ ) was determined. Table 3 presents the means and standard deviations for the measure used to assess executive functioning. In general,



from the parent perspective, the adolescents in the chronic illness group demonstrated clinically significant deficits in executive functioning 16.7% of the time. Those in the control group demonstrated clinically significant deficits in executive functioning 0% of the time, as reported by their parents. The mean GEC for the control group was 47.64 (SD=6.30) and the mean for the chronic illness group was 54.58 (SD=13.75). Results of the BRIEF Parent Report are provided in Table 3.

Table 3  
*Parent Reported Executive Function*

	<i>Typically Developing Group (N=11)</i>		<i>Chronic Illness Group (N= 12)</i>	
<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Global Executive Composite	47.64	6.30	54.58	13.75

Note. Clinically significant scores are >70. SD= Standard Deviation.

Descriptive data from the BRIEF Self-Report were examined in order to determine whether the group mean for the GEC composite for the chronic illness group was within normal limits. In addition, the frequency with which children in the chronic illness group obtained scores on the BRIEF GEC in the clinically significant range (T>70) was determined. Table 4 presents the means and standard deviations for the self-report measure used to assess executive functioning. In general, from the adolescents' perspective, those in the chronic illness group demonstrated clinically significant deficits in executive functioning 20% of the time. The individuals in the control group demonstrated clinically significant deficits 0% of the time. The mean GEC for the typically-developing group was 53.13 (SD=10.45) and the mean score for the chronic

illness group was 54.36 (SD=14.47). Results of the BRIEF Self-Report are provided in Table 4.

Table 4  
*Self-Reported Executive Function*

	Typically Developing Group (N=8)		Chronic Illness Group (N= 11)	
<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Global Executive Composite	53.13	10.45	54.36	14.47

Note. SD=Standard Deviation.

It was also hypothesized that children with chronic illness would demonstrate a pattern of executive function impairment that is significantly different from typically developing children. An ANCOVA was run to determine the differences in parent-reported executive functioning abilities in the chronic illness and control group after controlling for mother's highest level of education. After adjustment for mother's highest educational level, there was a statistically significant difference in executive function between the chronic illness and control groups [ $F(1, 19)=5.97, p=.02$ , partial  $\eta^2=.24$ ]. Parent-reported executive function was significantly higher (more impaired) in the chronic illness group ( $M=57.02, SE=3.30$ ) compared to the control group ( $M=43.88, SE=3.68$ ), a mean difference of 13.13 points [95% CI [1.89, 24.38],  $p < .05$ ]. Results of the ANCOVA are presented in Table 5 and Table 6.

Table 5

*ANCOVA Estimates of Parent-Report BRIEF by Group*

Group	Observed Mean	Adjusted Mean	SD	n
Typically-Developing	47.64	43.88	3.68	11
Chronic Illness	54.58	57.02	3.30	12

Note. BRIEF= Behavior Rating Inventory of Executive Function, SD= Standard Deviation

Table 6

*ANCOVA Summary of Parent-Report BRIEF by Group*

Source	Sum of Squares	df	Mean Square	F	P	Partial Eta Squared
Contrast	646.82	1	646.82	5.97	.02	.24
Error	2057.05	19	108.27			

Note. BRIEF= Behavior Rating Inventory of Executive Function, df= degrees freedom

When examining the between group differences in self-report BRIEF scores, an ANCOVA was also used to control for mother's highest level of education. After adjustment for mother's highest educational level, there was no statistically significant difference in executive function between the chronic illness and control groups [ $F(1, 15)=1.96, p=.39$ ]. Self-reported executive function showed a trend of being higher in the chronic illness group ( $M=56.53, SE=4.21$ ) compared to the control group ( $M=49.88, SE=5.48$ ), but the mean difference of 6.65 points was not statistically significant [95% CI [-22.49, 9.20].  $p=.39$ ]. Results of the ANCOVA are presented in Table 7 and Table 8.

Table 7

*ANCOVA Estimates of Self-Report BRIEF by Group*

Group	Observed Mean	Adjusted Mean	SD	n
Typically-Developing	49.88	5.48	5.30	8
Chronic Illness	54.36	56.53	4.21	11

Note. BRIEF= Behavior Rating Inventory of Executive Function, SD= Standard Deviation

Table 8

*ANCOVA Summary of Self-Report BRIEF by Group*

Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Contrast	134.77	1	134.77	.80	.39	.05
Error	2526.68	15	168.45			

Note. BRIEF= Behavior Rating Inventory of Executive Function, df= degrees freedom

An additional hypothesis was that if adolescents have poorly controlled epilepsy or asthma, as indicated by parent-reported control of illness and number of medications, they will be more likely to demonstrate executive impairment. This relationship was examined using a linear regression, with the BRIEF GEC scores as the dependent variables and illness-related variables as the independent variables.

When examining the relationship between parent-reported GEC scores and number of medications taken, there was independence of residuals, as assessed by a Durbin-Watson statistic of 2.13. There was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus the standardized predicted values. In addition, residuals were normally distributed, as assessed by visual inspection of a normal probability plot. Number of medications taken accounted for 33% of the variation in parent-reported GEC scores with adjusted  $R^2=.196$ , a small effect size. The

number of medications taken did not statistically significantly predict parent-reported BRIEF GEC scores [ $F(1, 5)=2.47, p=.18$ ]. Results of the regression analysis are provided in Table 9 and results of the corresponding analysis of variance are provided in Table 10.

Table 9  
*Regression of Parent-Reported GEC Scores and Number of Medications*

Variable	<i>B</i>	SE <i>B</i>	<i>B</i>	<i>p</i>	95% CI
Constant	42.40	10.96		.01	14.22-70.58
Number of Medications	13.15	8.37	.58	.18	-8.38-34.68
$R^2$	.33				
Adjusted $R^2$	.20				

Note. CI= confidence interval. SE=standard error. GEC= Global Executive Composite.

Table 10  
*ANOVA of Parent-Reported GEC Scores and Number of Medications*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	494.06	1	494.06	2.47	.18
Residual	1001.65	5	200.33		
Total	1495.71	6			

Note. df= degrees of freedom. GEC= Global Executive Composite.

When examining the relationship between parent-reported GEC scores and parent-reported control of illness, there was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus the standardized predicted values. In addition, residuals were normally distributed, as assessed by visual inspection of a normal probability plot. Parent-reported control of illness accounted for 63.2% of the variation in parent-reported GEC scores with adjusted  $R^2=.59$ , a medium effect size.

Parent-reported control of illness statistically significantly predicted parent-reported BRIEF GEC scores [ $F(1, 8)=13.74, p=.006$ ]. Results of the regression analysis are provided in Table 11 and results of the corresponding analysis of variance are provided in Table 12.

Table 11  
*Regression of Parent-Reported GEC Scores and Reported Control*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	p	95% CI
Constant	73.00	5.48		.00	60.36-85.64
Reported Control	-24.29	6.55	-.80	.006	-39.4- -9.17
$R^2$	.63				
Adjusted $R^2$	.59				

Note. CI= confidence interval. SE=standard error. GEC= Global Executive Composite.

Table 12  
*ANOVA of Parent-Reported GEC Scores and Reported Control of Illness*

Model	Sum of Squares	df	Mean Square	F	p
Regression	1238.57	1	1238.57	13.74	.006
Residual	721.43	8	90.18		
Total	1960.00	9			

Note. df=degrees of freedom. GEC=Global Executive Composite.

When examining the relationship between self-reported GEC scores and number of medications taken, there was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus the standardized predicted values. In addition, residuals were normally distributed, as assessed by visual inspection of a normal probability plot. Number of medications taken accounted for 27% of the variation in self-reported GEC scores, with adjusted  $R^2=.09$ , a small effect size. The number of

medications taken did not statistically significantly predict self-reported BRIEF GEC scores [ $F(1, 4)=1.48, p=.29$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 13 and Table 14, respectively.

Table 13

*Regression of Self-Reported GEC Scores and Number of Medications Taken*

Variable	<i>B</i>	SE <i>B</i>	<i>B</i>	<i>p</i>	95% CI
Constant	47.12	12.77		.02	11.65-82.58
Number of Medications	11.47	9.43	.52	.29	-14.72-37.66
$R^2$	.27				
Adjusted $R^2$	.09				

Note. CI= confidence interval. SE=standard error. GEC=Global Executive Composite.

Table 14

*Analysis of Variance of Self-Reported GEC Scores and Number of Medications Taken*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	372.79	1	372.79	1.48	.29
Residual	1008.71	4	252.18		
Total	1381.50	5			

Note. df=degrees of freedom. GEC= Global Executive Composite.

When examining the relationship between self-reported GEC scores and parent-reported control of illness, there was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus the standardized predicted values. In addition, residuals were normally distributed, as assessed by visual inspection of a normal probability plot. Parent-reported control of illness accounted for 62.3% of the variation in self-reported GEC scores with adjusted  $R^2=56.9%$ , a medium effect size. Parent-reported control of illness statistically significantly predicted self-reported BRIEF GEC

scores [ $F(1, 7)=11.58, p=.01$ ]. Results of the regression analysis are provided in Table 15 and results of the corresponding analysis of variance are provided in Table 16.

Table 15  
*Regression of Self-Report GEC and Reported Control of Illness*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	p	95% CI
Constant	71.67	6.08		<.001	57.29-86.0
Reported Control	-25.33	7.45	-.79	.01	-42.94- -7.73
$R^2$	.62				
Adjusted $R^2$	.57				

Note. CI= confidence interval. SE=standard error. GEC= Global Executive Composite.

Table 16  
*ANOVA of Self-Reported GEC Scores and Reported Control of Illness*

Model	Sum of Squares	df	Mean Square	F	p
Regression	1283.56	1	1283.56	11.58	.01
Residual	776.00	7	110.86		
Total	2059.56	8			

Note. df=degrees of freedom. GEC= Global Executive Composite.

## Research Question Two

It was hypothesized that children with chronic illness would demonstrate learned helplessness on the CASQ-R and the BASC-2 Self-Report. Descriptive data for the self-reported variables of interest (Children’s Attributional Style Questionnaire-Revised and the Locus of Control subscale of the BASC-2 Self-Report) are provided in Table 13. To address this question, the descriptive data were examined in order to determine whether the group means for the chronic illness group were indicative of learned helplessness. Scores that were two standard deviations or more above the mean on the BASC-2 (T-



score>70) or a negative overall score on the CASQ-R were considered to be indicative of learned helplessness. As a second indication of learned helplessness associated with chronic illness, the frequency with which children in the chronic illness group obtained negative scores on the CASQ-R and clinically significant scores on the Locus of Control scale of the BASC-2 Self-Report were determined.

The mean score for the typically-developing group was 1.44 (SD=1.59) on the CASQ-R and 53.2 (SD=10.8) on the BASC-2 Locus of Control subscale self-reports. The chronic illness group demonstrated a mean score of .3 (SD=.82) on the CASQ-R and 48.43 (SD=9.52) on the Locus of Control. In the chronic illness group, 9.1% of the individuals reported clinically significant scores on the Locus of Control subscale of the BASC-2 and 20% indicated a negative attributional style as measured by the CASQ-R. In the typically-developing group, 0% of the individuals indicated clinically significant scores on the Locus of Control subscale and 11.1% indicated a negative attributional style on the CASQ-R. The means and standard deviations on the measures are presented for each group in Table 17.

Table 17  
*Self-Reported Learned Helplessness*

<i>Variable</i>	<i>Typically Developing Group (N=9)</i>		<i>Chronic Illness Group (N=11)</i>	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
CASQ-R Total Score	1.44	1.59	.30	.82
BASC-2 SR Locus of Control	51.67	10.57	47.82	11.95

Note. Positive scores on the CASQ-R indicate primarily a positive attributional style. BASC-2 scores >70 are clinically significant. CASQ-R= Children’s Attributional Style Questionnaire-Revised. BASC-2= Behavior Assessment System for Children, Second Edition.

In order to address the question of whether the level of learned helplessness impairment in children with chronic illness is significantly different from that of the control group, an ANCOVA. After adjustment for mother's highest level of education, there was not a statistically significant difference in attributional style as measured by the CASQ-R [ $F(1, 15)=2.46, p=.14$ ]. Results of the ANCOVA are reported in Table 18. In addition, learned helplessness as measured by the BASC-2 Locus of Control subscale was not significantly different between the two groups,  $F(1, 16)=.10, p=.75$ . The results of this ANCOVA are presented in Table 19.

Table 18  
*ANCOVA Summary of CASQ-R by Group*

Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Group	4.28	1	4.28	2.459	1.38	.141
Error	26.10	15	1.74			

Note. CASQ-R= Children's Attributional Style Questionnaire-Revised, df= degrees freedom.

Table 19  
*ANCOVA Summary of Locus of Control Subscale by Group*

Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Group	14.45	1	14.45	.10	.75	.006
Error	2260.19	16	141.26			

Note. df= degrees freedom

The next question addressed whether illness related factors are predictive of learned helplessness. In order to address this question, regression analyses were conducted. Learned helplessness as measured by the CASQ-R and the BASC-2 Locus

of Control scale were the dependent variables. Parent-reported control of illness and number of medications taken were the independent variables. A regression was run to predict CASQ-R Total Score from parent-reported control of illness. Control of illness accounted for 7% of the variation in CASQ-R scores, with adjusted  $R^2=0\%$ . Control of illness did not statistically significantly predicted CASQ-R scores [ $F(1, 6) = .45, p = .53$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 20 and Table 21, respectively.

Table 20  
*Regression of CASQ-R and Reported Control*

Variable	<i>B</i>	SE <i>B</i>	B	p	95% CI
Constant	.67	.55		.27	-.68-2.02
Reported Control	-.47	.70	-.26	.53	-2.17-1.24
$R^2$	.32				
Adjusted $R^2$	.19				

Note. CI= confidence interval. SE=standard error. CASQ-R= Children’s Attributional Style Questionnaire-Revised.

Table 21  
*Analysis of Variance of CASQ-R and Reported Control*

Model	Sum of Squares	Df	Mean Square	F	p
Regression	.41	1	.41	.45	.53
Residual	5.47	6	.91		
Total	5.88	7			

Note. df=degrees of freedom. CASQ-R= Children’s Attributional Style Questionnaire-Revised.

A regression was run to predict CASQ-R Total Score from number of medications taken. Number of medications taken accounted for 1.2% of the variation in

CASQ-R scores, with adjusted  $R^2=0\%$ . Number of medications taken did not statistically significantly predict CASQ-R scores [ $F(1, 4) = 0.05, p=.84$ ]. Results of the regression analysis and corresponding ANOVA are presented in Table 22 and Table 23, respectively.

Table 22  
*Regression of CASQ-R and Number of Medications Taken*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	p	95% CI
Constant	.77	.37		.10	-.25-1.78
Number of Medications	.06	.27	.11	.84	-.69-.81
$R^2$	.01				
Adjusted $R^2$	.0				

Note. CI= confidence interval. SE=standard error. CASQ-R= Children’s Attributional Style Questionnaire-Revised.

Table 23  
*Analysis of Variance of CASQ-R and Number of Medications Taken*

Model	Sum of Squares	df	Mean Square	F	p
Regression	.01	1	.01	0.05	.84
Residual	.82	4	.21		
Total	.83	5			

Note. df= degrees of freedom. CASQ-R= Children’s Attributional Style Questionnaire-Revised.

A regression was run to predict BASC-2 Locus of Control subscale score from parent-reported control of illness. Control of illness accounted for 28.7% of the variation in Locus of Control scores, with adjusted  $R^2=18.5\%$ . Control of illness did not statistically significantly predict Locus of Control scores [ $F(1, 7) = 2.82, p=.14$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 24 and Table 25, respectively.

Table 24

*Regression of BASC-2 Locus of Control and Reported Control*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	<i>p</i>	95% CI
Constant	56.00	6.73		.00	40.09-71.91
Reported Control	-13.83	8.24	-.54	.14	-33.32-5.65
$R^2$	.29				
Adjusted $R^2$	.19				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 25

*Analysis of Variance of Locus of Control and Reported Control of Illness*

Model	Sum of Squares	Df	Mean Square	F	<i>p</i>
Regression	382.72	1	382.72	2.82	.14
Residual	950.83	7	135.83		
Total	1333.56	8			

Note. df=degrees of freedom.

A regression also was run to predict BASC-2 Locus of Control scores from the number of medications taken. Number of medications taken accounted for 14.2% of the variation in BASC-2 Locus of Control scores, with adjusted  $R^2=0\%$ . Number of medications taken did not statistically significantly predict BASC-2 Locus of Control scores [ $F(1, 4) = 0.66, p = .46$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 26 and Table 27, respectively.

Table 26

*Regression of BASC-2 Locus of Control and Number of Medications Taken*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	p	95% CI
Constant	42.77	11.73		.02	10.19-75.34
Number of Medications	7.06	8.66	.38	.46	-16.99-31.12
$R^2$	.14				
Adjusted $R^2$	.0				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 27

*Analysis of Variance of BASC-2 Locus of Control and Number of Medications Taken*

Model	Sum of Squares	df	Mean Square	F	p
Regression	141.18	1	141.18	0.66	.46
Residual	850.82	4	212.71		
Total	992.00	5			

Note. df=degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

### Research Question Three

It was hypothesized that children with chronic illness would demonstrate clinical levels of depression ( $T \geq 70$ ). The descriptive data was examined in order to determine whether the group mean for the chronic illness group was indicative of depression on parent and self-report. As a second indicator of depression in children with epilepsy or asthma, the frequency with which children in the chronic illness group had T-scores  $\geq 70$  on the parent and child reports was determined. Table 22 presents the means and standard deviations for the measures that were used to assess depression.

In general, from the parent’s perspective, those in the chronic illness group demonstrated clinically significant symptoms of depression 0% of the time. The individuals in the control group also demonstrated clinically significant symptoms of

depression 0% of the time. The mean T-score for the typically developing group was 48.45 (SD=5.61) and the mean score in the chronic illness group was 52.00 (SD=12.69).

From the adolescent’s perspective, those in the chronic illness group demonstrated clinically significant symptoms of depression 8.33% of the time. The individuals in the control group did not demonstrate clinically significant symptoms of depression. Based on BASC-2 self-report, the mean T-score for the typically developing group was 46.11 (SD=6.01) and the mean for the chronic illness group was 44.36 (SD=5.61). The means and standard deviations for the parent- and self- report measures are presented for each group in Table 28.

Table 28  
*Depressive Symptoms Reported on the BASC-2*

<i>Variable</i>	<i>Typically Developing Group (N=9)</i>		<i>Chronic Illness Group (N=11)</i>	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Parent Rated Depression	48.45	5.61	52.00	12.69
Self-Report of Depression	46.11	6.01	44.36	5.55

Note. SD=standard deviation. BASC-2= Behavior Assessment System for Children, Second Edition.

In order to address the question of whether depression in children with chronic illness is significantly different from that of the control group, an Analysis of Covariance was run. After adjustment for mother’s highest level of education, there was not a statistically significant difference in parent-reported symptoms of depression on the BASC-2 [F(1, 19)=3.18,  $p=.09$ ]. In addition, there was no statistically significant difference in depressive symptoms as reported by the self-report BASC-2 between the

chronic illness and control groups [ $F(1, 16)=.36, p=.56$ ]. The results of the analysis of variance are presented in Table 29 and Table 30.

Table 29

*ANCOVA Summary of Parent-Reported Depression Subscale by Group*

Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Group	294.82	1	294.82	3.18	.09	.14
Error	1763.77	19	92.83			

Note. df= degrees freedom

Table 30

*ANCOVA Summary of Self-Reported Depression Subscale by Group*

Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Group	13.40	1	13.40	.36	.56	.02
Error	595.74	16	37.23			

Note. df= degrees freedom

It was also hypothesized that if adolescents have poorly controlled seizures/asthma, as indicated by parent-reported control and number of medications, they would be more likely to demonstrate symptoms of depression. In order to address this question, regression analyses were conducted. Depression as measured by the parent- and self-report BASC-2 depression subscales were the dependent variables. Parent-reported control and number of medications taken were the independent variables.

A regression was run to predict BASC-2 depression parent-report from parent-reported illness control. Parent-reported control accounted for 55.2% of the variation in BASC-2 scores, adjusted  $R^2=49.6\%$ . Parent-reported control statistically significantly



predicted parent-reported BASC-2 depression scores [ $F(1, 8)=9.86, p=.01$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 31 and Table 32, respectively.

Table 31

*Regression of BASC-2 Depression Parent-Report and Reported Control*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	<i>p</i>	95% CI
Constant	66.67	5.74		<.001	53.44-79.89
Reported Control	-21.52	6.86	-.74	.01	-37.33—5.72
$R^2$	.55				
Adjusted $R^2$	.50				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 32

*Analysis of Variance of BASC-2 Depression Parent-Report and Reported Control*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	972.88	1	972.88	9.86	.014
Residual	789.52	8	98.69		
Total	1762.40	9			

Note. df=degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

A regression was run to predict BASC-2 depression parent-report from number of medications taken. Number of medications accounted for 32.2% of the variation in BASC-2 scores, adjusted  $R^2=18.6\%$ . Number of medications taken did not statistically significantly predict parent-reported BASC-2 depression scores [ $F(1,5)=2.37, p=.18$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 33 and Table 34, respectively.

Table 33

*Regression of BASC-2 Depression Parent-Report and Number of Medications Taken*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	<i>p</i>	95% CI
Constant	41.20	10.58		.01	14.00-68.40
Number of Medications	12.45	8.08	.57	.18	-8.32-33.22
$R^2$	.32				
Adjusted $R^2$	.19				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 34

*Analysis of Variance of BASC-2 Depression Parent-Report and Number of Medications Taken*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	442.86	1	442.86	2.37	.18
Residual	932.85	5	186.57		
Total	1375.71	6			

Note. df= degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

A regression was then run to predict BASC-2 depression self-report scores from parent-reported control of illness. Parent-reported control accounted for 26.9% of the variation in BASC-2 self-report scores, adjusted  $R^2=16.5\%$ . Parent-reported control did not statistically significantly predict self-reported BASC-2 depression scores [F (1, 7)=2.58,  $p=.15$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 35 and Table 36, respectively.

Table 35

*Regression of BASC-2 Depression Self-Report and Reported Control*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	<i>p</i>	95% CI
Constant	48.67	3.13		.000	41.26-56.08
Reported Control	-6.17	3.84	-.52	.15	-15.24-2.91
$R^2$	.27				
Adjusted $R^2$	.17				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 36

*Analysis of Variance of BASC-2 Depression Self-Report and Reported Control*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	76.06	1	76.06	2.58	.15
Residual	206.17	7	29.45		
Total	282.22	8			

Note. df= degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

A regression was run to predict BASC-2 depression self-report from number of medications taken. Number of medications taken accounted for 21.9% of the variation in self-report BASC-2 depression scores, adjusted  $R^2=2.3\%$ . Number of medications taken did not statistically significantly predict self-reported BASC-2 depression scores,  $F(1, 4)=1.12$ ,  $p=.35$ . Results of the regression analysis and corresponding analysis of variance are presented in Table 37 and Table 38, respectively.

Table 37

*Regression of BASC-2 Depression Self-Report and Number of Medications Taken*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	<i>p</i>	95% CI
Constant	41.77	5.20		.001	27.34-53.19
Number of Medications	4.06	3.84	.47	.35	-6.59-14.71
$R^2$	.22				
Adjusted $R^2$	.02				

Note. CI= confidence interval. SE=standard error. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 38

*Analysis of Variance of BASC-2 Depression Self-Report and Number of Medications Taken*

Model	Sum of Squares	df	Mean Square	F	<i>p</i>
Regression	46.68	1	46.68	1.12	.350
Residual	166.82	4	41.71		
Total	213.50	5			

Note. df= degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

In addition, it was hypothesized that learned helplessness is predictive of significantly more symptoms of depression. In order to address the question of whether learned helplessness is predictive of depression, two regression analyses were conducted. Learned helplessness as measured by the CASQ-R and the Locus of Control scale of the BASC-2 will be the independent variables. Depression as measured by the Depression scale of the BASC-2 parent and self-report were the dependent variables.

A multiple linear regression was run to predict BASC-2 depression parent-report from learned helplessness, as measured by the CASQ-R and BASC-2 Locus of Control subscale. Learned helplessness accounted for 43.6% of the variation in parent-report BASC-2 depression scores, adjusted  $R^2=36.5\%$ . Learned helplessness statistically

significantly predicted parent-reported BASC-2 depression scores [ $F(2, 16)=6.18$ ,  $p=.01$ ]. Results of the regression analysis and corresponding analysis of variance are presented in Table 39 and Table 40, respectively.

Table 39

*Regression of Learned Helplessness and Parent-Reported BASC-2 Depression*

Variable	B	SE B	B	Significance	95% CI
Constant	20.63	9.20		.04	1.13-40.13
Locus of Control	.60	.19	.65	.006	.20-1.0
CASQ-R	.29	1.60	.04	.86	-3.10-3.68
$R^2$	.44				
Adjusted $R^2$	.37				

Note. CI= confidence interval. SE=standard error. CASQ-R= Children’s Attributional Style Questionnaire- Revised. BASC-2= Behavior Assessment System for Children, Second Edition

Table 40

*Analysis of Variance of Learned Helplessness and Parent-Reported BASC-2 Depression*

Model	Sum of Squares	df	Mean Square	F	p
Regression	874.06	2	437.03	6.18	.01
Residual	1131.62	16	70.73		
Total	2005.68	18			

Note. df=degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

A multiple linear regression was then run to predict BASC-2 depression self-report from learned helplessness, as measured by the CASQ-R and BASC-2 Locus of Control subscale. Learned helplessness accounted for 35.2% of the variation in self-report BASC-2 depression scores, adjusted  $R^2=27\%$ . Learned helplessness statistically significantly predicted self-reported BASC-2 depression scores [ $F(2, 16)=4.34$ ,  $p=.03$ ].

Results of the regression analysis and corresponding analysis of variance are presented in Table 41 and Table 42, respectively.

Table 41

*Regression of Learned Helplessness and Parent-Reported BASC-2 Depression*

Variable	<i>B</i>	SE <i>B</i>	$\beta$	Significance	95% CI
Constant	32.03	5.32		.00	20.74-43.31
Locus of Control	.26	.11	.51	.03	.03-.49
CASQ-R	.67	.93	.16	.48	-1.29-2.63
$R^2$	.35				
Adjusted $R^2$	.27				

Note. CI= confidence interval. SE=standard error. CASQ-R= Children’s Attributional Style Questionnaire-Revised. BASC-2= Behavior Assessment System for Children, Second Edition.

Table 42

*Analysis of Variance of Learned Helplessness and Parent-Reported BASC-2 Depression*

Model	Sum of Squares	df	Mean Square	F	p
Regression	205.51	2	102.75	4.34	.03
Residual	379.13	16	23.70		
Total	584.63	18			

Note. df= degrees of freedom. BASC-2= Behavior Assessment System for Children, Second Edition.

### Research Question Four

It was hypothesized that there is an association between learned helplessness, depression, and executive function abilities. To answer this question, the strength of the correlation between learned helplessness, depression, and executive function was determined for the full sample. A one-tailed Pearson’s product-moment correlation was run to assess the relationships between measures of executive function (parent- and self-

report BRIEF GEC), learned helplessness (BASC-2 Locus of Control, CASQ-R), and depression (parent- and self-report BASC-2 Depression). There was a strong positive correlation between parent-reported BRIEF GEC scores and self-reported BRIEF GEC scores ( $r=.62, p=.002$ ). There was a strong positive correlation between parent-reported depression and parent-reported BRIEF GEC ( $r=.74, p<.001$ ) and self-reported BRIEF GEC ( $r=.72, p<.001$ ). There was a strong positive correlation between self-reported depression and self-reported BRIEF GEC ( $r=.69, p=.001$ ) and parent-reported depression ( $r=.50, p=.01$ ). There was also a strong positive correlation between self-reported scores on the BASC-2 Locus of Control subscale and self-reported BRIEF GEC ( $r=.75, p<.001$ ), parent-reported depression ( $r=.66, p=.001$ ), and self-reported depression ( $r=.59, p=.003$ ). The correlational matrix is presented in Table 43.

Table 43  
*Correlations Between Executive Functions, Learned Helplessness, and Depression*

	1	2	3	4	5	6
1 Parent BRIEF GEC	1					
2 Self BRIEF GEC	.62**	1				
3 CASQ-R	.13	.29	1			
4 Parent Depression	.74**	.72**	.29	1		
5 Self Depression	.25	.69**	.36	.50*	1	
6 Locus of Control	.37	.75**	.39	.66**	.59**	1

Note. \* Correlation is significant at the 0.05 level (1-tailed). \*\* Correlation is significant at the 0.01 level (1-tailed). BRIEF= Behavior Rating Inventory of Executive Function, GEC= Global Executive Composite.

Finally, a hierarchical regression analysis was used in order to determine if learned helplessness and executive function predict depression for the sample when illness-related variables previously identified as predictors are added in for the chronic illness sample. This final step was conducted because illness-related variables predicted executive function in the prior analyses. Parent-reported control of chronic illness was used, as this was the only illness-related factor to statistically significantly predict part of the model (parent reported BRIEF GEC scores, self-reported BRIEF GEC scores, parent reported depression).

When examining the prediction of parent-reported depression scores, the addition of BRIEF scores to parent-reported control led to an increase in  $R^2$  of .14 [ $F(2, 4)=.40$ ,  $p=.10$ ]. The addition of learned helplessness variables to the prediction of parent-reported depression led increase in  $R^2$  of .13 [ $F(2, 2)=1.16$   $p=.46$ ]. The full model of parent-reported control, executive function, and learned helplessness to predict parent-reported depression was not statistically significant,  $R^2=.89$  [ $F(5, 2)=3.13$ ,  $p=.26$ , adjusted  $R^2=1.0$ ]. Results of the hierarchical regression analysis and corresponding analysis of variance are presented in Table 44 and Table 45, respectively.



Table 44

*Hierarchical Regression of Reported Control, Executive Functions, Locus of Control, and Parent-Reported Depression*

Predictor	$\Delta R^2$	B
Step 1	.55	
Reported Control		-.78
Step 2	.57	
Parent-Reported GEC		.54
Self-Reported GEC		.36
Step 3	.60	
CASQ-R		.17
Locus of Control		.60

Note. GEC= Global Executive Composite, CASQ-R= Children's Attributional Style Questionnaire-Revised.

Table 45

*Analysis of Variance of Hierarchical Regression, Parent-Report*

Measure	Source	SS	df	MS	F	p
Reported Control	Regression	1068.03	1	1038.03	9.49	.02
	Residual	675.47	6	112.58		
	Total	1743.52	7			
Reported Control, BRIEF GEC	Regression	1316.81	3	438.94	4.12	.10
	Residual	426.69	4	406.67		
	Total	1743.50	7			
Reported Control, BRIEF GEC, Locus of Control	Regression	1546.04	5	309.21	3.13	.26
	Residual	197.46	2	98.73		
	Total	1743.50	7			

Note. BRIEF= Behavior Rating Inventory of Executive Function, GEC= Global Executive Composite, SS= Sum of Squares, df= degrees of freedom, MS= mean square.

When examining the prediction of self-reported depression scores, the addition of BRIEF scores to number of medications taken led to an increase in  $R^2$  of .49. This was not a statistically significant increase [ $F(2, 4)=3.44, p=.14$ ]. The addition of learned helplessness variables to the model led to an increase in  $R^2$  of .25. This was also not a

statistically significant increase [ $F(2, 2)=8.42, p=.11$ ]. Results of the hierarchical regression analysis and corresponding analysis of variance are presented in Table 46 and Table 47, respectively.

Table 46  
*Hierarchical Regression of Reported Control, Executive Functions, Locus of Control, and Self-Reported Depression*

Predictor	$\Delta R^2$	$\beta$
Step 1	.11	
Reported Control		-.48
Step 2	.51	
Parent-Reported GEC		.20
Self-Reported GEC		1.12
Step 3	.90	
CASQ-R		-.05
Locus of Control		.96

Note. GEC= Global Executive Composite, CASQ-R= Children's Attributional Style Questionnaire- Revised.

Table 47  
*Analysis of Variance of Hierarchical Regression, Self-Report*

Measure	Source	SS	df	MS	F	p
Reported Control	Regression	60.21	1	60.21	1.82	.23
	Residual	198.67	6	33.11		
	Total	258.88	7			
Reported Control, BRIEF GEC	Regression	185.88	3	61.96	3.40	.13
	Residual	73.00	4	18.25		
	Total	258.88	7			
Reported Control, BRIEF GEC, Locus of Control	Regression	251.12	5	50.23	12.96	.07
	Residual	7.75	2	3.88		
	Total	258.88	7			

Note. BRIEF= Behavior Rating Inventory of Executive Function, GEC= Global Executive Composite, SS= Sum of Squares, df= degrees of freedom, MS= mean square.

## CHAPTER V

### SUMMARY

Previous research has demonstrated that children with chronic illnesses are significantly more likely to experience academic, behavioral, and emotional difficulties. Difficulties with executive functioning and symptoms of depression, anxiety, and suicidality are particularly concerning. It was hypothesized that these difficulties could be impacted by the development of learned helplessness over time and/or executive functioning abilities or deficits. It has previously been proposed that depression is caused by learned helplessness in individuals with chronic illness; however, this relationship has not been fully studied and results are not conclusive. Knowledge of the relationship between depression, executive functioning, and learned helplessness could contribute to prevention and intervention efforts to benefit individuals with chronic illness. The proposed theoretical model suggests that chronic illness variables have an effect on learned helplessness and executive functioning abilities, with a bidirectional relationship between learned helplessness and executive functioning. Additionally, it was hypothesized that these factors then lead to an increased risk of depressive symptomatology.

In regards to the first hypothesis, the current analyses revealed statistically significant differences in parent-reported executive function, with the chronic illness demonstrating a pattern of increased deficits. No statistically significant differences were found between the groups on self-reported executive function. When examining the relationship between illness related-factors, parent-reported control significantly

predicted parent- and self-reported executive function. Number of medications did not predict parent- or self-report executive functioning abilities. This result was consistent with previous literature, which has shown strong support for deficits in executive functions in children with chronic illness.

When examining the second hypothesis, there was no significant difference between the control group and the chronic illness group on either measure of learned helplessness (CASQ-R and BASC-2 Locus of Control subscale). In addition, parent-reported control of illness and number of medications taken did not significantly predict CASQ-R or Locus of Control subscale scores on the BASC-2. These findings contribute to the current literature, as there is limited research examining the relationship between learned helplessness and individuals with chronic illness.

In regards to depression, there were no statistically significant differences in depressive symptoms between groups on either the parent- or self-report BASC-2. The number of medications taken did not predict parent- or self-reported depression. Parent-reported control did not predict self-reported depression; however, it did predict parent-reported depression. In addition, learned helplessness significantly predict parent- and self-reported depressive symptoms. This result appears to contradict several studies reporting significantly more symptoms of depression in individuals with chronic illness.

When examining the relationships between each piece of the model, there were several strong associations. There were strong correlations between parent-reported executive function and self-reported executive function. Parent-reported depression had a strong association with parent- and self-reported executive function. Self-reported

depression had a strong correlation with self-reported executive function and parent-reported depression. In addition, self-reported locus of control had strong correlations with self-reported executive function and self- and parent-reported depression. The model of learned helplessness, executive function, and parent-reported control of illness did not significantly predict self- or parent-reported depression. These results support they hypothesis that there is a relationship between executive function and depression. In addition, it supports the hypothesis that locus of control is related to executive function abilities and depression.

### **Clinical Implications**

The finding that chronic illness is associated with impairments in executive functions can lead to planning a more comprehensive assessment. It would also be beneficial to consider executive function abilities when determining appropriate goals for educational outcomes for children with chronic illness. Considering the relationship between executive function and depression also can inform assessment and intervention efforts, as improvements in one may lead to improvements in the other. In addition, behavioral interventions for depression could have the potential to improve an individual's control over their illness and/or reduce illness severity. It is also very important to consider the relationship between reported control of the chronic illness and factors such as depression and executive function, as this knowledge can inform intervention efforts.

## **Limitations**

A number of limitations must be considered when interpreting the findings of this study. First, the small sample size limits the ability to generalize results. In addition, a small sample size makes it more difficult to find significant relationships in the data. Second, the data were collected through a sample of convenience. This means that the individuals in the study may not represent the population as a whole. Another limitation of the current study is the reliance on self-reported data. Self-reported data is limited due to the difficulty in verifying how accurate the reports are. The present study attempted to address this limitation by using both parent- and self-reports. An additional limitation is the lack of longitudinal examination of the data. It would be very beneficial to have baseline data on individuals with chronic illness in order to determine if the illness itself has the measured effects.

## **Future Directions**

Future research should examine these relationships with larger sample sizes. It would be ideal to separate the chronic illness group into specific illnesses in order to obtain accurate results for individual groups. Additional research should be conducted on the relationship between chronic illness and learned helplessness or attributional style. In addition, it is important to examine how the bidirectional relationship between learned helplessness and executive function. Research has also demonstrated strong support for the relationship between chronic illness and depression; however, the illness-related factors that contribute to the expression of depressive symptomatology should be further examined.

An additional consideration for future research would be the possibility of conducting longitudinal research. Examination of executive function abilities, learned helplessness, and depression from baseline after the diagnosis is initially made on would provide valuable information on these factors throughout the course of a chronic illness. In addition, it would help with examining how frequency of seizures or asthma attacks could affect the individual.

### **Conclusion**

The current study revealed a significant difference in executive function abilities between the chronic illness and typically-developing groups. Parent-reported control of illness predicted executive function abilities and parent-reported depression. Learned helplessness was also found to predict symptoms of depression. Associations were found between several factors, primarily executive function and depression symptomatology. The model of learned helplessness, executive function, and parent-reported control of illness significantly predicted parent-reported depression. This information may be used to improve assessment and intervention efforts. Additional research designed specifically to assess the moderating effect of executive function on helplessness and depression in chronic illness is needed.

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**APPENDIX A**

**BACKGROUND QUESTIONNAIRE**

Information Sheet

Case # \_\_\_\_\_

**Age of Adolescent:**      years **Gender of Adolescent:** Male \_\_\_\_\_ Female \_\_\_\_\_

**Race/Ethnicity:** African American \_\_\_\_\_ Asian/Pacific Islander \_\_\_\_\_ Hispanic/Latino \_\_\_\_\_

Native American \_\_\_\_\_ White non-Hispanic \_\_\_\_\_ Biracial \_\_\_\_\_

Other: \_\_\_\_\_

**Mother's Highest Educational Level:** 9<sup>th</sup>-11<sup>th</sup> grade \_\_\_\_\_

High School Diploma/GED \_\_\_\_\_ Community College or Technical School \_\_\_\_\_

Some College \_\_\_\_\_ Completed 4 year degree \_\_\_\_\_

Completed Graduate Degree \_\_\_\_\_

**Father's Highest Educational Level:** 9<sup>th</sup>-11<sup>th</sup> grade \_\_\_\_\_

High School Diploma/GED \_\_\_\_\_ Community College or Technical School \_\_\_\_\_

Some College \_\_\_\_\_ Completed 4 year degree \_\_\_\_\_

Completed Graduate Degree \_\_\_\_\_

**Is your child eligible for free/reduced lunch?** Yes \_\_\_\_\_ No \_\_\_\_\_

**What is the primary language in your home?** English \_\_\_\_\_ Spanish \_\_\_\_\_

Other: \_\_\_\_\_

**Does your child speak a language other than English?** Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what language? \_\_\_\_\_

**Educational History:**

**What grade is this child in currently?** \_\_\_\_\_

**Has your child repeated a grade in school?** YES \_\_\_\_\_ NO \_\_\_\_\_

**Has your child skipped a grade in school?** YES \_\_\_\_\_ NO \_\_\_\_\_

**Did this child participate in a bilingual education program at school?**

YES\_\_ NO \_\_\_\_\_

**Does she or he currently receive ESL or LEP services?**

YES\_\_\_\_\_ NO \_\_\_\_\_

**Does your child receive Special Education services?**

YES\_\_\_\_\_ NO \_\_\_\_\_

If yes, for what reason(s)? \_\_\_\_\_

**Does your child receive 504 services or accommodations?**

YES\_\_\_\_\_ NO \_\_\_\_\_

If yes, for what reason(s)? \_\_\_\_\_

**Medical History:**

Has your child had any of the following or been diagnosed with any of the following?

- |  |  |                                      |
|--|--|--------------------------------------|
| <input type="checkbox"/> Asthma              | <input type="checkbox"/> Head Injury                   | <input type="checkbox"/> Cancer      |
| <input type="checkbox"/> Seizure or Epilepsy | <input type="checkbox"/> Loss of Consciousness or Coma | <input type="checkbox"/> Concussion  |
| <input type="checkbox"/> Head Injury         | <input type="checkbox"/> Cystic Fibrosis               | <input type="checkbox"/> Diabetes    |
| <input type="checkbox"/> ADHD/ADD            | <input type="checkbox"/> Cerebral Palsy                | <input type="checkbox"/> Sickle Cell |
| <input type="checkbox"/> Learning Disability | <input type="checkbox"/> Down Syndrome                 | <input type="checkbox"/> Autism      |
| <input type="checkbox"/> Asperger Syndrome   | <input type="checkbox"/> Intellectual Disability       | <input type="checkbox"/> Stroke      |

Other: \_\_\_\_\_

What medications is your child currently prescribed? \_\_\_\_\_

If you indicated that your child sustained a **head injury or concussion**, please answer the following questions:

To the best of your recollection, how many times did your child experience a head injury or concussion?

\_\_\_\_\_

In conjunction with a head injury, did your child experience dizziness or confusion?

YES \_\_\_\_\_ NO \_\_\_\_\_

If involved in sports, in conjunction with a head injury was your child held out from playing in the sport? YES \_\_\_\_\_ NO \_\_\_\_\_

In conjunction with a head injury, did your child lose consciousness?

YES \_\_\_\_\_ NO \_\_\_\_\_

If your child loss consciousness, approximately how long were they unconscious? \_\_\_\_\_

In conjunction with a head injury, was your child treated by a physician or neurologist?

YES \_\_\_\_\_ NO \_\_\_\_\_

In conjunction with a head injury, was your child hospitalized for 1 or more days?

YES \_\_\_\_\_ NO \_\_\_\_\_

If you indicated that your child has **epilepsy**, please answer the following questions:

At what age was your child first diagnosed with epilepsy? \_\_\_\_\_

If you know, what type of epilepsy does your child have? \_\_\_\_\_

When was your child's last seizure (month and year)? \_\_\_\_\_

How frequently does your child have seizures?

Once a year or less \_\_\_\_\_

More than once a year, but less than once a month \_\_\_\_\_

Once a month \_\_\_\_\_ Once a week \_\_\_\_\_ Daily \_\_\_\_\_

Would you describe your child's epilepsy as "controlled"?

YES \_\_\_\_\_ NO \_\_\_\_\_

How many medications is your child currently taking for epilepsy? \_\_\_\_\_

Is your child restricted from certain activities because of the epilepsy?

YES \_\_\_\_\_ NO \_\_\_\_\_

Has your child had surgery to gain better control of the epilepsy?

YES \_\_\_\_\_ NO \_\_\_\_\_

If you indicated that your child has **asthma**, please answer the following questions:

At what age was your child first diagnosed with asthma? \_\_\_\_\_

When was your child's last asthma attack (month and year)? \_\_\_\_\_

Would you describe your child's asthma as "controlled"?

YES \_\_\_\_\_ NO \_\_\_\_\_

How many medications is your child currently taking on a daily basis for asthma control? \_\_\_\_\_

Is your child restricted from certain activities because of the asthma?

YES \_\_\_\_\_ NO \_\_\_\_\_

**APPENDIX B**  
**COVER LETTER**

Dear Parent

Thank you for your interest in our research project, “Thinking and Problem-Solving in Adolescents. We hope this research study will help us better understand adolescent thinking in general, as well as in specific groups of adolescents (e.g., those who are bilingual, those who have epilepsy, asthma, or who have had head injury).

This packet contains a set of forms labeled “parent” and a set of forms labeled “adolescent”, each with a business reply envelope. After you have read and signed the consent and permission forms, please ask your son/daughter to read and sign the assent form and complete the adolescent packet. When you have completed the parent packet, please put all forms in the business reply envelope and mail them back to us. If a research staff member is present, you can hand them to that person. Please prompt your son/daughter to complete all forms and mail them back as well.

Once we receive the packets and link the parent and adolescent forms, we will remove any other identifying information. Each parent-adolescent pair will be entered into a drawing for a \$100 gift card; we hope to have 250 families in the drawing. In addition, for each completed parent packet returned, a \$10 donation will be made to one of the following groups at the end of December, March, June, and September:

\_\_\_\_Epilepsy Foundation ([www.epilepsy.com](http://www.epilepsy.com) )

\_\_\_\_American Lung Association ([www.lung.org/lung-disease/asthma/](http://www.lung.org/lung-disease/asthma/) )

\_\_\_\_Brain Injury Association of America ([www.biausa.org](http://www.biausa.org))

\_\_\_\_Special Olympics (www.specialolympics.org )

Please indicate your preferred charity of those listed above and be sure to include this page with your other forms.

Again, thank you for your participation! Should you have any questions, please contact :

Jessica Pliego (320-498-5170; [jbeath1@tamu.edu](mailto:jbeath1@tamu.edu))

Myracle Primus (832-786-9306; [mprime78@tamu.edu](mailto:mprime78@tamu.edu))

Amanda Drake (415-754-0124; [amandadrake@tamu.edu](mailto:amandadrake@tamu.edu)- ella hablo español)