AN EXAMINATION OF LEARNED HELPLESSNESS, CORTISOL, AND STRESS REACTIVITY IN COLLEGE STUDENTS WITH ASTHMA

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STUDENTS WITH ASTHMA

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CHAPTER I

INTRODUCTION

Asthma, the most common chronic illness in the United States, is defined as a chronic inflammatory disorder of the airway, in which individuals experience recurrent episodes of wheezing, breathlessness, chest tightness, and cough (National Heart, Lung, and Blood Institute; 1997). Traditionally viewed as an illness of younger children, studies have also demonstrated high asthma prevalence rates in older children and young adolescents ages 11 – 17 (Akinbami, Moorman, Garbe, Sondik, 2009). Although some individuals report that they experience a reduction in symptoms as they enter adolescence, studies have documented that this decrease does not happen as often as thought (Carpentier, Mullins, & Van Pelt, 2007a).

Unfortunately, little research has focused on psychosocial aspects of asthma in the adolescent and young adult population, even though studies have shown that they still experience significant life challenges (e.g., Perez-Yarza, 1996; Hommel et al., 2003; Mullins, Chaney, Pace, & Hartman, 1997). Adults and adolescents with asthma have been documented to be at greater risk for engaging in substance abuse (Forero, Bauman, Young, Booth, & Nutbeam, 1996), to experience high rates of school absenteeism (American Lung Association, 2007), and struggle with unemployment (Taitel, Allen, & Creer, 1998) when compared to same-aged peers. Medically, it has been noted that a significant number of college students with asthma are hospitalized each year. Indeed, 40% of college students with asthma report that they do not seek medical attention even if

they feel that their symptoms are severe enough for medical care (Jolicoeur, Pharm, Boyer, Reeder, & Turner, 1994). Thus, it would indeed appear that older adolescents and young adults continue to face a host of challenges related to the experience of asthma. More recent research has therefore turned towards the identification of the ways in which asthma may impact an individual, including examination of risk factors for adjustment difficulties and diminished health-related quality of life. Two constructs seem particularly relevant in the context of asthma, specifically, illness intrusiveness and perceived uncertainty. Both of these cognitive appraisal mechanisms have been highly correlated with adjustment outcomes in a variety of chronic illnesses among both adolescents and adults (Mullins, Chaney, Balderson, & Hommel, 2000; Mullins et al., 1997). Due to the unpredictable and variable nature of asthma, chronic feelings of uncertainty may develop and become associated with negative outcomes, such as poorer disease control and emotional difficulties (Ireys, Werthamer-Larsson, Kolodner, & Gross, 1994; Mullins et al., 1997). The nature of asthma may also lead to the reduction of various life activities as individuals attempt to limit exposure or avoid situations they feel may be leading to their asthmatic episodes (Mullins et al., 2000).

Furthermore, other studies have investigated the deficits in functioning that result from the unpredictable nature of asthma. In the past decade, researchers have applied the learned helplessness theory to the unpredictable contingences of asthma and the stress that accompanies this disease (Mullins et al., 1997; Chaney, Mullins, Uretsky, Pace, Werden, & Hartman, 1999). Learned helplessness theory is a widely researched model that attempts to explain the helplessness that an individual experiences after exposure to non-contingent or uncontrollable experiences (Abramson, Seligman, & Teasdale, 1978). In a sample of older adolescents and young adults with childhood-onset asthma, Mullins and colleagues (1997) found that illness uncertainty and stable negative attributions had independent effects in the prediction of poorer psychological adjustment.

In their discussion, they suggested that the uncontrollable events experienced by asthma patients may contribute to their negative cognitive attributions. Additionally, when using an experimentally-induced learned helplessness paradigm, Chaney and colleagues (1999), found older adolescents with childhood onset-asthma to show more cognitive deficits than age-matched healthy controls. The researchers suggested that the unpredictable nature of asthma may have led to an increased vulnerability to helplessness induction. Although such studies have demonstrated that college students with asthma may indeed be at higher risk for "learned helplessness", i.e., greater stress reactivity, such work needs replication. In addition, it remains to be seen whether or not individuals with asthma also respond differentially in terms of their physiological responses to stress.

In recent years, researchers have increasingly utilized salivary cortisol as a means of measuring stress responses. These researchers have documented increased levels of cortisol in response to uncontrollable situations in populations with chronic illness, including adolescence and adults with asthma (Wolf, Nicholls, & Chen, 2008). In addition, the ease and relatively low cost of assessing biological markers highlights cortisol as an ideal variable in stress research (Kirschbaum & Hellhammer, 1994).

Thus, this study was designed to further investigate the learned helplessness phenomenon in college students with asthma, including the utilization of salivary cortisol measurements as a means of measuring stress reactivity. In addition, this study examined both illness intrusiveness and perceived uncertainty in illness in college students with asthma. The specific aims of this study were as follows:

Aim 1. To examine the levels of psychological distress of college students with asthma versus their matched age-gender, healthy controls. Hypothesis 1. It was predicted that college

students with asthma would have higher levels of psychological distress, specifically, anxiety and depression, and lower ratings of their quality of life than healthy controls.

Aim 2. To examine the role of illness uncertainty and illness intrusiveness in college students with asthma. Hypothesis 2. It was hypothesized that illness uncertainty and illness intrusiveness would be positive predictors of psychological distress and negative predictors of quality of life among the college students with asthma.

Aim 3. To test the theory of learned helplessness in college students with asthma and their matched age-gender, healthy controls. Hypothesis 3. It was also predicted that all participants exposed to an uncontrollable event would show increased susceptibility as evidenced by poorer performance on an anagram task compared to participants that would be exposed to a controllable event. Furthermore, college students with asthma would show even greater susceptibility to helplessness when exposed to an uncontrollable event than all other participants.

Aim 4. To examine the role of cortisol in college students with asthma and their matched age-gender, healthy controls in response to stress. Hypothesis 4. Lastly, it was predicted that higher cortisol levels would be found in college students with asthma when compared to their healthy controls at the first collection point (T1) taken before the learned helplessness task in both conditions, non-solvable (non-contingent) and solvable (contingent). In the non-solvable or uncontrollable condition, after implementation of the stress task, cortisol levels would increase in both students with asthma and their healthy controls. Elevations would be steeper in the asthmatic population. Additionally, levels of cortisol would decline after 15 minutes have elapsed from the non-solvable event. In the solvable condition, cortisol levels would remain fairly consistent during the two other collection points (T2; T3).

CHAPTER II

REVIEW OF THE LITERATURE

The Nature of Asthma

Disease Characteristics

Prevalence, morbidity, and mortality**.** Reports from the National Center for Health Statistics (2006) divide asthma prevalence according to three different dimensions: lifetime diagnoses, current prevalence, and asthma attack prevalence. Approximately 23 million adults (ages 18+) and 9 million children (ages 1 – 17) have been diagnosed with asthma in their lifetime in the United States (National Center for Health Statistics, 2006). The current asthma prevalence rates in the United States reveal that 15.7 million adults (ages 18+) and 6.1 children (ages 0 – 17) have been diagnosed with asthma and are currently living with asthma and its symptoms. Statistics also show that Puerto Ricans have the highest current prevalence rates followed by non-Hispanic Blacks and non-Hispanic American Indians, among different ethnicities. By gender, adult women have a 30% higher current prevalence rate compared to men. Among children, this pattern is reversed, with boys having 30% higher current prevalence rates than girls (National Center for Health Statistics, 2006).

Even though there have been many advances in the management and treatment of asthma, mortality and morbidity rates are still unusually high for this chronic illness (Center for Disease Control and Prevention [CDC], 1998) and have just recently begun to improve. Reports show than in 2003 alone, 4,055 people died from asthma. More specifically in 2003, 3 per 100,000 children (ages

0 – 17) died from asthma compared to the 1.9 deaths per 100,000 adults (ages 18+). The death rate for women was found to be 40% higher than men. In addition, the statistics show that Non-Hispanic blacks were the most likely to die from asthma (National Center for Health Statistics, 2006). Data from 1979 to 2004 on asthma mortality rates in the United States show that deaths related to asthma have increased from 1979 to 1998 and declined from 1999 to 2004 (American Lung Association, 2007). Despite this decline, the rates were still found to be unusually high with 3,816 people dying from asthma in 2004, 63% of the deaths occurring in women, and the highest prevalent rate in Black women (3.1 per 100,000; American Lung Association, 2007). Researchers have proposed that the mortality rates have been declining for the past 6 years and will likely continue in to do the same in the future (American Lung Association, 2007).

Like the high mortality and morbidity rates, the costs of asthma in the United States are also unusually high. In 1998, it was estimated that asthma accounted for 12.7 billion dollars in the United States (Weiss & Sullivan, 2001a) and has been estimated at an increasing rate since then (American Lung Association, 2007).

To sum, increasing mortality and morbidity rates, along with costs analyses, underscore the continued effort to understand the nature of asthma and its lasting effects on individuals and their environment.

Asthma and Health Care Utilization

In 2004, it was reported that the most frequent uses of health care for asthma included outpatient visits to doctor's offices and hospital outpatient departments, visits to hospital emergency departments, and hospitalizations in the United States. During that year, there were 14.7 million outpatient visits, 1.8 million visits to emergency departments, and 497,000 hospitalizations. Further examination showed that children had 7.0 million outpatient visits, 754,000

emergency department visits, and 198,000 hospitalizations. Blacks had outpatient visit rates 18% higher than whites, emergency department visits 350% higher than whites, and hospitalizations 240% higher than whites (National Center for Health Statistics, 2006). As a result of these overall trends, treatment guidelines have been developed for asthma to reduce mortality and improve patient outcomes for all individuals with asthma (Douglass et al., 2002)

Treatment of Asthma

Although a comprehensive overview of treatment approaches to asthma is beyond the scope of this thesis, a brief overview of current treatments is warranted. To date, there is no cure for asthma, but symptoms can be controlled with appropriate treatment. Action plans are used in many nations to control asthma episodes and attacks. To date, what are referred to as "action plans" for the self management of asthma are the standard for treatment (Douglas et al., 2002). Action plans are strategic lists that include critical guidelines for asthma management and have been associated with improved asthma outcomes (Gibson et al., 2000) and viewed positively by patients with asthma (Douglas et al., 2002). Doctors recommend controlling the disease by using action plans to reduce troublesome symptoms. Action plans specify how individuals with asthma take their medicine, either long-term control medication or quick-relief medication. The first type of medication helps to reduced airway inflammation and prevents asthma symptoms; the latter relieves symptoms that may flare up. Due to the different outcomes of the medications, they should not be used in place of each other (National Health, Lung, and Blood Institute, 2008). It has been stated that the most commonly used medications for asthma are anti-inflammatory drugs and bronchodilators. Anti-inflammatory drugs prevent asthma attacks on an ongoing basis by reducing swelling and mucus production in the airways. Popular anti-inflammatory drugs include steroids, also called "corticosteroids." Bronchodilators are drugs that relax the muscles around the airways and can be

inhaled, taken in the mouth, or injected into the muscles or veins (LungDiseaseFocus.com, 2008). Short term bronchodilators are used as "needed" and long term bronchodilators are often used on a daily basis. Popular short term bronchodilators include Albuterol, Albupent, Combivent, DuoNeb, Maxair, and Xopenex. Commonly used long term bronchodilators include Advair, Symbicort, Serevent, Foradil, and Perforomist (WebMD, 2008). As noted before, there is no cure for asthma but asthma medications are critical in controlling problematic symptoms (LungDiseaseFocus.com, 2008).

Action plans also suggest that individuals avoid environmental contexts that may worsen their asthma. Taxing factors that affect asthma can vary by individual. The most common factors include exposure to pollen or air pollution, animal fur, and health conditions like runny nose or sinus infections (National Heart, Lung, and Blood Institute, 2008). Lastly, the treatment for asthma varies by age. For instance, it is challenging to diagnose children under the age of five with asthma, therefore the benefits for long-term control medications are not known for this population. Also, pregnant women with asthma may be at risk for having low birth weight babies (National Heart Lung and Blood Institute, 2008). Overall, treatment plans have been used nationwide to help maintain negative symptoms pertaining to asthma (Douglas et al, 2002).

The Impact of Asthma on Older Adolescents and Young Adults: Academic, Social, Psychological, and Physical Functioning

Academic Functioning. The experience of childhood asthma appears to indeed affect the academic functioning of older adolescents and young adults. Researchers have found that, on average, college students with asthma miss 2.8 days of class due to asthma during a given semester (Jolicoeur et al., 1994). Chaney and colleagues (1999) also suggest that college students with asthma encounter additional academic challenges. They speculate that students with asthma may demonstrate a lack of persistence in the face of uncontrollable situations. Van Pelt (2002) supported

this argument by investigating whether individuals with asthma demonstrate lower functioning in the academic context. She found that college students with asthma had significantly lower GPAs than age- and gender- matched peers without a history of chronic illness (Van Pelt, 2002).

Social Functioning. Little is known about the social functioning of individuals with childhood-onset asthma. However, Taitel and colleagues (1998) found that several individuals with asthma reported a lack of quality of life due to their restricted physical activities. Among adults with asthma, work is a frequently reported restricted activity (Sibbauld, Anderson, & McGuigan, 1992). In a longitudinal study with individuals with asthma Sibbauld et al. (1992) found that work loss increased with asthma severity. In addition the study discovered that the individuals with asthma had lower social class grouping, determined by evaluating their current job, by 23 years of age. The researchers speculated that this grouping could be reflective of their employment difficulty. Other studies have also commented on the poor self esteem and lack of social competence reported by individuals with asthma (Vila et al., 1999). Klinnert and colleagues (2000) studied a sample of children with asthma and found significant evidence for poor emotional regulation that resulted in interpersonal difficulties marked by negativity and conflict. They noted that these disturbances are often too subtle to reach a diagnostic threshold. In addition, the authors found that interpersonal difficulties, like work loss, increased with asthma severity. In summary, additional research is needed to better understand the social functioning of individuals with childhood- onset asthma.

Psychological Functioning. A number of studies suggest that children and adolescents are at higher risk for psychological adjustment difficulties, with a portion of this risk due to asthma severity (e.g., Gillaspy, Hoff, Mullins, Van Pelt, & Chaney, 2002; Chaney et al*.* , 1999; MacLean, Perrin, Gortmaker, & Pierre, 1992; Mullins et al., 1997). Mullins and colleagues (1997) suggest that this increase in psychological distress may be in part the result of the intermittent, unpredictable, and

reversible nature of asthma symptoms. Some studies have found children with chronic medical problems, including asthma, are at slightly elevated risk for depressive symptoms (Bennett, 1994). MacLean and associates (1992) further investigated psychological functioning by examining factors that lead to poorer adjustment. Out of a sample of children 6 -14 years of age with asthma, they found that low socioeconomic status, negative life changes, and high illness severity were predictive of poor psychological adjustment. Psychological factors are of key importance in older individuals too, especially since psychosocial difficulties associated with asthma still display themselves in adolescence and adulthood (Jolicoeur et al*.,* 1994). Chaney and colleagues (1999) found that, when compared to age-matched healthy controls, a group of older adolescents with asthma were more likely to meet DSM-IV criteria for major depression. In addition, young adults (16 -21) with asthma have been found to display higher levels of stress, depression, and anxiety than their matched controls that do not have asthma (Gillaspy, Hoff, Mullins, Van Pelt, & Chaney, 2002).

Medical Functioning. Medical care for adolescents with asthma has often been described as inadequate. This is due in part to the medical perspective that adolescents are too old to be seen by a pediatrician and too young to be seen by a general practitioner (Perez-Yarza, 1996). In addition, adolescents with asthma have been found to engage in increased levels of non- adherence to medical plans as well as the minimization of symptoms (Bender, Milgrom, Rand, & Ackerson, 1998). Bender and associates (1998) tracked 24 asthmatic children over three months that used inhalers. They found that the children seldom took all of their medication as prescribed and that non-adherence was correlated with lower levels of asthma knowledge and family dysfunction. As noted previously, this poor management leads to a large number of hospitalizations per year. In a recent cross-sectional survey of 185 adolescents with asthma treated in three managed care organizations in the United States, 41% had emergency department visits and 30% missed more than 1 day of school because of asthma (Okelo et al*.,* 2004). Another study noted that 80% of adolescents with

asthma did not receive regular medical supervision of their disease, despite experiencing numerous symptoms (Roordan, 1996). Due to frequent hospital visits and/or doctor visits, it has been reported that children with asthma have missed 14 million school days annually (American Lung Association, 2007). Research on college students with asthma has noted that, on average, 2.8 days of class during a semester is missed because of asthmatic symptoms (Jolicoeur et al., 1994). Carpentier and associates (2007a) found that college students with asthma missed more days of school and work due to health reasons than college students without asthma. This research suggests that missed school days continue to be a problem over an extended period of time and may continue through collegiate education.

As research has shown, the negative impact of asthma is manifested early in childhood and continues through adolescents and early adulthood. Problems concerning school, interpersonal difficulties, psychological distress, and medical care continue over an extended period of time. Since issues concerning the nature of asthma have be shown to worsen with lack of knowledge about the disease (Bender et al., 1998) it is pertinent to assess other factors, like illness uncertainty and illness intrusiveness, and the roles these cognitive appraisal mechanisms play in the life of an adolescent with asthma.

Illness Uncertainty

Illness uncertainty refers to the inability of an individual to understand their illness in terms of the events, outcomes, and its course (Mishel, 1990). Mishel (Mishel & Braden, 1988; 1990) developed the concept from an extensive literature of psychological and sociological responses to uncertainty, stress, and response to stress. The construct has frequently been studied in both adult and child disease populations, as well as with parents of children that have a chronic illness (Stewart & Mishel, 2000). Researchers have suggested that the intermittent and unpredictable nature of

asthma can lead to feelings of uncertainty, especially in the context of asthma management. The argument is also made that these feelings of uncertainty may over time become associated with negative outcomes, like poorer disease control and poorer adjustment (Mullins, et al*.,* 1997). Mullins and associates (1997) investigated illness uncertainty, attributional style, and psychological adjustments in older adolescents and young adults with asthma. They found that stable attributional style and high illness uncertainty independently predicted poorer psychological adjustment. It was hypothesized that the nature of asthma cultivated an increased sense of illness uncertainty for asthma management (Mullins et al., 1997).

Emotional difficulties have been reliably linked to illness uncertainty in chronically ill populations, including asthma. Past research has found that illness uncertainty significantly predicts symptoms of depression and anxiety in adolescences and young adults with childhood-onset asthma (Hommel et al*.*, 2003; Mullins et al., 2000). More recently, Mullins, & Van Pelt (2007a) reported that illness uncertainty was a significant predictor of anxiety, depression, and overall poor psychological symptoms in college students with asthma. In the broader chronic illness literature, illness uncertainty has also been linked to a number of other health adjustment difficulties in adults including myocardial infarction (Bennett, 1993), multiple sclerosis (McNulty, Livneh, & Wilson, 2004; Mullins, Cote, & Fuemmeler, 2001), and cancer (Clayton, Mishel, & Belyea, 2006; Mast, 1995; Mishel & Sorenson, 1991).

It has been suggested that the variable nature of asthma may be responsible for the wide range of disease expectations and for the large amount of uncertainty that individuals with asthma feel (Creer, 1994; Creer & Bender, 1993). Indeed, individuals may develop a sense of uncertainty about controlling their asthmatic related attacks due to the ambiguous contingences that exists between behavior and illness outcome (Mullins et al., 2000). This unpredictable and variable nature

of asthma contributes to individuals developing uncertainty about various aspects of their disease, which in turn, may lead to significant stress.

Illness Intrusiveness

Illness intrusiveness is a construct which is defined as the extent to which illness-related impediments are perceived as interfering with an individual's life (Devins, et al*.,* 1983). In a study of adults with renal disease, Devins et al. (1983) discovered that patient perceptions of intrusiveness and limited control were significantly correlated with negative mood. The researchers suggested that an illness produced life-style develops within an individual that involves a hindrance of valued activities and interests. Illness intrusiveness is also pertinent in the adjustment process in asthma. As hypothesized in previous literature, the unpredictable nature of an illness can lead to diminished participation in pleasurable activities as individuals attempt to prevent events and avoid situations they feel may be leading to their asthmatic episodes (Mullins, et al*.*, 2000). Multiple demands that are placed on individuals with asthma can intrude with a range of life activities, including domains of work (Sibbauld, Anderson, & McGuigan, 1992) and interpersonal relationships (Klinnert, McQuaid, McCormick, Adinoff, & Bryant, 2000). Illness intrusiveness subsequently arises out of these illness-produced demands that disrupt the life of the individual, which in turn can perpetuate psychological distress. This component may be a part of a vicious cycle, in which being uncertain about an illness leads to intrusiveness, which then leads to psychological distress (Mullins et al., 2000).

Researchers highlight that this cyclic relationship accounts for the overwhelming documented relationship between illness uncertainty and psychological adjustment problems among individuals with asthma (Mullins et al., 2000). Mullins and colleagues (2000) suggest that illness intrusiveness may be an extension of asthma uncertainty and accounts for the connection between emotional adjustment and uncertainty in individuals with asthma.

As we have noted in past literature, illness uncertainty and illness intrusiveness appear to be critical constructs in understanding the impact of childhood and adolescent asthma. The unpredictable nature of asthma has also been linked with the model of learned helplessness, which will be described below.

The Nature of Learned Helplessness

The initial theory of learned helplessness proposed by Overmier & Seligman (1967) suggested that when animals experienced a situation they could not control, they later showed deficits in learning to master a controllable situation. Using two yoked groups of dogs, one whom could escape a shock by jumping over a barrier and a second that could not escape a shock, Overmier & Seligman (1967) found that dogs that could not escape the shock showed behavioral deficits when being taught how to actually escape the shock later. In other words, approximately two thirds of the dogs in the shock group appeared to simply give up, hence the term "learned helplessness." The revised version of learned helplessness included the concept of attributional style, with an elaboration of how an individual's cognitive interpretation of an event influences the development of mood disorders (Abramson et al., 1978). Abramson (1978) suggested that when the learned helplessness theory was applied to humans, it contained two flaws: 1) it did not distinguish between universal helplessness and personal helplessness and 2) it did not explain when helplessness is chronic or acute. She resolved these issues by applying the attribution theory that defines helplessness to a specific cause: stable or unstable, global or specific, and internal or external. Stable factors are thought to be long-lived or recurrent while unstable factors are short lived or intermittent. Global causes are general whereas specific causes are more detailed. Lastly, internal factors pertain to the individual and external factors include the environment (Abramson et al., 1978).

Years later, psychologists soon linked the phenomena of learned helplessness to depression in humans. The central idea to this linkage was that depressed people often have maladaptive thoughts concerning control over important situations in their life. Researchers postulate that the tendency for depressed patients to generally or globally contribute uncontrollability over major outcomes helps perpetuate depression (Abramson, Alloy, & Rosoff, 1981). Currently, learned helplessness has been applied to individuals with a chronic illness.

A number of lines of research have investigated the construct of learned helplessness and how it relates to both emotional adjustment and disease management. In a population of children with diabetes, researchers found that perceived helplessness was indeed associated with both depression and poor metabolic control (Kuttner, Delameter, & Santiago, 1990). Other researchers have found analogous helplessness-depression and helplessness-anxiety relationships in children with diabetes, sickle cell disease, and cancer (Frank, Blount, & Brown, 1997; Schoenherr, Brown, Baldwin, & Kaslow, 1992).

As mentioned previously, asthma is a condition that varies significantly between individuals and even within the same individual (Young, 1994). In addition, management requirements and course of illness can vary uniquely depending on each individual (Creer, 1994). These aspects of the disease highlight the uncontrollable nature that a person with asthma can experience and shed light on how the construct of learned helplessness can be applied. The repeated experience of these behavior-outcome non-contingencies can lead to a decreased persistence in the face of stress or adversity in (e.g., problem-solving behaviors) in participants with asthma (Chaney et al., 1999).

Recently, researchers have found that the combined effect of greater illness uncertainty with perceived helplessness was associated with emotional adjustment problems in individuals with long-standing asthma (Mullins et al,, 1997). Mullins and colleagues (1997) found unpredictable

disease-management outcome contingences and negative experiences combined to produce an increased susceptibility to the experience of helplessness and problems with adjustment in individuals with long-standing asthma.

Collectively, this research would indeed suggest that college students with asthma may be predisposed to differentially respond to stress from a psychological perspective. It remains to be determined as to whether we might find differential physiologic responses to stress in these same individuals. This next section will focus on studies demonstrating the linkage of stress to physiologic markers, specifically, cortisol and α-amylase.

Cortisol in Individuals with Chronic Illnesses

Cortisol is a corticosteroid or glucocorticoid, steroid hormone that is released by the hypothalamus, pituitary, and adrenal cortex, collectively referred to as the HPA axis. Stress activates the autonomic nervous system and the HPA axis successfully in both animals and in humans (Kalat, 2004). Within the HPA axis, the hypothalamus induces the anterior pituitary gland to secrete the hormone andrenocorticotripic (ACTH) which in turn stimulates the human adrenal cortex to secrete cortisol. In rats and other animals, corticosterone is released instead. Due to this reaction to stress, cortisol is often referred to as the stress hormone (Kalat, 2004). The secretion of cortisol follows a diurnal pattern, showing increased levels in the early morning and the lowest levels around midnight (Pruessner, Wolf, Hellhammer, Buske-Karschbaum, & von Auer, 1997). Over the course of 10 minutes or so, it has been found that cortisol levels will peak and decline (Sapolsky, et al., 2000). Thus research has shown that we can physiologically measure stress and that this measurement of stress only takes minutes to elevate. In the context of asthma and other chronic illnesses, we should be able to assess stress quickly and consequently in the future use the knowledge to prevent asthmatic attacks that may result from stress.

Thus, the examination of cortisol secretion is quite pertinent in understanding the relationship between external stressors and internal biological courses in chronic illnesses (Chrousos & Gold, 1992).

Investigation about the elevation of cortisol is evident in a number of lines of research. There is evidence that maternal stress and depression can lead to elevated cortisol levels that last up to 13 years of life in humans (Exxes, Klein, Cho, & Kalin, 2002; Ashman, Dawson, Panagiotides, Yamade & Wilkinson, 2002; Halligan, Herbert, Goodver, & Murray, 2004). A disturbance in the normal cortisol production cycle has also been documented in orphanage- reared and adopted children (Carlson & Earls, 1997; Gunnar, Morison, Chisholm, & Schuder, 2001). Vedhara and colleagues (2007) hypothesized that early childhood illness would result in hyperactivity of the HPA axis in adulthood, and therefore higher levels of cortisol. They found that childhood respiratory illnesses were actually associated with reduced HPA axis activity in adulthood, which conflicted with their hypothesis. They attributed this alternate finding in cortisol levels to the low birth rate of the children in the study with a chronic illness, proposing that the low birth rate of the children resulted in lower cortisol levels.

Recently, cortisol secretion has been studied in populations of individuals with asthma. Masharani and colleagues (2005) found support for the diurnal pattern of cortisol secretion in a pool of adults with asthma of varying severity. After collecting salivary cortisol samples from the participants 30 minutes and then 12 hours after awakening, they found significantly higher cortisol levels in the morning samples. They also investigated the impact of prescribed glucocorticoid from inhaled, nasal, or oral, on cortisol secretion. The results showed that external glucocorticoid use suppressed salivary cortisol secretion, especially in the 30-minute after awakening samples.

Granger and colleagues (2006) studied cortisol and α-amylase, another stress hormone, levels in mother-infant dyads, preschoolers, children, and adolescents. They found, on average, infants had higher salivary cortisol levels than their mothers whereas mothers had higher salivary α -amylase levels than their infants. Older adolescents (over the age of 13) showed exaggerated reactivity than younger adolescents (under the age of 13) while experiencing an uncontrollable task (e.g. speech task or math task). The results from the studies support cortisol as a marker of stress reactivity and its developmental nature.

Henry and Stephens (1977) first noticed that an uncontrollable situation in animals triggered the HPA axis to release an increased level of ACTH and corticosterone. More recently, researchers have linked this loss of control and cortisol release to the concept of learned helplessness in animals (Conner, Vernikos-Daneliis, & Levine, 1971; Dess, Linwick, Patterson, Overmier, & Levine, 1983; Overmier, 1985; Swenson & Vogel, 1983). In humans, researchers have found that cortisol increases in uncontrollable situations when compared to controllable ones (Breier et al., 1987). Croes, Merz, & Netter (1993) found support for higher cortisol levels during uncontrollable situations in non-depressed humans. They utilized a stress condition that consisted of preventing participants from completing a number completion and addition test. They hypothesized that this finding was due to the depressed patient's malfunctioning HPA axis, which resulted in lower cortisol levels.

Researchers have suggested that using saliva cortisol measurements has several advantages. First, the procedure is noninvasive and therefore the stress-inducing effects of a venipuncture procedure are eliminated. Also, sampling at room temperature offers stability in the transferring of data. The samples can be collected under naturalistic conditions. Lastly, free serum cortisol is more resilient to external factors than total cortisol levels (Croes, Merz, & Netter, 1993). Others have

noted that changes in salivary cortisol are readily reflected in salivary cortisol levels (Aardal-Eriksson, Karlberz, & Holm, 1998). In conclusion, the use of salivary cortisol as a measurement has increased frequently in studies (Kirschbaum & Hellhammer, 1994). Additionally, researchers have suggested that use of self-report inventories alone may limit the results of studying the psychological effects of asthma on individuals (Mullins et al., 2000, Gillaspy et al., 2002).

In conclusion, following the research of Chaney and colleagues (1999), we expected that college students with asthma would be more susceptible to experimentally-induced learned helplessness, as a function of chronic exposure to the unpredictable environmental contingencies associated with asthma. In addition, we investigated the nature of cortisol secretion in adults with asthma. We predicted that cortisol levels would rise soon after participants were exposed to uncontrollable, non-solvable problem situations. In addition, we expected that participants with asthma would respond in greater magnitude to stress than their healthy counterparts as measured by their elevated cortisol levels.

CHAPTER III

THE PRESENT STUDY

The overarching goal of the present study was to further investigate psychological aspects of asthma in college students. More specifically, we wanted to better understand the role that stress plays in college students with asthma, and whether there are differences in stress responses between matched age and gender healthy controls. Therefore, four different hypotheses were addressed. First, we wanted to replicate the research that documented higher levels of psychological distress in adolescents with asthma versus their healthy controls. Researchers have found that older adolescents and young adults with asthma tend to display higher levels of stress, depression, and anxiety than their matched controls that do not have asthma (Gillaspy, Hoff, Mullins, Van Pelt, & Chaney, 2002). In addition, Mullins and colleagues (1997) suggested that this increase in psychological distress may be the result of the intermittent, unpredictable, and reversible nature of asthma symptoms. We hypothesized that:

> Hypothesis 1: College students with asthma would have higher levels of psychological distress, specifically, anxiety and depression, and lower ratings of their quality of life than healthy controls.

Next, we wanted to understand the role of illness uncertainty and its relationship to distress in this population (Mullins et al., 2000). The literature has suggested that the unpredictable nature of

asthma may be at least partially responsible for the increased level of uncertainty that individuals with asthma experience (Creer, 1994; Creer & Bender, 1993). In addition to illness uncertainty, illness intrusiveness has also appeared to be an important factor in understanding the nature of asthma. Illness intrusiveness is defined as the level to which illness-related impediments interfere with an individual's life (Devins et al., 1996). Mullins and colleagues (2000) have suggested that illness intrusiveness may be related to asthma uncertainty and account for the connection between emotional adjustment and uncertainty in individuals with asthma. Researchers have proposed that illness intrusiveness arises out of these illness-produced demands that disrupt the reinforcing life activities of the individual (Mullins et al., 2000). Accordingly we hypothesized that:

> Hypothesis 2: Illness uncertainty and illness intrusiveness would be positive predictors of psychological distress and negative predictors of quality of life among the college students with asthma.

Researchers have also found college students with asthma to be more susceptible to experimentally-induced learned helplessness as a function of chronic exposure to the unpredictable environmental contingencies associated with asthma (Chaney et. al, 1999). We wanted to replicate this finding, and therefore hypothesized that:

Hypothesis 3: All participants exposed to an uncontrollable (non-contingent) event would show increased susceptibility compared to participants who will be exposed to a controllable (contingent) event. Moreover, college students with asthma would be initially more susceptible and would show even greater susceptibility to helplessness than all other participants as measured by their responses on a subsequent anagram problem-solving task.

Figure 1. Susceptibility of Participants with Asthma and Healthy Controls

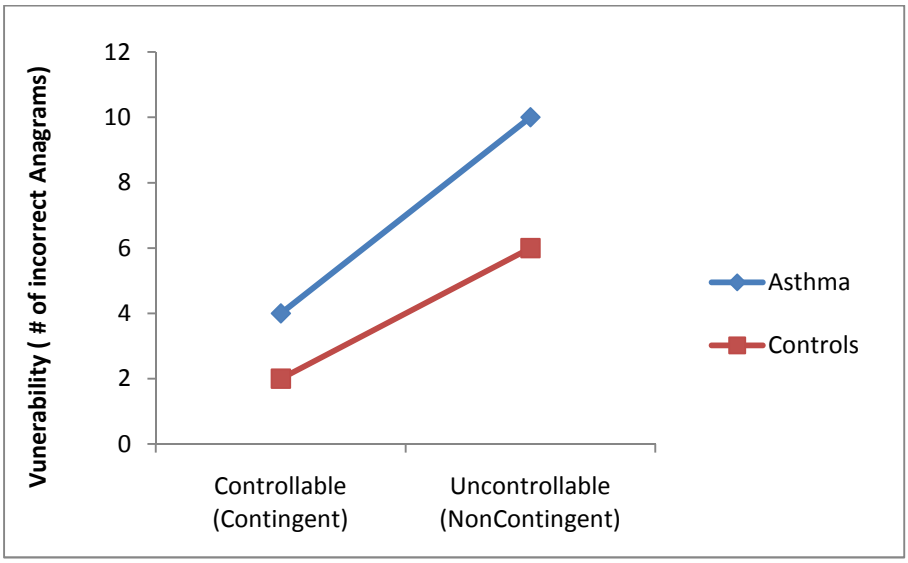

Figure 1. Hypothesized susceptibility outcomes for college students with asthma and their age-gender matched healthy controls after being exposed to either an uncontrollable condition or controllable condition.

In addition, we wanted to expand on the literature that has proposed elevated levels of cortisol in individuals with health problems, such as asthma (Granger et al., 2007). Several researchers have found that cortisol levels peak when individuals are placed in uncontrollable situations (Overmier, 1985; Swenson & Vogel, 1983; Breier et al., 1987) in less than 10 minutes (Sapolsky, et al., 2000). We wanted to replicate the finding of elevated cortisol levels when participants are placed in uncontrollable situations in adolescents and young adults with asthma and their healthy controls. Thus, we predicted that:

Hypothesis 4: Higher cortisol levels would be found in college students with asthma when compared to their healthy controls at the first collection point (T1) taken before the learned helplessness task in both conditions, uncontrollable (non-contingent) and controllable

(contingent). In the uncontrollable or non-solvable condition, after implementation of the stress task (T2) cortisol levels would peak in both students with asthma and their healthy controls. It was predicted that elevations would be steeper in the college students with asthma population. Additionally, levels of cortisol were predicted to decline after 15 minutes have elapsed from the uncontrollable event (T3). In the controllable, condition cortisol levels would remain fairly consistent during the two other collection points (T2; T3).

Figure 2. Predicted cortisol levels in uncontrollable condition

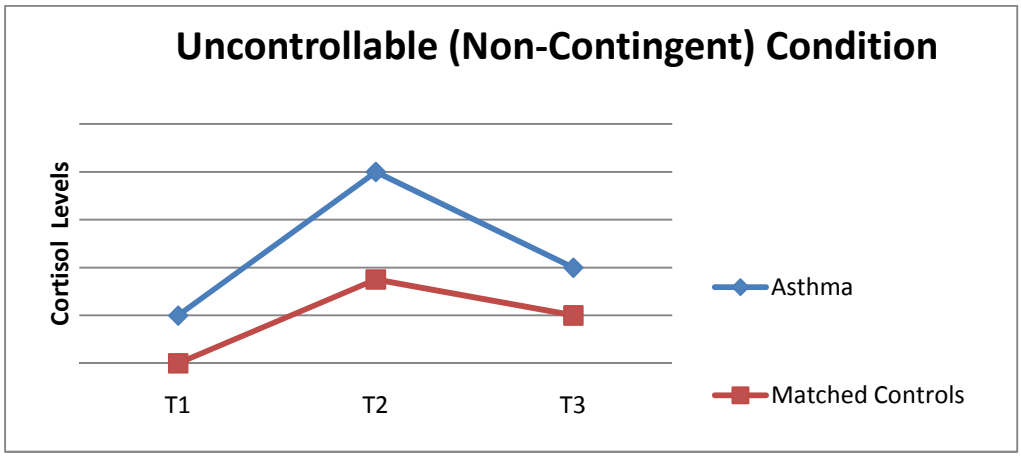

Figure 2. Hypothesized cortisol levels at T1, T2, and T3 during the uncontrollable (non-contingent) condition for college students with asthma and their age-gendered matched healthy controls.

Figure 3. Predicted cortisol levels in controllable condition

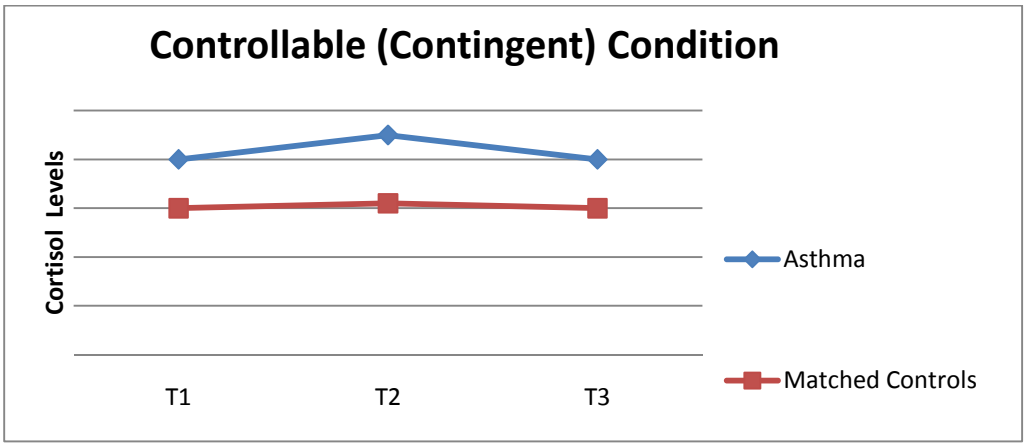

Figure 3. Hypothesized cortisol levels at T1, T2, and T3 during the controllable (contingent) condition for college students with asthma and their age-gendered matched healthy controls.

To test these hypotheses, college-aged students with asthma and matched age and gender healthy controls were recruited and randomized to either receive an uncontrollable or controllable experimental condition. The uncontrollable condition was defined as being exposed to the *non-contingent or non-solvable* condition of the learned helplessness task, where solving the task is *impossible*. The controllable condition was defined as being exposed to the *contingent or solvable* condition of the learned helplessness task where solving the task is *possible*. Each participant was asked to participate on two occasions. On the first occasion, the participant experienced a computerized learned helplessness task with random assignment to either contingent (controllable) or non-contingent (uncontrollable) feedback. Participants then completed a computerized anagram task that served as a measure of cognitive problem-solving ability following failure. The anagram task thus assessed the susceptibility of the participants to the manipulation. Through the course of this session, participants gave cortisol saliva measurements at three different times points.

On the second occasion, participants filled out self-report measures assessing their psychological distress, illness uncertainty, and illness intrusiveness. Please see “Methodology” for more detail.

CHAPTER IV

METHODS

Participants

College students with and without a history of asthma were recruited from undergraduate psychology courses at Oklahoma State University (OSU) and from the OSU Student Health Center. Participants in the asthma group were 30 college students between the ages of 18 and 24 (*M* = 20.00, *SD* = 1.39) who self-identified as having asthma. The group with asthma included 18 women (60.0%) and 12 men (40.0%). The majority of participants self-identified as Caucasian (83.3%, *n* = 25), followed by Native American (13.3%, *n* = 4).

Participants in the control group were 30 college students between the ages of 18 and 24 (*M* = 19.70, *SD* = 1.34) who denied any history of asthma or major chronic illnesses. The control group included 18 women (60.0%) and 12 men (40.0%). The majority of participants self-identified as Caucasian (80.0%, *n* = 24), followed by Native Americans (10.0%, *n* = 3), and Hispanic/Latino (6.7%, *n* = 2). The current distribution of ethnicities tends to reflect the makeup of the larger college population at this particular institution.

Materials

Demographic Form. A demographic questionnaire was designed for the present study that inquired about the participant's gender, age, ethnicity, number of years of education completed, household income, marital status, current chronic illness, and medication history.

Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977*)* The CES-D is 20-item self report measure that assessed for depressive symptoms and behaviors during the past week. For each item, the respondent rated how much they experienced depressive and non-depressive feelings during the week (e.g., "I did not feel like eating, my appetite was poor," "I felt I was just as good as other people"). All 20 items were added to reflect a total score. The total score was used to assess participants' level of depression, with higher scores being indicative of greater levels of depression. A score > 16 indicated a clinically significant level of psychological distress. The measure has demonstrated high internal consistency estimates (.85 to .90) in general and patient populations (Radloff, 1977). The current sample had a Cronbach's alpha of 0.89.

Zung Self-Rating Anxiety Scale (SAS; Zung, 1971*)*. The SAS is a 20-item (e.g., "I feel afraid for no reason at all," "I can feel my heart beating fast") self report measure that assessed anxiety. Each question inferred about anxious behavior and was scored on a scale of 1-4 (none or a little of the time, some of the time, good part of the time, most of the time). The overall score from the SAS was used to assess participants' level of anxiety, with higher scores reflecting greater anxiety. Scores range from 20-80, with 20 – 44 indicating normal anxiety levels, 45 – 59 indicating mild to moderate anxiety levels, 60-74 indicating marked to severe anxiety levels, and 75-80 indicating extreme anxiety levels. This measure has been found to have high internal consistency in community samples (0.79; Knight, Waal-Manning, & Spears, 1983) and depressed patients (0.88; Gabreys & Peters, 1985). Cronbach's alpha for the current sample was 0.82.

SF-36 Health Survey (Ware & Sherbourne, 1992). The SF-36 is an extensively utilized 36-item self-report measure of health-related quality of life (HRQOL) and general health status across eight domains: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. Scores range from 0 (*poorest health status*) to 100 (*best health status*), and the measure can be administered to persons 14 years and older. The SF-36 takes approximately 5 to 10 minutes to complete and yields an overall score, a score for each health domain, as well as a physical component summary score and mental component summary score. The overall score is comprised of averaging all 8 SF-36 subtests. The Physical Component Summary Score measures physical HRQOL and is comprised of the physical functioning, role-physical, body pain, and general health subscales. The Mental Component Summary Score measures mental HRQOL and is comprised of vitality, social functioning, role-emotional, and mental health subscales. The SF-36 has been used in previous research as a measurement of quality of life in individuals with asthma (Lobo & Almada-Lobo, 2008; Nishimura, Hajiro, Oga, Tsukino, & Ikeda, 2004; Olajos-Clow, Costello, & Lougheed, 2005). Internal consistency reliability estimates for the SF-36 have been shown to be high (.91; Bousquet et al., 1994). Cronbach's alpha for the combined group of healthy control and asthma participants was 0.94.

Mishel Uncertainty in Illness Scale-Community Form (MUIS-C; Mishel, 1981). The MUIS-C is a 23-item self-report instrument designed to measure four components of illness uncertainty: ambiguity, uncertainty, lack of information, and unpredictability. Respondents rated items on a 5-point Likert scale regarding the degree to which they agree or disagree with a variety of uncertainty statements, such as "I don't know what's wrong with me." The MUIS-C yields a single composite score, where higher scores represent greater levels of illness uncertainty. Previous studies have shown the MUIS-C to be a reliable and valid measure of illness uncertainty across a number of

chronic disease states (Mullins, Chaney, Balderson, Hommel, 2000; Mishel, 1990). The measure has demonstrated moderate to high alpha reliability estimates (.74 to .92) for a variety of illness populations (Mishel & Epstein, 1990). Cronbach's alpha for the current sample was 0.76.

Illness Intrusiveness Scale (IIS; Devins, Edworthy, Seland, Klein, Paul, & Mandin, 1993). The 13-item Illness Intrusiveness Scale assesses the extent to which a respondent's illness and its treatment interfere in 13 life domains: health, diet, work, active reactions (e.g., sports), passive reactions (e.g., reading or listening to music), financial situation, relationship with spouse, sex life, family relationships, other social relationships, self-expression or self-improvement, religious expression, and community and civic involvement. Ratings are reported using a 7-point Likert scale ranging from 1 (*not very much*) to 7 (*very much*). Reliability and construct validity of the IIS have been consistently high among studies of various chronic illnesses (e.g., test-retest reliabilities at nine months range from 0.80 to 0.85; Devins, Binik, Hutchinson, Hollomby, Barre, & Guttmann, 1983; Devins, Edworthy, Seland, Klein, Paul, & Mandin, 1993). Cronbach's alpha for the current sample was 0.85.

Experimental Task. The experimental task utilized in the present study is a computerized version of a standard concept-formation task (e.g., Levine, 1971), similar to the task originally used by Hiroto and Seligman (1975) and others (e.g., Benson & Kennelly, 1976). During the experimental task, participants sat at a computer terminal in a private room and were given the following standardized instructions.

> "In this task, you will be presented with several problems. Each problem consists of a series of displays like the one in the bottom right hand corner of the screen. Each display will contain a letter 'Y' and a letter 'Z'. You will also see that one letter will be surrounded by a square and the other by a circle. Also, one background will be red and the other will be

blue. Every display will be like this one except that the letters, the surrounding shapes, and the background colors will be combined in different ways.

One of the two patterns, either the top or the bottom, has been chosen to be the right pattern. For each display, you are to indicate which of these two you think is the right pattern and the computer will tell you whether you are 'right' or 'wrong'. Then you will go on to the next display, again you will make a choice, and again the computer will tell you if you are 'right' or 'wrong'.

In this way, you can learn the reason for the computer saying 'right' or 'wrong'. The reason may be because of the letter, the surrounding shape, or the background color. The object for you is to figure this out as fast as possible so that you can choose correctly as many times as possible.

For each display, you are to indicate which of the two patterns you think is right and the computer will tell you whether you are 'right' or 'wrong'. To choose a pattern, click it once."

Anagram Task. The present study also included a computerized anagram-solving task containing twenty anagrams with five letters per anagram. The purpose of this task is to measure changes in performance and motivation following experiencing non-contingency in the concept-formation task. For this task, all anagrams were presented in the same scrambled order (i.e., 3-4-2-5-1) and were solvable in the same sequence (i.e., 5-3-1-2-4; e.g. Alloy, Peterson, Abramson, & Seligman, 1984; Benson & Kennelly, 1976; Hiroto & Seligman, 1975). Participants were given the following standardized instructions to complete the anagram task:

"You will be asked to solve some anagrams. Anagrams are words with the letters scrambled. The problem for you is to unscramble the letters so that they form a word.

When you have found the word, type it into the computer keyboard. Notice that there may be a pattern or principal by which to solve the anagrams. But, that's up to you to figure out.

You will have 100 seconds to solve each anagram before the next one is presented. If you guess incorrectly, you may try again and again until the time is up. If you want to make a correction, use the backspace key."

Saliva Collection Materials .Saliva samples were taken at three different points (T1, T2, and T3) during the first session of the study (please see Figure 4). The participants were given 3 oral swabs, each inside one of the 3 swab storage tubes ordered from Salimetrics Testing Services. Each storage tube had the participant's subject number and the abbreviation for when to swab their mouth (T1-S1 = prior to experimental task, T2-S2 = after experimental task, and T3-S3 = 15 minutes after the experimental task). A timer was used to time 15 minutes between T2 and T3 collection points.

Figure 4. Timing of saliva samples

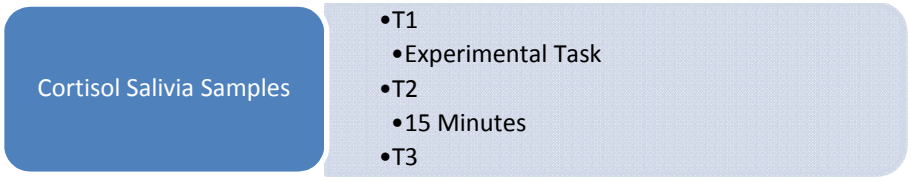

Figure 4. Visual guideline for saliva samples that were taken from the participants (T1, T2, and T3).

All saliva samples were stored in Ziploc bags and then placed in a freezer within 24 hours. After all samples had been taken, samples were packed on dry ice and shipped to Salimetrics to assay using Enzymatic Immunoassay (EIA; Salimetrics, Inc.) following standard procedures outlined by Salimetrics, State College, PA.

Referral Sheet. Since the tasks and measures in the study could have elicited some distress in the participants, a list of available psychological support services was issued to each person.

Procedure

The study was advertised online through an undergraduate research database for enrolled students and through flyers in the OSU Student Health Center. All participants voluntarily consented themselves to the study via email. Verbal informed consent was obtained at the beginning of session one after explaining the purpose of the study. Participants were matched by age and gender after data collection. By matching subjects on age and gender, we aimed to minimize the probability that an uncontrolled or extraneous variable accounted for the observed differences between the healthy control group of students and the students with asthma, although matching cannot ensure that all extraneous variables are controlled. Participants from the psychology courses received course credit and $10 for completion of the study. Participants from the OSU Student Health Center were compensated $20 for completion of the study. The study consisted of 2 sessions, the first lasting one-and a half hours, and the second lasting approximately an hour. In the first session, participants were told about the study and asked to read and sign the consent form after any questions were answered. Participants not wanting to participate in the study were free to go. If they elected to sign the consent form, they were given a subject number and asked to fill out the Health Questionnaire. After filling out the Health Questionnaire and consent form, the first saliva sample was collected (T1). For each collection time, participants were told to locate the appropriate swab storage tube and take off the top cap by holding the bottom portion of the tube and snapping off the cap. The cotton swab was in the tube for the participants to remove and place in their mouth for at least two minutes. Participants were instructed to place the cotton swab under their tongue in their mouth and to chew lightly on the swab to initiate salivation. After two minutes passed, they

were instructed to remove the cotton swab and place it inside the appropriate storage tube. Then, participants were assigned (before arrival) by the experimenter to either a contingent or non-contingent condition for the experimental (learned helplessness) task, which were located on computers in the Pediatric and Health Psychology Lab. Participants were given examples of how the tasks work, and read the script presented in the "Materials" section. After the examples, the computer presented the participants with forty stimulus patterns grouped into four sets of ten problems. After the tenth problem in each set, the stimulus dimension (e.g., the letter Y) associated with a correct response changed automatically such that the participant had to determine which stimulus dimension was currently correct (e.g., the color blue). The experimental manipulation involved half of the participants receiving feedback that allowed them to successfully complete the task (contingent condition) and half of the participants receiving random feedback that prevented successful completion of the task (non-contingent condition).

As part of the standardized instructions, all participants were led to believe that the task was solvable and that determining the correct stimulus dimension was attainable. However, only participants in the contingent-feedback condition were given solvable problems with response-contingent correct and incorrect feedback about their performance. In other words, only participants in the contingent-feedback condition were given feedback that facilitated the discovery of the correct stimulus dimension. Participants in the non-contingent-feedback condition received unsolvable problems with feedback that was not contingent upon their actual performance. The random performance feedback provided to participants in this condition did not allow them to solve the problems successfully.

After completing the concept-formation task, the researcher displayed the participant's score and commented on the participant's performance. For participants in the contingent-

feedback condition, the experimenter would say, “Hmm, it looks like you did very well. You got 20 correct. That’s one of the highest scores that I have ever seen. The average score is about 15.” For participants in the non-contingent-feedback condition, the experimenter would say, “Hmm, it looks like you did not do very well. You got 15 correct. I guess you’re not very good at this sort of thing. The average score is about 20.” As soon as the feedback was given, the participant was asked to give saliva sample, T2. The same instructions were given as earlier. After the participant gave the T2 sample, the experimenter started the timer for 15 minutes.

Afterwards, participants completed the anagram task containing twenty anagrams with five letters per anagram and were given 100 seconds to solve each anagram. The program was conducted on the same computer as the experimental task. The purpose of this task was to measure changes in performance and motivation following experiencing non-contingency in the earlier task. After the task was over, a score was presented on the screen. The experimenter documented this score on the Health Questionnaire filled out by the participant after the experimental task. Next, the experimenter gave the participant the demographic form to fill out (allowing 15 minutes to pass). After 15 minutes passed, T3 saliva sample was taken. The same instructions were given to the participant as earlier. If the participant did not fill out the demographic form before the 15 minutes, the experimenter took the saliva sample and then allowed the participant to fill out the form afterwards.

Following completion of the experiment, participants were given an explanation regarding the deceptive aspects of the study and the expected results to be gained from the research. The referral list was presented to the participants. They were given course credit and reminded to come back for the scheduled second part of the study

In the second session, the experimenter re-introduced the study to the participants. All participants were asked to complete a series of questionnaires. Participants without asthma completed the SF-36, CES-D, and SAS. Participants with asthma completed those measures in addition to completing the MUIS-C and the IIRS. The participants were debriefed and paid $10 or $20, according to recruitment from SONA or OSU Health Center respectively, for their participation.

CHAPTER V

RESULTS

Preliminary Analyses

A series of bivariate correlations were first conducted to determine if any demographic variables (i.e., age, gender, and ethnicity) or illness parameters (i.e., age at diagnosis, currently taking medication, and number of physician visits within the last year) in participants with asthma were related to any outcome variables (i.e., SF-36 Physical Component Summary and Mental Component Summary Scores, SAS total scores, and CES-D total scores). Results revealed that for the illness characteristic variables, frequency of physician visits was significantly correlated with physical HRQOL, $r(28) = -.45$, $p = .01$, and anxiety, $r(28) = .40$, $p = .03$, indicating that more visits to the physician was associated with lower physical HRQOL and increased anxiety. None of the demographic variables were found to be significant correlates, nor were any other correlations significant.

Descriptive statistics were conducted to determine the percentage of college students with asthma that met clinically significant criteria for depression and anxiety. Results revealed that 23.2% of college students with asthma scored in the clinically significant range for depression (>16 for the CES-D; Radloff, 1977) and 3.3% scored in the severe to extreme range for anxiety (between 60 and 80 for the SAS; Zung, 1971).

Primary Analyses

To test whether college students with asthma would have higher levels of psychological distress, specifically, anxiety and depression, and lower ratings of their quality of life than their age and gender matched healthy controls, a paired *t*-test analysis was conducted between the two groups. Paired *t*-test analysis revealed that the matched healthy controls, (*M* = 56.39*, SD* = 5.82) evidenced higher physical health-related quality of life (HRQOL) than participants with asthma, (*M* = 51.50*, SD*= 8.03); $t(59) = -2.91$, $p = 0.007$, $d = 0.53$. No other significant differences were found as it applied to comparisons of participants with asthma on measures of anxiety, $t(59) = .80$, $p = .429$, $d = 0.15$, depression, $t(59) = -.03$, $p = .978$, $d = 0.01$, or mental HRQOL, $t(59) = .14$, $p = .886$, $d = 0.03$ compared to healthy controls.

To test the hypotheses that illness intrusiveness and illness uncertainty would be significant predictors of SF-36 mental and physical HRQOL and psychological distress, four separate hierarchical regressions were conducted with only participants with asthma. Following Thompson and Gustafson's (1996; 45) transactional model of stress and coping, illness covariates identified by significant correlations in the preliminary analyses (i.e., frequency of seeing a physician within the last year for SF-36 mental component summary scores) were entered on Step 1, and Illness Intrusiveness Scale and Mishel Uncertainty in Illness total scores were entered as the predictor variables on Step 2 for each regression.

SF-36 Mental Component Summary Score Regression Results. Illness Intrusiveness and Illness Uncertainty total scores were entered as the predictor variables on Step 1, and the SF-36 Mental Component Summary Score served as the dependent variable. Results revealed that the overall model was significant, $F(2, 29) = 5.31$, $p = .01$, and explained 28% ($R^2 = .28$) of the variance in SF-36 Mental Component Summary Scores. Furthermore, illness intrusiveness ($\beta = -.51$, $p = .02$) emerged

as an inverse significant predictor of SF-36 Mental HRQOL, indicating that for participants with asthma, higher illness intrusiveness was associated with lower mental HRQOL. Illness uncertainty did not significantly predict SF-36 Mental HRQOL, (β = -.02, p = .92).

SF-36 Physical Component Summary Score Regression Results. Based on the preliminary analyses, frequency of physician visits was entered on Step 1. Illness intrusiveness and illness uncertainty total scores were entered on Step 2, and the SF-36 Physical Component Summary Score served as the dependent variable. Results revealed that the overall model was significant, F(3, 29) = 21.244, p = .00, and explained 71% (R^2 = .71) of the variance in SF-36 Physical Component Summary Scores. Additionally, illness intrusiveness emerged as an inversely related significant predictor of (β = -.80, p = .001) of SF-36 Physical HRQOL, indicating that higher levels of illness intrusiveness was associated with lower physical HRQOL for the participants with asthma. Illness uncertainty did not significantly predict SF-36 Physical HRQOL, (β = -.17, p = .31).

Psychological Distress – Anxiety. Based on the preliminary analyses, frequency of visiting a physician was entered on Step 1. Illness intrusiveness and illness uncertainty total scores were entered on Step 2, and the SAS Anxiety total score served as the dependent variable. Results revealed that the overall model was significant, F(3, 29) = 8.14, p = .001, and explained 48% (R^2 = .48) of the variance in SAS Anxiety Total Scores. Neither illness intrusiveness (β = .59, p = .05) nor illness uncertainty (β = .17, p = .45) emerged as a significant independent predictor of anxiety.

Psychological Distress – Depression. Illness intrusiveness and illness uncertainty total scores were entered on Step 1, and the CES-D Depression Total Score served as the dependent variable. Results revealed that the overall model was significant, F(2, 29) = 9.94, p = .001, and explained 42% (R^2 = .42) of the variance in CES-D Depressive Scores. Additionally, illness intrusiveness emerged as positive related significant predictor of (β = .60, p = .003) of depression, indicating that higher illness

intrusiveness was associated with higher depression scores for participants with asthma. Illness uncertainty did not significantly predict depression, (β = .08, p = .67).

A 2 (illness status) x2 (experimental condition) factorial ANOVA was conducted to examine the susceptibility , assessed by anagram score, of participants with asthma and their matched controls to the learned helplessness manipulation. Analysis revealed that there was no main effect of illness status, $F(1,56) = .17$, $p = 0.682$, $d = 0.00$, or experimental condition, $F(1,56) = .01$, $p = 0.911$, $d = 0.00$, on susceptibility of the learned helplessness task. Additionally there was no interaction of factors, $F(1,56) = .88$, $p = 0.352$, $d = 0.02$.

A 2 (illness status) x 3 (saliva measurement times) x 2(experimental condition) mixed ANOVA design was used to assess the level of cortisol after the experimental manipulation. Analysis revealed a significant main effect of measurement times, $F(1.54,84.92) = 7.53$, $p = 0.002$, $d = 0.12$. Bonferroni corrected post hoc tests showed that measurement time T2 (M = 0.32) was significantly higher than measurement time T3 (M = 0.28); T1 measurements were not significantly different from T2 ($p > 0.05$) or T3 ($p > 0.05$). There was not a main effect of illness status, $F(1,55) = 3.32$, p = 0.74, $d = 0.06$, or experimental condition, $F(1,55) = .58$, $p = 0.45$, $d = 0.01$, thus, indicating that neither illness status nor experimental condition alone had an effect on cortisol levels. There was an interaction between measurement times and illness, $F(1.54,84.92) = 3.42$, $p = 0.049$, $d = 0.06$, indicating that the differences between measurement times differed by illness group (see Figure 5 and Figure 6). To breakdown this interaction, simple contrasts were conducted to compare the three measurements times across illness status. The contrasts revealed that among asthma participants T1, (M = 0.29, SD = 0.18); $F(1,56) = 5.32$, $p = 0.025$, and T2, (M = 0.27, SD = 0.18); $F(1,56) = 7.72$, p = 0.007, cortisol levels were significantly higher than T3, (M = 0.23, SD = 0.15), cortisol levels. There was no interaction between experimental condition and illness, $F(1,55) = .73$, $p = 0.40$, $d = 0.01$, between measurement time and experimental condition, $F(1.54,84.92) = 0.90$, $p = 0.39$, $d = 0.02$, or

between measurement time, experimental condition, and illness, $F(1.54,84.92) = 1.43$, $p = 0.24$, $d = 0.03$. Thus, to summarize, the only significant effects on cortisol levels were measurement times and the interaction of measurement time and illness condition. Among measurement times, T2 levels were significantly higher than T3 levels. The interaction indicated that participants with asthma had overall higher T1 and T2 cortisol levels when compared to T3 cortisol levels (see Figure 5 and Figure 6).

CHAPTER VI

DISCUSSION

The purpose of the present study was to examine aspects of learned helplessness and salivary cortisol in college students with asthma compared to their age-gender matched controls. Additionally, we wanted to evaluate the constructs of illness uncertainty and intrusiveness in college students with asthma as predictors of quality of life, anxiety, and depression. The impact of illness on psychological distress and quality of life is well- documented (e.g., Gillaspy, Hoff, Mullins, Van Pelt, & Chaney, 2002; Chaney et al*.,* 1999; MacLean, Perrin, Gortmaker, & Pierre, 1992; Mullins et al., 1997; Juniper, 1997). The present study was guided by four hypotheses. The following results add to past findings and suggest new future directions in research with college students with asthma.

The first hypothesis stated that college students with asthma would have higher levels of psychological distress, specifically anxiety and depression, and lower ratings of health-related quality of life. The hypothesis was supported as it applies to physical health-related quality of life, and results revealed that participants with asthma had significantly lower physical ratings of health-related quality of life than age-gendered matched controls. The hypothesis was not supported for measures of psychological distress and mental health-related quality of life. Results revealed that participants with asthma and their age-gender matched controls did not differ on measures of anxiety, depression, and mental health-related quality of life. This finding was unexpected, given

that past literature has demonstrated that individuals with asthma tend to evidence higher levels of anxiety (Gillaspy, et al., (2002) and depression (Bennett, 1994) than healthy controls. Past research has also revealed that impaired functional abilities of children with asthma can interfere with integration in peer relationships and in turn affect health-related quality of life (Juniper, 1997).

Such results could be an effect of utilizing a sample of well functioning college students with relatively limited health impairments. Indeed, half of the participants with asthma (53%) reported visiting a physician at least once a year. Physicians who treat asthma often provide action plans that include strategic lists and guidelines to help manage asthma symptoms (Gibson et al., 2000). Since it has been documented that asthma symptoms are better controlled with appropriate treatment (Douglas et al. 2002), regular office visits could lead to better control of asthma symptoms and help reduce psychological distress. Thus, our results could reflect a population who seek appropriate treatment of symptoms. Additionally, it should be noted that most of the students with asthma reported mild severity of symptoms (see Table 1). This lack of severity of asthma-related symptoms could result in less emotional distress as compared to the matched healthy control population.

It can be postulated, that the divergent-findings in physical and mental health-related quality of life may also be attributed to the reduction of psychological distress by frequent physician visits. Knowledge about controlling asthma symptoms could improve mental health-related quality of life, but may not diminish pressing physical symptoms associated with asthma. To date, there continues to be no cure for asthma, and taxing physical limitations still persist in a subset of this illness population. Physical restrictions associated with asthma (i.e., coughing, wheezing, and having trouble breathing) could be attributed to the significantly lower ratings of physical health-related quality of life in participants with asthma when compared to their age-gendered matched controls.

The second hypothesis stated that illness uncertainty and illness intrusiveness would be positive predictors of psychological distress and negative predictors of quality of life among college students with asthma. The results supported this hypothesis as it applied to illness intrusiveness predicting quality of life and depression. Among college students with asthma, regression analysis did show that illness intrusiveness was negatively related to both mental and physical HRQOL and was a positive predictor of depression. Illness intrusiveness has been well documented to disrupt demands of daily life and perpetuate psychological distress in individuals with a chronic illness (Mullins et al., 2000). As asthma intrudes on daily life, physical activities may lessen and rumination about this reduction could lead to diminished mental quality of life and/or depression.

Interestingly, illness uncertainty did not predict psychological distress, or, mental and physical health-related quality of life in participants with asthma. Past research has shown that together, illness intrusiveness and uncertainty may be a part of a vicious cycle, in which being uncertain about an illness leads to intrusiveness, which then leads to psychological distress (Mullins et al., 2000). The lack of findings with uncertainty is unexpected but may reflect the education about asthma that is now available (i.e., action plans, Gibson et al., 2002). Additionally, the measure of uncertainty, MUIS-C, had the lowest internal consistency ($\alpha = 0.76$) when compared to the other measurements in the current study. Thus, the observed reliability score could contribute to uncertainty not showing up as a significant predictor in participants with asthma.

Neither illness intrusiveness nor uncertainly predicted anxiety in the sample. As stated previously, college students with asthma have been documented to exhibit higher levels of anxiety (Gillaspy et al, 2002) and this unexpected finding, as it applies to anxiety, could be result of the well-supported nature of the current sample.

The third hypothesis stated that all participants exposed to an uncontrollable event would show increased susceptibility, as evidenced by poorer performance on an anagram task compared to participants that will be exposed to a controllable event. Furthermore, it was predicted that college students with asthma would show even greater susceptibility to helplessness when exposed to an uncontrollable event than all other participants. The results did not support this hypothesis of the learned helplessness theory. Increased susceptibility was not reflected, through anagram scores, in the participants with asthma nor their matched controls, after being exposed to an uncontrollable event. Although Chaney (1999) suggested that feelings of learned helplessness associated with the chronic illness may interfere with real world non-contingent experiences, it was not replicated in the current study. A primary explanation for this finding might be a function of the dated learned helplessness task. The experimental task used in the current study was developed in older studies from the 1970s (e.g., Levine, 1971; Hiroto & Seligman, 1975, Benson & Kennelly, 1976). Participants in the current sample were born between 1985 and 1991 and the older task may have looked dated to them, contributing to the lack of effective manipulation in both populations.

The fourth hypothesis stated that higher cortisol levels would be found in college students with asthma when compared to their healthy controls at the first collection point (T1) taken before the learned helplessness task in both experimental conditions. In the non-solvable or uncontrollable condition, after implementation of the stress task, it was proposed that cortisol levels would increase in both students with asthma and their healthy controls with steeper elevations in the asthmatic population. Additionally, it was hypothesized that levels of cortisol would decline after 15 minutes had elapsed from the uncontrollable event. In the controllable condition, it was predicted that cortisol levels would remain fairly consistent during the two other collection points (T2; T3).

The results of the current study supported the hypothesis as it pertains to higher cortisol levels in college with asthma at T1 and T2 across experimental conditions (interaction between illness status and cortisol sampling; see Figure 5 and 6). Results did not support an elevation in cortisol levels in the non-solvable condition as a response to the stress task in either college students with asthma nor to matched controls at T2 (see Figure 5). Finally, in the solvable condition, the results showed little variability in cortisol levels (see Figure 6) and hence did support the hypothesis of cortisol levels remaining fairly consistent.

Figure 5. Cortisol levels in uncontrollable condition

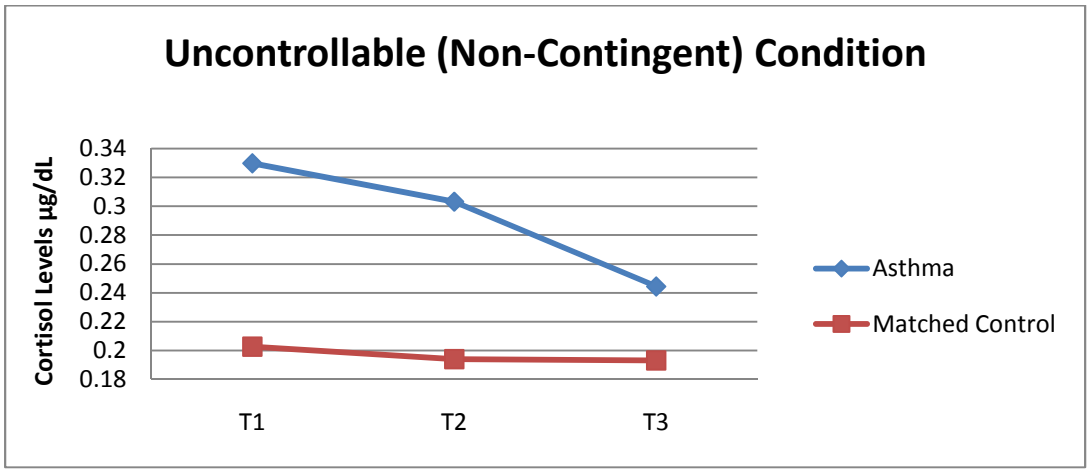

Figure 5. Results for cortisol levels at T1, T2, and T3 during the uncontrollable (non-contingent) condition for college students with asthma and their age-gendered matched healthy controls.

Figure 6. Cortisol levels in controllable condition

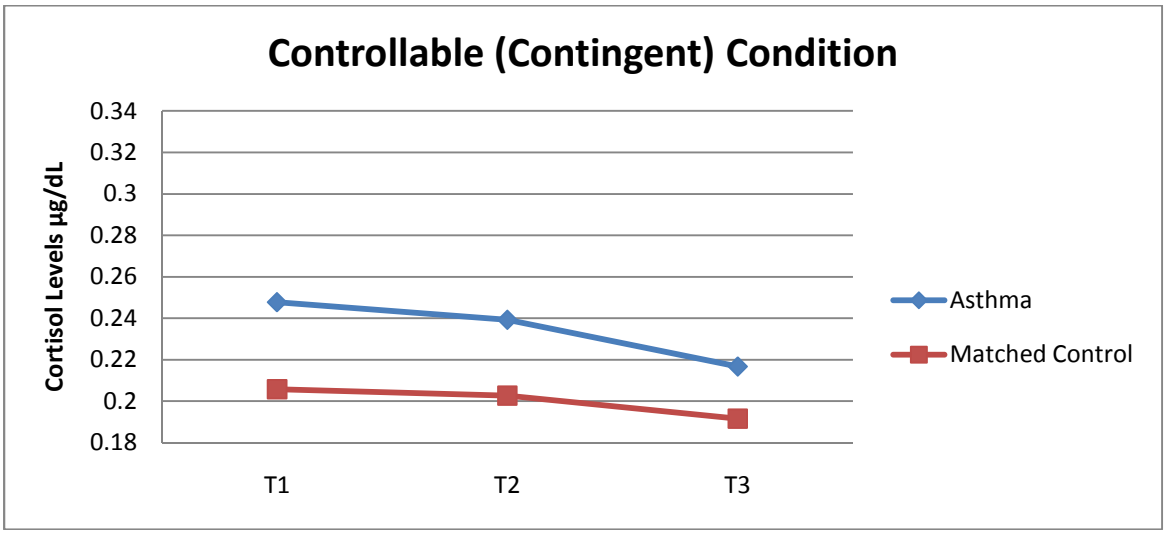

Figure 6. Results for cortisol levels at T1, T2, and T3 during the controllable (contingent) condition for college students with asthma and their age-gendered matched healthy controls.

Although research has found support for diurnal patterns of cortisol in individuals with asthma (Masharani et al. 2005); there has been limited research comparing cortisol levels among individuals with a chronic illness and their matched controls. Even though, the current study did show a significant decrease in cortisol levels 15 minutes after the stress task (T3), the decrease did not appear to be an effect of the non-contingency events in the learned helplessness task. The cortisol levels were elevated at the start of the experiment and tapered off towards T3 in college students with asthma. Since the three cortisol collection points and associated hypothesis were developed as a function of the expected success of the manipulation of the learned helplessness task, this non-significant effect could be expected since the learned helplessness task was not apparently effective in producing the expected susceptibility. The initial elevation noticed in the participants with asthma in both experimental conditions could be a result of a pre-experimental anticipation response in individuals with asthma. Indeed, participants could have been

physiologically responding to the novel environment. Furthermore, the decline seen from T2 to T3 could be a result of their habituation to the environment. As individuals with asthma adjusted to the experimental setting, their cortisol levels and stress response declined. Supporting this proposition, this anticipation response was not seen in the matched control population in either condition.

Lastly, it should be noted that the peak in cortisol levels, and later stabilization, that individuals with asthma encountered during the study may be better explained by stress reactivity than learned helplessness. Adaptive reorganization is a theory used to describe the reactive stress system of people after controllable and uncontrollable situations (Huether et al., 1999). It suggests that after controllable stress there is a stabilization of neural patterns and coping where individuals habituate to the situation (Huether et al., 1999). The observed decrease in cortisol in participants with asthma in the current study most likely resembles adaptive reorganization to a stressor that was controllable to them.

Limitations and Strengths

The current study has a number of limitations. First, asthma diagnosis and severity was purely subjective, based on self-report, and was not verified by a medical professional. Additionally, most of the individuals with asthma reported mild severity (see Table 1), which may not generalize when compared to populations with more severe asthma. Also, all participants were college students and mostly Caucasian, further limiting generalizability of the results. Furthermore, the small sample size limits the ability to find significant effects. Lastly, salivary cortisol measurements were not assayed in duplicates for average variability for each assay. More accurate ratings could have been achieved with duplicate assays.

Despite these limitations, several strengths should be acknowledged. First, the current study is an initial step in highlighting cortisol differences in individuals with chronic illnesses. To our

knowledge, the current study is the first to find significant differences in cortisol levels of college students with asthma and their matched controls. The results provide evidence that stress levels may be initially elevated in individuals with asthma due to anticipation of novel situations or environments but later can become habituated. Accordingly, the study provides evidence for the adaptive reorganization theory of stress response (Huether et al., 1999). Lastly, the results add to the well documented literature of illness intrusiveness and its impact on daily life and well-being (Mullins et al., 2000).

Future Directions

Overall, the current study supports past research findings that document relationships between illness intrusiveness and both higher psychological distress and lower health-related quality of life. Future studies should continue to examine this critical construct as it relates to chronic illness. Additionally, utilization of a different learned helplessness task that reliably elicits stress is needed. The structure of the current learned helplessness task was used in older studies from the 1970s (e.g., Levine, 1971; Hiroto & Seligman, 1975, Benson & Kennelly, 1976). Participants in the current sample were born between 1985 and 1991 and the older task may have looked dated to them, contributing to the lack of effective manipulation.

Next, even though the theory of learned helplessness was not replicated, the current study did demonstrate that individuals with a chronic illness may have higher cortisol levels at different sampling times than individuals without a chronic illness. Future studies would benefit from a methodology that involves having participants fill out questionnaires during the first part of the study and complete the learned helplessness task during the second part of the study. This change in methodology could help reduce the theorized experimental anticipation observed in participants with asthma in the experimental task. Cortisol elevations could then be solely contributed to stress

reactivity in the session because habituation would already have taken place. Also further examination of cortisol levels in individuals with a chronic illness across different illnesses, gender, and varying ethnicities would be helpful to future research, especially since several disparities have been documented in mortality, morbidity, and prevalence rates among individuals with asthma. Additionally, including evaluation of salivary α-amylase would be beneficial to future research. Stress has been noted to also activate the sympatho-adrenal medullary (SAM) axis, which releases salivary α-amylase (Baum, 1993; Smith, 1996).

Wolf and associates (2008) investigated cortisol levels, salivary α-amylase levels, and stress in healthy children and adolescents and children and adolescents with asthma. In healthy children, chronic stress was associated with flatter cortisol slopes. Higher chronic stress among children with asthma was associated with lower daily α-amylase, thus indicating lower sympathetic activity, and implying increased susceptibility to symptom exacerbations. In addition, their study supported a reversed secretion patterns of cortisol and α-amylase and also found that only salivary α-amylase patterns differed between children with asthma and healthy children, with asthmatic children showing lower levels. The authors hypothesized that increased sympathetic system activity can protect against asthma, hence, further evaluation of α-amylase is warranted.

Also, frequency of physician visits was associated with lower physical HRQOL and higher anxiety in bivariate correlations. It would be interesting to examine the psychological and quality of life impacts of individuals that receive medical care more frequently than those who do not. Lastly, verification of asthma diagnosis, severity of asthma symptoms, and physician visits should be confirmed with additional independent physician ratings.

Conclusions and Clinical Implications

As shown in the current study, illness intrusiveness appears to still be a risk factor among college students with asthma. More education for children and adolescents about the impact of asthma on daily life would be beneficial at diagnosis. Additionally, the theory of learned helplessness may no longer be applicable to college students with asthma that have mild severity. Evidence for the peak then decline of cortisol levels in individuals with asthma could have many future implications. More knowledge about the pattern of cortisol levels and its impact on individuals with asthma would be beneficial for the health and lifestyle of individuals with asthma or with other chronic illnesses. Education about adaptive organization to stress (Huether et al., 1999) can be made readily available to individuals with increased physiological mechanisms that have not developed a strategy to decrease stress. .

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APPPENDICES

Appendix A

MEASURES

Demographic Form

Center for Epidemiologic Studies Depression Scale (CES-D)

Zung Self-Rating Anxiety Scale (SAS)

SF-36 Health Survey

Mishel Uncertainty in Illness Scale-Community Form (MUIS-C)

Illness Intrusiveness Scale (IIS)

Subject #:_____

DEMOGRAPHIC FORM

1. Age: _____

2. Sex: M F
   1 2

3. Race
   1 African-American
   2 Native American/American-Indian
   3 Caucasian
   4 Hispanic
   5 Asian
   6 Biracial, please specify: _____
   7 Other, please specify: _____

4. Highest Level of Education Obtained:
   1 Middle School
   2 High School
   3 College (please indicate highest year completed)
      a. Freshman
      b. Sophomore
      c. Junior
      d. Senior
   4 College Degree
   5 Post-Graduate Degree

4a. What is your current (or intended) major? _____

5. Marital Status:
   1 Never Married
   2 Married
   3 Divorced
   4 Cohabitating/Living with Partner
   5 Widowed
   6 Other, please specify: _____

6. If married, spouse's occupation: _____

7. Parent's occupation: Father:_____ Mother: _____

8. Parent's highest level of education obtained:
   Father: _____ Mother: _____

9. Do you live with your parents even part-time (including weekends or summers)?
_____

10. Are you currently taking any psychoactive medication (e.g., antidepressants, anti-anxiety)?

YES	NO
1	2

11. Have you ever been treated by a physician for a medical condition for more than three consecutive months in any given year? (For example: May, June, and July, 1999)

YES	NO
1	2

12. Have you ever been hospitalized continuously for a medical condition for more than one month?

YES	NO
1	2

13. In the last hour, have you consumed any caffeine?

YES	NO
1	2

14. In the last hour, have you eaten a meal?

YES	NO
1	2

15. In the last hour, have you taken any medication?

YES	NO
1	2

If yes, what was the medication? _____

16. In the last hour, have you slept or taken a nap?

YES	NO
1	2

17. Do you have a chronic illness?

YES	NO
1	2

IF NO, PLEASE ANSWER 17B AND THEN NOTIFY THE EXPERIMENTER. THANK YOU. IF YES, PLEASE GO ON TO QUESTION 18.

17B. Please estimate the number of school and/or work days you missed during the last academic year (2008-2009) *for medical reasons*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days missed from work only.)

SCHOOL: _____

WORK: _____

18. Do you have asthma?

YES	NO
1	2

If you have another chronic illness in addition to asthma, please specify the type or types of condition(s):_____

19. Have you or another family member ever received any type of psychological counseling or therapy?

YES	NO
1	2

If yes, was your counseling related to your asthma?

YES	NO
1	2

20. Are you currently taking any medications for your asthma?

YES	NO
1	2

If yes, please specify the type of medication(s) and how frequently you take the medication(s):

Type	Frequency
a. _____	_____
b. _____	_____
c. _____	_____

21. At what age did you have your first asthma attack? _____

22. At what age were you diagnosed with asthma? _____

23. Are you presently receiving any medical treatment from a physician for your asthma?

YES	NO
1	2

If yes, please indicate the number of visits to your physician in the past 6 months.

_____

24. Do you have asthma attacks only during a certain season (SEASONAL) or all-year round (PERENNIAL)?

SEASONAL	PERENNIAL
1	2

25. How **severe** do you think your asthma has been in the past year?

1	2	3	4	5	6	7
Mild	Mild Respiratory	Moderate	Moderate	Severe	Extremely Severe	Failure

Mild = 1 or 2 attacks per week; as many as two episodes of nighttime cough a month; good exercise tolerance; no symptoms between attacks; bronchospasm responds to bronchodilator.

Moderate = More than 2 attacks per week; symptoms between attacks; symptoms affect sleep, activity level, or work performance; bronchospasm responds to bronchodilator; reduced exercise tolerance; coughing; chest tightness, wheezing; seeking emergency room treatment more than three times per year.

Severe = Daily wheezing; sudden, severe attacks; limited exercise tolerance and activity level; sleep is disrupted; bronchospasm does not always respond to bronchodilator; poor work attendance; mild tachycardia (excessively rapid heartbeat); tachypnea (excessively rapid breathing); difficulty speaking in complete sentences; seeking emergency care more than 3 times per year.

Respiratory Failure = Increased tachycardia (excessively rapid heartbeat); tachypnea (excessively rapid breathing); wheezing; reduced, poor air exchange; uses accessory muscles (e.g., arms) to sit up, with perspiration; confusion; lethargy; altered consciousness.

26. How **controllable** do you think your asthma is?

1	2	3	4	5	6	7
Entirely Uncontrollable	Uncontrollable	Somewhat Controllable	Somewhat Controllable	Mostly Controllable	Mostly Controllable	Entirely Controllable

27. Please estimate the number of school and/or work days you missed during the last academic year (e.g., 2008-2009) *as a result of your asthma or asthma-related symptoms*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days from work only.)

SCHOOL: _____
WORK: _____

28. Please estimate the number of school and/or work days you missed during the last academic year (2008-2009) *for medical reasons other than asthma*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days from work only.)

SCHOOL: _____
WORK: _____

29. During the 2008-2009 academic year, did you ever attend class when you had asthma symptoms?

YES	NO
1	2

If yes, please estimate the number of days you did attend class when you had asthma symptoms.

_____

If yes, please circle the number that indicates how much the asthma symptoms interfered with your normal daily class routine (i.e., taking notes, taking an exam, participating in a laboratory).

1	2	3	4	5	6	7
No Interference	Interference	Mild Interference	Mild Interference	Moderate Interference	Moderate Interference	Interfered a Great Deal

30. During the 2008-2009 academic year, did you ever attend work when you had asthma symptoms?

YES	NO
1	2

If yes, please estimate the number of days you did attend work when you had asthma symptoms.

_____

If yes, please circle the number that indicates how much the asthma symptoms interfered with your normal work routine (i.e., getting to work on time; completing job tasks efficiently).

1	2	3	4	5	6	7
No Interference	Interference	Mild Interference	Mild Interference	Moderate Interference	Moderate Interference	Interfered a Great Deal

31. During the 2008-2009 academic year, do you feel that your asthma interfered with your social life?

YES	NO
1	2

If yes, please circle the number that indicates how much your asthma symptoms interfered with your social life.

1	2	3	4	5	6	7
No Interference	Interference	Mild Interference	Mild Interference	Moderate Interference	Moderate Interference	Interfered a Great Deal

CES-D

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way in the past week.

DURING THE PAST WEEK

Rarely or none of the time (less than 1 day)	Some or a little of the time (1 – 2 days)	Occasionally or a moderate amount of time (3 – 4 days)	Most or all of the time (5 – 7 days)
0	**1**	**2**	**3**

_____ 1. I was bothered by things that usually don't bother me.

_____ 2. I did not feel like eating; my appetite was poor.

_____ 3. I felt that I could not shake off the blues even with help from my family or friends.

_____ 4. I felt I was just as good as other people.

_____ 5. I had trouble keeping my mind on what I was doing.

_____ 6. I felt depressed.

_____ 7. I felt that everything I did was an effort.

_____ 8. I felt hopeful about the future.

_____ 9. I thought my life had been a failure.

_____ 10. I felt fearful.

_____ 11. My sleep was restless.

_____ 12. I was happy.

_____ 13. I talked less than usual.

_____ 14. I felt lonely.

_____ 15. People were unfriendly.

DURING THE PAST WEEK

Rarely or none of the time (less than 1 day)	Some or a little of the time (1 – 2 days)	Occasionally or a moderate amount of time (3 – 4 days)	Most or all of the time (5 – 7 days)
0	**1**	**2**	**3**

_____ 16. I enjoyed life.

_____ 17. I had crying spells.

_____ 18. I felt sad.

_____ 19. I felt that people dislike me.

_____ 20. I could not get “going.”

SAS

Instructions: Based on how you felt in the last week, reply to the following questions using one of the four replies below.

None or a little of the time	Some of the time	A large part of the time	Most of the time
1	**2**	**3**	**4**

_____ 1. I feel more nervous and anxious than usual.

_____ 2. I feel afraid for no reason at all.

_____ 3. I get upset easily or feel panicky.

_____ 4. I fell like I'm falling apart and going to pieces

_____ 5. I feel that everything is all right and nothing bad will happen

_____ 6. My arms and legs shake and tremble.

_____ 7. I am bothered by headaches, neck, and back pains.

_____ 8. I feel weak and get tired easily.

_____ 9. I feel calm and can sit still easily.

_____ 10. I can feel my heart beating fast.

_____ 11. I am bothered by dizzy spells.

_____ 12. I have fainting spells or feel like it.

_____ 13. I can breathe in and out easily.

_____ 14. I get feelings of numbness and tingling in my fingers and toes.

_____ 15. I am bothered by stomach aches or indigestion.

_____ 16. I have to empty my bladder often.

_____ 17. My hands are usually warm and dry.

None or a little of the time	Some of the time	A large part of the time	Most of the time
1	**2**	**3**	**4**

_____ 18. My face gets hot and blushes.

_____ 19. I fall asleep easily and get a good night's rest.

_____ 20. I have nightmares.

Your Health and Well-Being

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. ***Thank you for completing this survey!***

For each of the following questions, please mark an ☒ in the one box that best describes your answer.

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

2. <u>Compared to one year ago</u>, how would you rate your health in general <u>now</u>?

Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse now than one year ago
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

3. The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a	Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	☐1	☐2	☐3
b	Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐1	☐2	☐3
c	Lifting or carrying groceries	☐1	☐2	☐3
d	Climbing several flights of stairs	☐1	☐2	☐3
e	Climbing one flight of stairs	☐1	☐2	☐3
f	Bending, kneeling, or stooping	☐1	☐2	☐3
g	Walking more than a mile	☐1	☐2	☐3
h	Walking several hundred yards	☐1	☐2	☐3
i	Walking one hundred yards	☐1	☐2	☐3

j Bathing or dressing yourself .... ☐1 .... ☐2 .... ☐3

4. During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Cut down on the <u>amount of time</u> you spent on work or other activities	☐1	☐2	☐3	☐4	☐5
b <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5
c Were limited in the <u>kind</u> of work or other activities	☐1	☐2	☐3	☐4	☐5
d Had <u>difficulty</u> performing the work or other activities (for example, it took extra effort)	☐1	☐2	☐3	☐4	☐5

5. During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Cut down on the <u>amount of time</u> you spent on work or other activities	☐1	☐2	☐3	☐4	☐5
b <u>Accomplished less</u> than you would like	☐1	☐2	☐3	☐4	☐5

c Did work or other activities less carefully

than usual ..... ☐1 ..... ☐2 ..... ☐3 ..... ☐4 ..... ☐5

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

Not at all	Slightly	Moderately	Quite a bit	Extremely
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

7. How much bodily pain have you had during the past 4 weeks?

None	Very mild	Mild	Moderate	Severe	Very Severe
▼	▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5	☐6

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
▼	▼	▼	▼	▼
☐1	☐2	☐3	☐4	☐5

9. These questions are about how you feel and how things have been with you <u>during the past 4 weeks</u>. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the <u>past 4 weeks</u>...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Did you feel full of life?	☐1	☐2	☐3	☐4	☐5
b Have you been very nervous?	☐1	☐2	☐3	☐4	☐5
c Have you felt so down in the dumps that nothing could cheer you up?	☐1	☐2	☐3	☐4	☐5
d Have you felt calm and peaceful?	☐1	☐2	☐3	☐4	☐5
e Did you have a lot of energy?	☐1	☐2	☐3	☐4	☐5
f Have you felt downhearted and depressed?	☐1	☐2	☐3	☐4	☐5
g Did you feel worn out?	☐1	☐2	☐3	☐4	☐5
h Have you been happy?	☐1	☐2	☐3	☐4	☐5
i Did you feel tired?	☐1	☐2	☐3	☐4	☐5

10. During the <u>past 4 weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	Most of the time	Some of the Time	A little of the time	None of the time
☐1	☐2	☐3	☐4	☐5

11. How TRUE or FALSE is <u>each</u> of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a I seem to get sick a little easier than other people	☐1	☐2	☐3	☐4	☐5
b I am as healthy as anybody I know	☐1	☐2	☐3	☐4	☐5
c I expect my health to get worse	☐1	☐2	☐3	☐4	☐5
d My health is excellent	☐1	☐2	☐3	☐4	☐5

THANK YOU FOR COMPLETING THESE QUESTIONS!

MUIS-C

Instructions: **PLEASE COMPLETE THIS QUESTIONNAIRE ONLY IF YOU HAVE BEEN DIAGNOSED WITH A CHRONIC HEALTH CONDITION OR ILLNESS DURING CHILDHOOD, SUCH AS ASTHMA, DIABETES, PEDIATRIC CANCER, OR A SIMILAR ILLNESS.**

My chronic health condition is_____ (fill in the blank).

Please read each statement. Take your time and think about what each statement says. Then, circle the number that most closely measure about how you are feeling TODAY. If you agree with a statement, then you would mark either "strongly agree" or "agree." If you disagree with a statement, then mark either "strongly disagree" or "disagree." If you are undecided about how you are feeling today, then mark "undecided" for that statement. Please respond to every statement.

1. I don't know what is wrong with me.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

2. I have a lot of question without answers.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

3. I am unsure if my illness is getting better or worse.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

4. The explanations they give me about my illness seem hazy to me.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

5. My symptoms continue to change unpredictably.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

6. I understand everything explained to me.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

7. The doctors say things to me that could have many meanings.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

8. I can predict how long my illness will last.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

9. My treatment is too complex to figure out.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

10. It is difficult to know if the treatments or medications I am getting are helping.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

11. Because of the unpredictability of my illness, I cannot plan for the future.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

12. The course of my illness keeps changing. I have good and bad days.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

13. It is not clear what is going to happen to me.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

14. I usually know if I am going to have a good or bad day.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

15. The effectiveness of the treatment is undetermined.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

16. I can generally predict the course of my illness.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

17. Because of the treatment, what I can do and cannot do keeps changing.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

18. They have not given me a specific diagnosis.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

19. My physical distress is predictable. I know when it is going to get better or worse.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

20. My diagnosis is definite and will not change.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

21. The seriousness of my illness has been determined.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

22. I'm certain they will not find anything else wrong with me.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

23. The doctors and nurses use everyday language so I can understand what they are saying.

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
5	4	3	2	1

IIS

Instructions: PLEASE COMPLETE THIS QUESTIONNAIRE ONLY IF YOU HAVE BEEN DIAGNOSED WITH A CHRONIC HEALTH CONDITION OR ILLNESS DURING CHILDHOOD, SUCH AS ASTHMA, DIABETES, PEDIATRIC CANCER, OR A SIMILAR ILLNESS.

The following items ask about how much your illness and or its treatment interfere with different aspects of your life. Please circle the one number that best describes your current life situation. If an item is not applicable, please circle the number one (1) to indicate that this aspect of your life is not affected very much. Please do not leave any item unanswered. Thank you.

How much does your illness and or its treatment interfere with your:

1. Health

Not Very Much 1 2 3 4 5 6 7 Very Much

2. Diet (i.e. things you eat or drink)

Not Very Much 1 2 3 4 5 6 7 Very Much

3. Work

Not Very Much 1 2 3 4 5 6 7 Very Much

4. Active Reactions (eg, sports)

Not Very Much 1 2 3 4 5 6 7 Very Much

5. Passive Reaction (eg, reading or listening to music)

Not Very Much 1 2 3 4 5 6 7 Very Much

6. Financial Situation

Not Very Much 1 2 3 4 5 6 7 Very Much

7. Relationship with Your Spouse (girlfriend or boyfriend not married)

Not Very Much 1 2 3 4 5 6 7 Very Much

8. Sex Life

Not Very Much	1	2	3	4	5	6	7	Very Much

9. Family Relationships

Not Very Much	1	2	3	4	5	6	7	Very Much

10. Other Social Relationships

Not Very Much	1	2	3	4	5	6	7	Very Much

11. Self-expression or Self-improvement

Not Very Much	1	2	3	4	5	6	7	Very Much

12. Religious Expression

Not Very Much	1	2	3	4	5	6	7	Very Much

13. Community and Civic Involvement

Not Very Much	1	2	3	4	5	6	7	Very Much

Appendix B

Tables

Table 1. *Descriptive of Self Report Asthma Severity Ratings*

	Frequency	Percent
Very Mild	14	46.7
Mild	7	23.3
Very Moderate	3	5
Moderate	3	5
Severe	3	5

College students with asthma (n = 30)

Table 2. *Zero-Order Correlations for Demographic Variables and Study Outcome Variables*

	1	2	3	4	5	6	7	8
1. Current Age		-.04	.18	.88**	-.07	-.05	-.01	-.06
2. Ethnicity			-.06	.01	-.06	.25	-.12	-.26
3.Gender				.36	-.14	-.31	.35	.19
4.Education					.01	-.03	-.01	-.12
5.Mental HRQOL						.29	-.64**	-.74**
6. Physical HRQOL							-.60**	-.49**
7. Anxiety								.82**
8. Depression								

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

Table 3. *Zero-Order Correlations for Illness Characteristics and Study Outcome Variables*

	1	2	3	4	5	6	7
1. Age of Diagnosis		.08	.01	.11	-.12	-.04	-.01
2. Medication			-.16	.15	.13	-.04	-.11
3.Frequency of Physician Visits				-.34	-.45**	.40*	.32
4.Mental HRQOL					.29	-.64**	-.74**
5. Physical HRQOL						-.60**	-.49**
6. Anxiety							.82**
7. Depression							

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

Table 4. *Hierarchical Regressions for Illness Uncertainty and Illness Intrusiveness on MCS*

Step and Variable		B	SE (B)	β	*p*
1	Illness Uncertainty	-.013	.123	-.022	.915
2	Illness Intrusiveness	-.393	.158	-.517	.019*

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

Table 5. *Hierarchical Regressions for Illness Uncertainty and Illness Intrusiveness on PCS*

Step and Variable		B	SE (B)	β	*p*
1	Frequency of Physician Visits	.935	1.42	.114	.517
2	Illness Uncertainty	-.094	.091	-.166	.312
	Illness Intrusiveness	-.577	.159	-.80	.001**

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

Table 6. Hierarchical Regressions for Illness Uncertainty and Illness Intrusiveness on Anxiety

Step and Variable		B	SE (B)	β	*p*
1	Frequency of Physician Visits	-.179	1.93	-.021	.927
2	Illness Uncertainty	.095	.123	.166	.446
	Illness Intrusiveness	.436	.215	.594	.053

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

Table 7. *Hierarchical Regressions for Illness Uncertainty and Illness Intrusiveness on Depression*

Step and Variable		B	SE (B)	β	*p*
1	Illness Uncertainty	.049	.115	.079	.673
2	Illness Intrusiveness	.474	.147	.599	.003**

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

VITA

Angelica R. Eddington

Candidate for the Degree of

Master of Science

Thesis: AN EXAMINATION OF LEARNED HELPLESSNESS, CORTISOL AND STRESS REACTIVITY IN COLLEGE STUDENTS WITH ASTHMA

Major Field: Psychology

Biographical:

Personal Data: Born in Memphis, Tennessee in 1984; Parents: Carl J. Eddington, Sr., and Brenda F. Eddington.

Education: Graduated from Summitt High School, Arlington, TX in 2003. Received Bachelor of Arts degree in Psychology from the University of Texas at Arlington in May 2007; Completed the requirements for the Master of Science in Psychology at Oklahoma State University, Stillwater, Oklahoma in December, 2009.

Experience: Graduate Research Assistant to Larry L. Mullins, Ph.D., Pediatric Health Psychology Lab, Department of Psychology, Oklahoma State University, August 2007 – present; Clinical practicum experience through the Oklahoma State University Psychological Services Center (PSC), August 2007-present.

Professional Memberships: American Psychological Association, Student Affiliate, Division 54 (Pediatric Psychology)

Name: Angelica R. Eddington Date of Degree: December, 2009

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: AN EXAMINATION OF LEARNED HELPLESSNESS, CORTISOL, AND STRESS REACTIVITY IN COLLEGE STUDENTS WITH ASTHMA

Pages in Study: 95 Candidate for the Degree of Master of Science

Major Field: Psychology

Scope and Method of Study: The purpose of the present study was twofold: 1) to examine aspects of a learned helplessness induction task and salivary cortisol in college students with asthma compared to age-and gender-matched controls; and 2) to examine constructs of illness uncertainty and intrusiveness in college students with asthma as predictors of quality of life, anxiety, and depression. Participants were recruited online through a research database and through the university health center. Participants were 30 college students with asthma and 30 age-and gender-matched controls. All participants were randomly assigned to either receive an uncontrollable or controllable task. Cortisol samples were taken three times (T1-baseline, T2-after stressor, and T3-15 minutes post) throughout the course of the task. Matched controls completed the Center for Epidemiologic Studies Depression Scale (CES-D), the Zung Self-Rating Anxiety Scale (SAS) and the SF-36 Health Survey. Participants with asthma completed these previous measures in addition to the Mishel Uncertainty in Illness Scale-Community Form (MUIS-C) and the Illness Intrusiveness Scale (IIS).

Findings and Conclusions: Results revealed that students with asthma had significantly lower ratings of physical HRQOL than controls. No differences were found with regards to mental HRQOL, depression, or anxiety between the students with asthma and controls. After controlling for significant illness characteristics, illness intrusiveness predicted decreased physical and mental HRQOL and increased depression in students with asthma. Notably, we could not replicate a learned helplessness induction in students with asthma. However, evidence for higher T1 and T2 levels of cortisol in students with asthma compared to T3 levels was supported. Overall, these preliminary results suggest that HRQOL and physiological differences exist between students with asthma and controls. Additionally, illness intrusiveness appears to be an important risk factor among students with asthma. Future research investigating illness constructs and stress reactivity in individuals with asthma is warranted.

ADVISER'S APPROVAL: Larry L. Mullins, Ph.D.