

A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

by

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The purpose of this research was to test a model explaining how cognitive and emotional factors relate to adolescents' abilities to successfully manage their own food allergies. It was hypothesized that higher scores on cognitive and emotional symptoms scales would predict lower scores in self-regulation of food allergy and in treatment adherence. One hundred and six adolescents with food allergies (ages 12-19) were surveyed, with 61.8% reporting a past experience of anaphylaxis. Utilizing multiple linear regression and path models, results indicate cognitive and emotional variables significantly predict treatment adherence and whether adolescents take more responsibility for food allergy behaviors. Significant findings indicate the older an adolescent, the more they report food allergy self-regulatory behaviors, yet the lower their treatment adherence. Perceived barriers, susceptibility, and severity all significantly impact adolescents' self-regulation and/or treatment adherence. Limitations, clinical implications, and areas of future research are discussed.

A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

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by

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LIST OF ABBREVIATIONS

FA	Food Allergy
EAI	Epinephrine Auto Injector (e.g., epi-pen, Auvi-Q, etc.)
CHLOC	Children's Health Locus of Control Scale
CS-SRM	Common Sense Self-Regulation Model
PTSS	Post-traumatic Stress Symptoms
QoL	Quality of Life
HRQoL	Health-related Quality of Life
PTSD	Post-traumatic Stress Disorder
FARE	Food Allergy Research and Education
HBM	Health Belief Model
SCARED	Screen for Child Anxiety Related Emotional Disorders
FAIM	Food Allergy Independent Measure
BoT	Burden of Treatment
IES-6	Impact of Events Scale 6
EMPOWER	Enhancing, Managing, and Promoting Well-Being and Resiliency

ABBREVIATIONS OF SPECIFIC MEASURES

FAIM	Appraised perception of risk using the FAIM
BoT	Measure of burden of treatment
ANX	Measure of generalized anxiety using the SCARED
IES	Measure of PTSS using the IES-6
BAR	Measure of perceived barriers using the HBM
SUC	Measure of perceived susceptibility using the HBM
SEV	Measure of perceived severity using the HBM
REG	Measure of self-regulation of responsibility using the EMPOWER
ADH	Measure of treatment adherence

Chapter I: Introduction

Chronic illnesses affect approximately 15 to 18 million children and adolescents in the United States (Compas, Jaser, Dunn, & Rodriguez, 2012; Van Cleave, Gortmaker, & Perrin, 2010; van der Lee, Mokkink, Grootenhuis, Heymans, & Offringa, 2007). Psychosocial effects from chronic illnesses heavily impact children's lives (Pao & Bosk, 2011) and have been found to predict adolescents' treatment adherence (Law, Tolgyesi & Howard, 2014). Anxiety disorders are frequently found in children and adolescents with comorbid medical illnesses, and the separation of anxiety disorders and chronic illness is often difficult (Pao & Bosk, 2011; Richardson et al., 2006). Chronic medical and psychological disorders often interact, aggravating each other so as to decrease patients' overall functioning physically, psychologically, and socially (Anderson, Cohen, Naumova, & Must, 2006; Chavira, Garland, Daley, & Hough, 2008). The theory of self-regulation further explains the interactions between the cognitive, emotional, and behavioral components of chronic illnesses and how those can lead to specific behavioral outcomes (Lansing & Berg, 2014). One factor of self-regulation, treatment adherence, is a key indicator of safety in individuals with food allergies. Research has demonstrated that physicians do not regularly assess emotional aspects of chronic illnesses in children (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007; Spitzer et al., 1994), even though emotional aspects may impact self-regulation. Adolescence is a key period of transferring responsibility of food allergy management (LeBlanc, Goldsmith, & Patel, 2003), and also one of the most risky in terms of adolescents' treatment adherence (Bock, Muñoz-Furlong, & Sampson, 2001; Macadam et al., 2012; Pumphrey & Gowland, 2007). As adolescents are found to be more likely to have comorbid anxiety and food allergies, it is also important to investigate how these factors influence adolescents' treatment adherence.

Review of Food Allergies: Chronic Illness, Characteristics

Food allergy is one condition that often meets the four-criteria definition for childhood chronic health conditions developed by Mokkinik and colleagues (2008). First, the diagnosis is designated for children aged 0 to 18 years. Second, the diagnosis is grounded on reproducible, medical, “scientific knowledge,” derived from valid methods or instruments “according to professional standards” (p. 1444). Third, the long-term chronic condition is either incurable or difficult to treat. Finally, the condition occurs three times or more per year with a probable reoccurrence or is present for longer than three months.

This definition for chronic illnesses (Mokkink, Van der Lee, Grootenhuis, Offringa, & Heymans, 2008) was specifically worded in order to include clinical manifestations and not the severity or consequences of chronic illnesses. In contrast, other definitions have included consequences of chronic illnesses, such as limitations in daily activities, special or increased requirements of care, and functional limitations in cultural, educational, or financial circumstances (Compas et al., 2012; Stanton, Revenson, & Tennen, 2007; Van Cleave et al., 2010). Consequences of childhood chronic illnesses as discussed by Compas and colleagues included negative effects on daily activities, as well as requirements of frequent hospitalizations, home health care, and/or expensive medical care.

Eight percent of children in the United States are affected by food allergies (Gupta et al., 2011; Gupta et al., 2018). The degree to which a person’s life is affected by a food allergy depends on the specific allergic reaction one has to a specific food protein. Strong bodily symptoms due to food allergies can be life threatening, and an allergic reaction could be a psychologically traumatic event (Kovalenko et al., 2001). The diagnosis of food allergies is based on both medical scientific knowledge and reproducible blood/skin graphing tests. Food

allergies may not be apparent until after a reaction to a food sends a child to their primary care physician or emergency room.

Allergic reactions are triggered by IgE antibody-mediated immune responses to food proteins (Peavy & Metcalfe, 2008; Sicherer & Sampson, 2009). Anaphylaxis can be brought on by an allergic reaction. This is a multiple organ system reaction including skin and mucosal tissue (sweating, hives, angioedema), respiratory (shortness of breath, bronchospasm), cardiovascular (reduced blood pressure, increased heart rate, hypotension, syncope), and gastrointestinal (nausea, cramping) symptoms. Treatment for food allergies is limited to a strict avoidance regimen of all foods that contain the allergen (trigger foods) and immediate medical treatment with epinephrine in the event of anaphylaxis (Lyons & Forde, 2004). In order to avoid an allergic reaction, people with food allergies must incessantly check foods they eat or that are nearby. People with allergies must be especially watchful when they do not have direct knowledge of their food's preparation, such as when eating meals with friends, in restaurants, or in other people's houses (Lyons & Forde, 2004). In 2000, the president of the Anaphylaxis Society compared eating in restaurants to playing 'Russian Roulette' for people who have anaphylaxis reactions. The life or death matter of simply eating in a restaurant or outside of one's home can be anxiety provoking for people with food allergies, and especially for those who have a history of anaphylactic shock.

Emergency room visit rates for anaphylaxis have increased in all child age groups between 2008 and 2016 (Michelson et al., 2020). This occurred most significantly in children under the age of 5, with the rate tripling "from 54 to 163 visits per million" patients per year, followed closely by adolescents between the ages of 15-17 (p.767). Michelson, Dribin, Vyles, and Neuman (2020) also reported a decrease in the hospitalization rate of children between 2008

and 2016, from 11.2% to 6.0% correspondingly. The rate for adolescents was not reported. This decrease in the hospitalization rate reported by Michelson and colleagues is a change from the increased reported rate between 1990 and 2006 from 1.00 to 4.70 per 100,000 children (Lin, Anderson, Shah, & Nurruzzaman, 2008). Lin and colleagues' study only included youth who were hospitalized due to anaphylactic reactions and not patients who were taken care of in emergency rooms and released, where more reactions are seen on a regular basis (Ross et al., 2008). Overall, these studies indicate that even if hospitalization rates may be decreasing in children, emergency department visits and thus reactions are increasing substantially in both children under the age of five years and in adolescents between the ages of 15-17 years.

Lin and colleagues (2008) studied a sample of patients from New York who were younger than age 20 years (median age of 11-years-old) and found that 66% of anaphylaxis hospitalizations were due to food allergies. Frequency and location of allergic reactions, especially the most recent reaction, are crucial factors that may influence the psychosocial impact of food allergies. Generally, the more allergic reactions that children have had, the lower parents rate them in physical functioning, and the higher the impact on family functioning (Marklund, Ahlstedt, & Nordström, 2006). One's developmental level affects one's functioning in regard to food allergies (LeBlanc et al., 2003). Adolescents' normal development of more independence significantly pertains to their increasing need to take responsibility for their food allergies as well as their parents' and physicians' need to foster and forego control to allow them to take responsibility (LeBlanc et al., 2003).

Developmental Context

Facilitation of the transfer of responsibility between parents to adolescents for management of their food allergies has recently become a topic of interest to researchers in this

area. Specifically, research interests have included increasing the communication between parents, children, and physicians on this topic (Herbert, Shemesh, & Bender, 2016), physicians working to identify stress and anxiety in adolescents with food allergies (Ferro et al., 2016), and utilizing assessments to assist in this process (Annunziato et al., 2015). LeBlanc and colleagues (2003) utilized Piaget's developmental stages to identify how children's and adolescents' developmental level may influence their understanding of chronic illness and which steps physicians should take to provide patient education. They identified the early ages of adolescence (12 to 14) as the time period that children start to understand that their actions have consequences, specifically in terms of their chronic illness. They acknowledged that this new level of understanding may not create behavioral changes and thus may require additional intervention in order to do so. This developmental understanding of chronic illness may be applied to adolescents with food allergies, explaining why adolescents often comprehend how to avoid severe allergic reactions, and yet have poor treatment adherence.

Developmental level also affects mental health in adolescents with food allergies. Ferro and colleagues (2016) identified adolescents with food allergies as having significantly higher levels of anxiety than both adolescents without chronic illnesses and adolescents with asthma (another common chronic illness). Annunziato and colleagues (2015) found that a history of a life-threatening reaction was associated with greater anxiety as well. In comparison, adolescents with asthma have significantly higher levels of depression than adolescents with food allergies or no chronic illness (Ferro et al., 2016). Ferro and colleagues also identified a persistent pattern of anxiety in those adolescents with food allergies as they become young adults, similar to previous studies (Shanahan, Zucker, Copeland, Costello, & Angold, 2014; Klinnert & Robinson, 2008). Potentially, this continuation of anxiety from adolescence to young adulthood may be due to the

positive correlation between anxiety symptoms in food-allergic young adults and health competence (Lyons & Forde, 2004; Ferro et al., 2016), indicating an adaptive level of vigilance required to avoid allergic reactions (Shanahan et al., 2014; Ferro et al., 2016). That is, being vigilant in screening food choices and avoiding allergic triggers is adaptive, but it also may increase anxiety as young adults worry about missing a trigger or letting their guard down.

Peniamina, Miroso, Bremer, and Conner (2016) discussed daily-life food allergy stressors that adults report. These are stressors that adolescents must learn to take responsibility for in order to successfully care for themselves. They identified the following food allergy issues as particularly stressful: (1) physical symptoms of food allergy, (2) feeling anxious about whether food is safe to eat, (3) feeling anxious or stressed in social occasions that involve food, (4) finding suitable foods to purchase while shopping, (5) maintaining a healthy diet, and (6) higher prices for safe food causing extra financial cost. Adolescents who are beginning to take responsibility for their food allergy management must learn to handle these stressors independently. Peniamina and colleagues' list of persistent daily stressors may lead to chronic stress-related health issues. Not only does stress put individuals at risk for exacerbating an allergic reaction (Wright, Cohen, & Cohen, 2005; Dave, Xiang, Rehm, & Marshall, 2011), it can cause other health issues due to raised stress levels (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Odgers & Jaffee, 2013). Because increased stress and mental health concerns are found among adolescents and young adults with food allergies, the transfer of responsibility from caregivers to adolescents must include consideration of the mental health and physical repercussions of stress that coincide with food allergy management.

Model of Self-Regulation

Self-regulation in adolescents, as rationalized by Lansing and Berg (2014), can be defined as an individual process in which adolescents moderate their cognitions, emotions, and behaviors in order to reach a goal. They theorized self-regulation as having far-reaching effects on physical and mental health on both individual and inter-personal constructs. As defined in this theory, individual constructs consist of self-regulation processes (cognition, emotion, and behaviors), while interpersonal constructs include others that assist and engage in individual self-regulation of chronic illness (i.e., family, community, and the healthcare system). In terms of chronic illness, Lansing and Berg proposed that adolescents must self-regulate their cognitions, emotions, and behaviors in order to stay healthy. Deficits in self-regulation would affect overall management of one's chronic illness. This theoretical framework appears to be an extension of Ireys, Werthamer-Larsson, Kolodner, and Shapiro Gross's (1994) theory that describes the mediating effect of a cognitive construct (perceived impact of illness) on the relationship between specific characteristics of chronic illness and mental health in young adults. Examples of characteristics specific to chronic illness include severity, predictability of symptoms, age of onset, etc. In consideration of one specific chronic illness, extending this model, as Lansing and Berg presented, allows one to parse out areas of intervention in order to change behavior (treatment adherence).

As food allergies' sole proven treatment is avoidance and administration of an epinephrine (epi-pen) autoinjector (EAI), treatment adherence would measure those specific adaptive behaviors. Jackson, Kim, and Delap's (2007) study on the mediators of cognitive constructs, stressful life events, and adaptive behavior provided an example of utilizing adaptive behaviors as an outcome measure, albeit in the context of including social support as an

additional variable in their analyses. Lansing and Berg's (2014) model combines the best of both Ireys and colleagues' (1994) and Jackson and colleagues' (2007) theories in application to adolescents with food allergies. Characteristics among food allergies and allergic reactions may vary; however, the treatment for food allergies is the same. Thus excluding the characteristics of the illness from Ireys and colleagues' (1994) theory is substantiated. Instead, including adaptive behaviors as an outcome measure, as used by Jackson, Kim and Delap (2007), would be appropriate as avoidance behaviors are the primary target for food allergies. Thus, Lansing and Berg's (2014) self-regulation model, which identifies cognitive, emotional, and behavioral components, is appropriate for assessing effects of cognition and mental health on treatment adherence, or adaptive behaviors. What follows is a discussion of the key elements of the self-regulation model.

Cognitive

Cognitive aspects of self-regulation in adolescents with food allergies include health beliefs (Schwartz et al., 2012), perception of risk or severity (van der Velde et al., 2010), and negative attitudes of illness (LeBovidge, Strauch, Kalish, & Schneider, 2009). Law and colleagues (2014) utilized the common sense model to identify how health beliefs in children with chronic illnesses affected their adaptive behaviors. They found children who believe their chronic illness is controllable by their prescribed treatments are more likely to demonstrate increased levels of treatment adherence. The authors supported the assessment of adolescents' health beliefs across the developmental period during the transfer of responsibility and to promote not only increasing self-management behaviors but also beliefs of control over their illnesses. Schwartz and colleagues (2012) identified health beliefs as moderating the association between increased health problems and post-traumatic stress symptoms in adolescent survivors

of childhood cancer. Specifically, the three subscales health perceptions, satisfaction with healthcare, and cognitive competence were significant moderators of the relationship. Due to children with food allergies' likelihood to experience trauma by anaphylaxis, need to continue monitoring their allergy, and need to adhere to treatment as long as the allergy is present, Schwartz and colleagues' findings may demonstrate a pattern that can be also examined in this population.

Adolescents' perceived severity of food allergy and risk of allergic reaction have been found to be tied to decreased quality of life and increased anxiety (van der Velde, Flokstra-de Blok, DunnGalvin, Hourihane, & Dubois, 2011; Herbert et al., 2016). However, no study to date has compared adolescents' perceived risk to actual risk as determined by a physician. Thus, an unsubstantiated higher perceived risk may be correlated with higher anxiety and provide a target for intervention. Additionally, the more negative an attitude a child has toward his/her food allergy, the more child-reported anxiety, depressive symptoms as well as social stressors (LeBovidge et al., 2009). Although mothers' report of their children's anxiety and depressive symptoms was substantially higher than the children's (ages 8-17 years) report of children's own report, the child-report of their own symptoms was also significant. Potentially, children's increased negative attitudes may reflect increased daily-hassles and stressors, as has been exhibited in adults and corresponded with decreases in mental health (Peniamina et al., 2016). LeBovidge and colleagues (2009) extrapolated that children's perception of risk for serious allergic reactions may be more predictive of mental health concerns, such as anxiety or decreased QoL, than history of allergic reactions. This theory further indicates the need to assess Lansing and Berg's (2014) theory of self-regulation while eliminating the illness characteristics

construct that Ireys and colleagues (1994) used in their model as children's perception of risk may be more indicative of future mental health concerns than actual or validated characteristics.

Locus of control, or the perception of the amount of control and responsibility one has over his or her health, has also been researched in relation to pediatric chronic illness.

Tieffenberg, Wood, Alonso, Tossutti, and Vicente (2000) found children with asthma and epilepsy's internal locus of control increased significantly after being trained to take control of their illnesses. Following this line of research, Knibb and Hourihane (2013) used Parcel and Meyer's (1978) Children's Health Locus of Control Scale (CHLOC), to measure children with food allergies' beliefs about whether their health was under their control, the control of others more powerful (doctor, parent), or if they had no control over their health. Parcel and Meyer (1978) hypothesized that children's ratings on the CHLOC, using external or powerful others scales, could be predictors of whether children exhibited internalizing (anxious or depressive) behavioral patterns. Promoting children's beliefs that they could control their own health was thought to be essential in children that have to assume more of the responsibility for their food allergies as they age (Knibb & Hourihane, 2013). Knibb and Hourihane longitudinally measured amounts of anxiety and locus of control in children aged 11 to 12 years who attended a one-week holiday run by the Anaphylaxis Campaign. Activities targeted confidence building and allergy self-management. They found that the participants' locus of control of caring for their own health significantly increased as their social anxiety lowered, and their anxiety levels continued to decrease even at three and six-month follow-ups. Knibb and Hourihane suggested that a reason for food allergic children's initial belief that others more powerful than themselves were in charge of maintaining their health was, in part, due to their parents' extreme anxiety about their children's food allergies.

Jones and colleagues (2013) compared the health belief model (HBM) and the common sense self-regulation model (CS-SRM) in the context of adolescents with food allergies. The HBM identified which cognitive factors contributed to an individual's perceived threat of an illness, focusing on perceived barriers, benefits, susceptibility, severity, and cues to action. Jones and colleagues specified the HBM as determining behaviors through recognition of recommended behaviors (i.e., by medical professionals). In contrast, they identified the CS-SRM focuses less on predicting behaviors, and more on an individual's beliefs about their illness (i.e., consequences, timeline, amount of control, and cause of the illness). The outcome measure they used when comparing the HBM and CS-SRM was adherence to self-care behaviors, which in the context of FA signifies carrying an EAI and avoiding trigger foods in multiple developmental contexts.

Jones and colleagues (2013) found that both models similarly explained the variance in adherence to self-care behaviors using multiple regression. However, Jones and colleagues (2013) identified differences in the theories in their explanations. Research cited suggested that the HBM is better able to predict behaviors due to its focus on behavioral beliefs instead of beliefs about illness, as does the CS-SRM (Hagger & Orwell, 2003). Hagger and Orwell also questioned the use of the CS-SRM's construct of illness identity beliefs with individuals who are largely asymptomatic, as would be the case of individuals with food allergies who are asymptomatic unless they eat their trigger foods. Jones and colleagues (2013) highlighted that individuals with food allergies may perceive themselves to have less of a risk of an allergic reaction and the need to manage their food allergies to be less essential the longer they have been without experiencing an allergic reaction or symptoms due to FA.

The HBM's better ability to predict behaviors may be potentially due to the model's inclusion of the barriers and benefits constructs in terms of health-related decision-making, which is not present in the CS-SRM (Jones et al., 2013). Although the use of one model may be useful, a model on its own is unlikely to fully explain behaviors that are due to complex conditions. In order to utilize a bioecological framework to assess and create interventions for the adolescent population with FA, it would be appropriate to address both the barriers and benefits of making health-related decisions to self-care. It may thus be a better theoretical orientation in order to study the developmental context of self-regulation that leads to specific self-care behaviors in adolescents. In contrast, the HBM does not fully clarify the role of the *perceived severity* construct in the model nor the *role of emotion* in decision-making (Henshaw & Freedman-Doan, 2009). In order to address the limitations of each model to increase the validity and applicability of the models, a combination of the models appears highly appropriate. Thus, by utilizing the HBM questionnaire (Champion, 1984), adapted by Jones and colleagues (2013) for food allergies, in combination with also assessing emotions and perceived severity, research may achieve a more accurate depiction of how self-regulation (cognitive and emotional aspects) affects adaptive behaviors (self-care).

Emotional

Food allergies are associated with various emotional outcomes. What follows is a review of how food allergies are related to (1) internalizing symptoms, (2) quality of life, (3) and post-traumatic stress symptoms (PTSS).

Food Allergies and Internalizing Symptoms. Chronic medical illnesses often trigger and/or exacerbate existing anxiety symptoms (Chavira et al., 2008). For example, common somatic sensations are associated with both food allergies and anxiety (gastrointestinal, trouble

breathing, heart racing, sweating). Anxiety can be misinterpreted as an allergic reaction and lead to panic attacks or simply be misidentified as a physical problem (Peavy & Metcalfe, 2008; Sicherer & Sampson, 2009). Symptoms of childhood anxiety have been associated with low self-esteem, withdrawal, loneliness (Chavira et al., 2008; Fordham & Stevenson-Hinde, 1999), academic underachievement (Chavira et al., 2008; Van Ameringen, Mancini, & Farvolden, 2003; Woodward & Fergusson, 2001), the development of disordered eating (Munoz-Furlong, 2003), as well as increased risk for later psychological diagnoses such as depression and substance use (Chavira et al., 2008; Essau, Conradt, & Petermann, 2002; Pine, Cohen, Gurley, Brook, & Ma, 1998). Likewise, the risk of internalizing and externalizing problems, bodily pain and discomfort, school absences, activity limitations, and lower social competence are associated with chronic physical illnesses (Chavira et al., 2008).

Chavira and colleagues (2008) analyzed a sample of children with and without comorbid anxiety disorders and physical illnesses. Those with comorbid anxiety disorders and physical illnesses self-reported having more internalizing problems and somatic complaints, impairment in role-social functioning due to emotional and behavioral problems, as well as parent reported caregiver strain. Participants with anxiety disorders and anxiety comorbid with physical illnesses reported having more withdrawal than the group with physical illness alone. Chavira and colleagues (2008) concluded that children with anxiety disorders comorbid with a physical illness have greater functional impairment, as well as more severe levels of emotional problems when compared to individuals with either anxiety alone or physical illness alone.

Östblom, Egmar, Gardulf, Lilja, and Wickman (2008) noted that for children with more severe food allergy, there were reports of poorer mental health along with poorer general health than peers without allergy. Differences in child and parental perception of the child's food

allergies depended on age of child and recency of previous reaction(s) (Cummings, Knibb, King, & Lucas, 2010; Mandell, Curtis, Gold, & Hardie, 2005). A difference between parental and child perceptions of food allergy's psychosocial effect is evident when children do not remember previous reactions (Akeson, Worth, & Sheikh, 2007). Adolescents have reported that food allergies affect their lives significantly less than do their parents. Additionally, children who do not remember previous reactions report food allergies as having significantly less of an effect psychosocially than do their parents. This may be important to keep in mind when considering adolescents' attitudes toward their food allergies and risk-taking behaviors.

Avery, King, Knight, and Hourihane (2003) found that children with peanut food allergies felt restricted in regard to where they could safely eat. These restrictions may be maladaptive for children, but some perceive the fear that accompanies new situations and environments as appropriate reactions to potentially life threatening situations. This study indicated that a decrease in unjustified levels of anxiety due to food allergies would be important to enable food-allergic children to have a less restricted lifestyle when possible. However, approximately 40% of food-induced anaphylaxis occurs outside of the home (25% at restaurants, 15% at school or work) (Pumphrey, 2004), and 60% of food-induced anaphylaxis fatalities occur outside of the home (restaurants, schools, friends' houses, camp) (Bock et al., 2001; Pumphrey & Gowland, 2007). Obviously some amount of fear of restaurants and "unsafe" places is warranted. In fact, Avery and colleagues (2003) concluded that, while their research showed high levels of anxiety experienced by food allergic children adversely impacted their quality of life, this level of anxiety may actually be good for children's overall well-being by pushing them to safely comply with necessary/required avoidance and management plans. Mandell and colleagues (2005) had similar findings, reporting that anxiety motivated parents and families to

seek support and more information on how to safely manage their children's food allergies. Moreover, lower levels of anxiety were correlated with decreased amounts of readiness for allergic reactions and subpar avoidance strategies to keep children safe, which suggests that anxiety is not only good for safely managing food allergies, but necessary. Unfortunately, prolonged stress and anxiety impact other areas of individuals' health (Cummings et al., 2010). A balance of healthy vigilance in avoiding allergic reactions while maintaining a healthy psychological state is needed. Helgeson, Becker, Escobar, and Siminerio (2012) refer to the Yerkes Dodson Law while hypothesized that moderate levels of parental stress related to their children's diabetes may motivate higher levels of involvement in their "children's diabetes care without clinically significant harm to the self" (p. 475). This relationship appears to be parallel to the level of vigilance needed to maintain healthy psychological state as described by Cummings and colleagues.

Researchers have repeatedly found that children with food allergies experience higher levels of stress, worry, distress, and anxiety than children without food allergies (e.g., King, Knibb, & Hourihane, 2009; Sicherer, Noone, & Munoz-Furlong, 2001), but there may be age-related differences. For example, Mandell and colleagues (2005) found that, in a small sample of children aged infancy to 11 years, the children of the age range 6 to 11 had the highest levels of anxiety. This age-range encompasses the developmental period in which children could start understanding the impact of their food allergy but not be able to fully protect themselves. As this sample did not include any children older than 11, it is impossible to determine if children in the age range of 6 to 11 experience more or less anxiety than children ages 12 to 18.

Quality of Life. Another method of measurement for anxiety and psychological states of chronically ill children has been to consider their quality of life (QoL) (Compas et al., 2012) or

health-related quality of life (HRQoL) (Herzer, Umfress, Aljadeff, Ghai, & Zakowski, 2009). An example study of children's self-report of their QoL compared children with peanut allergies to children with diabetes (Avery et al., 2003). These two groups were considered similar in the issues that they face on a daily basis: food choices, social restrictions, the need to carry and/or use a syringe kit, and the chronicity of the condition. Each participant had experienced either an allergic reaction or a hypoglycemic attack, depending upon his or her illness. Avery and colleagues coded each child's life experiences and quality of life using questionnaires and a disposable camera/journal to record how each participant's condition impacted his or her QoL over a 24-hour period. The results were quite striking. Although diabetes was more commonly identified as a chronic illness than food allergies, child participants with food allergies were found to have a poorer QoL and to show higher levels of illness-specific anxiety than did participants with diabetes. Peanut allergic children were found to check food labels more often and to be more afraid of accidentally eating peanuts than diabetic children were of having a hypoglycemic event. Although such high vigilance could be seen as helpful and protective, it could also be unhelpful if the restrictions of the allergic child's lifestyle are unrealistic or unfounded.

When looking at QoL and the sense of burden adolescents feel due to their food allergies, Marklund, Wilde-Larsson, Ahlstedt, and Nordström (2007) directly interviewed 17 adolescents aged 14 to 18 years. The adolescents reported that both the allergic reactions themselves, as well as the measures they took to avoid allergens, negatively impacted their QoL. They also reported that they felt disregarded by adults in their lives, including relatives, camp counselors, and school personnel who often did not consider or plan for their inability to eat or participate in activities. These adults were perceived as unwilling to cooperate in ensuring their safety. The

adolescents reported feeling like they could not trust adults to reliably disclose ingredients in foods at restaurants, school, and environmentally in public. Finally, they felt a lack of understanding from the general public, in restaurants, and at school, especially by adults who bear responsibility for their safety (Marklund et al., 2007).

As any uncontrolled environment is a potential risk, children and adolescents with food allergy experiencing bullying, teasing, and harassment could have dire consequences of potential anaphylaxis reactions (Munoz-Furlong, 2003). Lyons and Forde (2004) hypothesized that children's level of vigilance and safety also depended on how their friends perceived their food allergies; for example, if friends grasped the significance of their checking behaviors, they were more likely to check their foods. More recently, Miller and colleagues (2020) delineated how the impact of food allergies on QoL worsens as age increases (from 0-17 years old) with significantly higher scores in adolescents (13-17 years old) compared to younger children, indicating significantly worse QoL, as well as significantly higher emotional impact, and social and dietary limitations. As noted in this study, adolescents completed their own surveys while parents completed those for children ages 0-12 years, which may have affected the scores.

Children's quality of life was also linked to how long they had lived with a food allergy as well as if they had to be injected with epinephrine to treat an allergic reaction. Following Kazak, Schneider, and Kassam-Adams' (2009) research on medical trauma, Roy and Roberts (2011) concluded that an injection of epinephrine by either the child or another could be traumatic for a child, with child and parental stress and worry levels possibly influencing trauma at the time of the event. Unmentioned by Roy and Roberts, it is important to remember the injection of epinephrine is just one step in the process of an allergic reaction. The use of an EAI can be traumatic, but so can the accumulation of symptoms that render the use of said EAI

necessary. Understanding the experience of increasing anaphylaxis symptoms is necessary to capture the full picture of the subjective experience that children and parents experience during a severe allergic reaction: with swelling of body parts, hives, stomach and uterine wall cramping, inability to breathe, sweating, or loss of consciousness as just a sampling of the very serious symptoms that accompany the multi-system anaphylactic reaction requiring epinephrine injection. Kazak and colleagues (2006) proposed that prospective areas of intervention to improve the mental health of families after a medical traumatic event include the mediating and moderating factors influencing the relationship between a pediatric traumatic event and the ensuing PTSS that may occur.

Food Allergies and PTSS. Although little research has been done on food allergy and trauma symptoms, children with severe food allergies have demonstrated trauma-specific internalizing symptoms (Kelsay, 2003). Severity of allergies in general has been found to predict severity of anxiety (Friedman & Morris, 2006). Along with anxiety, and a tendency towards depression, especially if bullying is involved (Patten & Williams, 2007; Lieberman, Weiss, Furlong, Sicherer, & Sicherer, 2010; Cummings et al., 2010), other mental health effects of experiencing or observing allergic reactions/anaphylaxis include a full diagnosis of posttraumatic stress disorder (PTSD) (Kelsay, 2003). The magnitude of a stress response children exhibit after experiencing an allergic reaction is based more on the individual child's subjective experience during and after the event than the severity of the event itself (Friedman & Morris, 2006). Influences that change subjective experiences include beliefs about how life-threatening the medical experience was or will be (Taïeb, Moro, Baubet, Revah-Lévy, & Flament, 2003), and feelings of uncertainty, (i.e. "acute or persistent fear of possible illness consequences") (Williams, Para, & Elkin, 2009, p. 215). Research has shown that parental reports of children's

acute stress and PTSS have low sensitivity in detecting actual symptoms (Kassam-Adams, García-España, Miller, & Winston, 2006; Valentino, Berkowitz, & Stover, 2010). Potential bias in parental reporting exists. Kassam-Adams and colleagues (2006) found that parents fail to identify acute stress disorder in approximately three-fourths of children who identify themselves as having sub-syndromal or full acute stress disorder, regardless of if they exhibit trauma symptoms themselves.

Adaptive Behaviors

Herbert and colleagues (2016) addressed the need for physicians' involvement in assessing the different aspects of adolescents' emotions during the transition of responsibility period in food allergy management. Increasingly, researchers have called for physicians to increase awareness of, and provide more screening for, behavioral and emotional states in order to improve treatment adherence and mental health (LeBlanc et al., 2003; Shemesh et al., 2016; Ferro et al., 2016). As previously discussed, adaptive behaviors for adolescents with food allergies are those that assist in either avoiding trigger foods, such as reading food labels, or helping one treat an allergic reaction, such as carrying and using EAIs when needed. Treatment adherence has been described as declining sharply when patients are not experiencing symptoms, such as adolescents who rarely experience or do not remember experiencing an allergic reaction (LeBlanc et al., 2003). Individual characteristics of both adolescents and their families may also affect treatment adherence, such as levels of social support from peers, family cohesion and functioning, as well as premorbid behavioral and emotional difficulties. Cognitive factors may also affect adaptive behaviors in adolescents with chronic illness, such as cystic fibrosis. Treatment adherence was assessed by Bucks, Hawkins, Skinner, Horn, Seddon, and Horne (2009) in terms of illness perception and beliefs about medicines. The authors found treatment

adherence to be poorest in older adolescents, with treatment beliefs mediating the association between age and adherence. This is the same age range (ages 15-17 years) that has been found to be increasing in emergency department visits in the past decade, as mentioned previously (Michelson et al., 2020).

Adolescents are more prone to risk-taking behaviors (Chipps, 2013), which in the case of food allergies may manifest as not checking food before consumption or not carrying emergency medication in case of a reaction. If adolescents have not had a reaction for an extended period of time, have had only mild reactions in the past, or do not remember their last reaction, they are less likely to feel their allergy is critical and more likely to take part in risky behaviors. Heimlich, Westbrook, Austin, Cramer, and Devinsky (2000) found that the attitude of adolescents with a comparable condition, epilepsy, were more negative toward their condition as they reached older adolescence, with girls being more likely to have negative attitudes than boys. As the likelihood of death due to allergic reactions and risk-taking behaviors increases in adolescence (Bock, et al., 2001; Macadam et al., 2012; Pumphrey & Gowland, 2007), developmental level and attitude towards allergy appear to be important factors that need consideration when treating this population.

Saleh-Langenberg, Flokstra-de Blok, Goosens, Kemna, van der Velde, and Dubois (2016) identified cognitive and emotional factors that affected adolescents' use of adaptive behaviors to treat their food allergies. They assessed adolescents' burden of treatment (BoT) with a one-item measure that has previously been validated with venom-allergic individuals, as well as quality of life, illness perception, and anxiety. The authors found that a high BoT was significantly correlated with lower self-reported compliance scores in carrying of EAI's. However, BoT was not found to be associated with HRQoL, illness perception, trait anxiety, or

perceived severity of illness. Perceived severity was found to be significantly associated with whether adolescents who were having an allergic reaction actually used their EAI. A pattern of selective compliance was also described, where adolescents who do not constantly carry their EAI's doing so instead only in food-consumption areas such as restaurants or when they travel. Saleh-Langenberg and colleagues described a very high percentage of adolescents (75%) who self-reported having an EAI available during an allergic reaction and not using it. The authors acknowledged this was a higher rate of this risk-taking behavior than previous studies had reported (11-33%) (Sampson et al., 2006; Sicherer, Forman, & Noone, 2000; Pumphrey & Gowland, 2007). This difference between burden and perceived severity affecting adaptive care behaviors for food allergies may be tested in the food-allergy adaptation of Lansing and Berg's (2014) self-regulation model, indicating that different cognitive constructs predict different adaptive behavior patterns

Statement of the Problem

Lansing and Berg's (2014) model of adolescent self-regulation breaks the construct into three separate processes, specifically adolescents' ability to regulate their cognitions, emotions, and behaviors in order to reach a goal of managing chronic illness. This model has not yet been applied to food allergies, although it has been discussed in the context of diabetes (Berg et al., 2016) and chronic pain (Cousins, Kalapurakkal, Cohen, & Simons, 2015). Adapting Lansing and Berg's (2014) model to test self-regulation in adolescents with food allergies may inform areas of intervention to increase treatment adherence. Adolescence is the transition period between having zero to full responsibility over the care of their own food allergies.

Unfortunately, during this time period they are also at the highest risk for death due to their food

allergies specifically because of decreased treatment adherence (Bock et al., 2001; Macadam et al., 2012; Pumphrey & Gowland, 2007).

The purpose of this research was to test a model explaining how cognitive, emotional, and behavioral components of self-regulation of food allergies (Lansing & Berg, 2014) relate to one another while modulating adolescents' ability to successfully manage their own chronic illness. Additional secondary study questions included (1) which factors predict increased adaptive behaviors in managing food allergies and (2) at what level of PTSS adaptive behaviors are affected. This was also the first research study to include food-allergy specific questions to identify anxiety and hypervigilance, such as how often a participant handles or practices using an EAI or how many times a day a participant checks food labels.

Hypotheses

The general research goal was to investigate whether more dysregulated cognition and emotions (two of the three tiers of self-regulation) are related to worse medical risk outcomes of food allergy. The tested hypotheses were:

H₁: More perceived impairment in both cognitive symptoms (FAIM, BoT, & HBM) and emotional symptoms (SCARED & IES-6) will predict lower scores in self-regulation on the EMPOWER scale, indicating less individual responsibility of food allergy tasks by adolescents.

H₂: More perceived impairment in both cognitive symptoms (FAIM, BoT, & HBM) and emotional symptoms (SCARED & IES-6) will predict worse treatment adherence.

Chapter II: Methods

Participants

This study employed a cross-sectional sample of adolescents aged 12 to 19 years with food allergies. Parental involvement solely consisted of parental consent for their child's participation. Adolescents were recruited through schools across the country, support and public groups, allergist offices, and social media, mainly Facebook advertisements. Recruitment lasted for 17 months and consisted of social media posts, emails and messages to organizations and support groups, personal meetings and phone calls, and flyers posted in schools through school nurse associations (specifically in WI and IL). Posts were made on the national food allergy organization Food Allergy Research and Education (FARE)'s Facebook page; however, they did not actively promote this study as was requested.

The final sample included 106 adolescent participants ages 12 to 19 years. Adolescents who identified as 'female' comprised 79.1% of the total sample with an average age of 16.66 years ($SD = 2.30$); those who identified as 'male' composed 20.0% of the data with an average age of 14.68 years ($SD = 2.71$). One participant age 19 years, identified as 'other' (0.9% of the data). Approximately 83% of participants identified themselves as 'one race, White.' Further details on participants' identification of race can be seen in Table 1.

Table 1.*Demographics: Race*

Reported Race	Number of Responses	% of Participants Counted (106)
One race	97	91.5%
White	88	83.02%
Black or African American	2	1.89%
American Indian or Alaska Native	-	-
Asian	3	2.83%
Native Hawaiian or Other Pacific Islander	-	-
Hispanic or Latino	3	2.83%
Other (write in)	-	-
No Response	1	0.94%
Two or More Races	9	8.5%
White	9	8.5%
Black or African American	1	0.94%
American Indian or Alaska Native	2	1.89%
Asian	2	1.89%
Native Hawaiian or Other Pacific Islander	1	0.94%
Hispanic or Latino	2	1.89%
Other (write in)	-	-

The majority of participants were recruited for this study through social media (75.5% of all data). This was comprised of 74 participants specifically indicating they were recruited on Facebook (69.8%) with the rest either recruited on Twitter or social media in general. Other recruitment methods indicated by participants include Word of Mouth (10.4%), ‘other’ with no text entered (5.7%), Support Groups (potentially including social media support groups) (4.7%), Allergist office (2.8%), and Schools (0.9%). Participants reported the highest level of education either of their parent(s) earned: Master’s Degree (26.4%), Some Post-high school education (22.6%), Less than 12 years of school (17.9%), 4-year degree (16%), Doctorate or Professional Degree (8.5%), Two-year degree (7%), and Some graduate school education (2.8%).

Inclusionary criteria for food allergy included individuals with one or more of the following described markers, which have been adapted by Gupta and colleagues’ (2011)

description of food allergies. First, anaphylaxis, “defined as [a] severe allergic reaction that can lead to death” (Gupta et al., 2011, p. e11) (#1), if has been present, will automatically indicate a severe food allergy. The second marker specified an EAI has been prescribed for the child (#2). The third marker indicated the child has been diagnosed by a doctor as having a food allergy based on testing for food allergies (#3). The fourth marker indicated whether the child has seen an allergist for his or her food allergy (#4). Finally, the fifth marker (#5) indicated if the child has experienced two or more symptoms other than anaphylaxis due to his or her food allergy (vomiting, gastrointestinal issues, swelling of the lips, face, or other body parts, flushing, hives, eczema, itch, coughing, wheezing, trouble breathing, or low blood pressure). Table 2 demonstrates the use of these markers to screen the data. As reported in Table 2, four responses in the age range of 12-19 years were excluded from the study due to Marker #5, reporting only one symptom of their food allergy. All four of these responses reported the symptom of ‘Vomiting, nausea, cramping, or stomach pain.’

Table 2.

Participants meeting Inclusionary and Exclusionary Markers

Markers	Frequency of Affirmative Responses	% of Participants Counted (106 Total)
1. Anaphylaxis	68	64.15%
2. Prescribed an EAI (And Responded ‘No’ to #1)	17	16.04%
3. Diagnosed FA by a doctor based on testing (And Responded ‘No’ to #1 & 2)	18	16.98%
4. Seen an allergist for food allergy (And responded ‘No’ to #1, 2, 3)	0	0.00%
5. Experienced two or more symptoms other than anaphylaxis (And No to # 1, 2, 3, 4)	3	2.83%
Do not meet criteria Based on Criteria #1-5	4	
Excluded due to being outside of age range (1 participant each reported age as 11, 20, 42)	3	

Measures

Demographic Information

Basic demographic information on all child and parent participants were collected from a set of REDCap surveys. Basic information included age (continuous), gender (male; female; other), race (One Race: White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Hispanic or Latino, or Other; Two or more races: White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Hispanic or Latino, or Other), and socio-economic status proxy based on level of parental education (<12 years school, some post-high school education, 2 year degree, 4 year degree, some graduate school education, master's degree, doctorate or professional degree). Information on the history and severity of food allergies were collected (see markers of food allergy criteria in Participants section above).

Food Allergy History

In addition to the previously mentioned categories, information on food allergies were collected (see Table 5 in the Results Section). Questions asked of participants sought to identify anxiety and hypervigilance symptoms specifically related to food allergy. Table 5 details the questions, possible responses and their corresponding scores, as well as basic data analysis of these items.

Appraised Perception of Risk

The Food Allergy Independent Measure- Teenager Form (FAIM-TF), a self-report measure developed by van der Velde and colleagues (2010) was used to assess adolescents' appraised perception of risk. van der Velde and colleagues report internal consistency scores for the FAIM-TF as $\alpha = 0.86$. The FAIM-TF items used with this study's sample had an internal

consistency of $\alpha = .61$. The FAIM is comprised of two parts. First, three questions assess adolescents' expectations of outcomes should they consume their allergen. These questions are scored on a 7-point scale, ranging from never/ not severe (0) to always/ most severe (6). Second, two items assess adolescents' perception of disease severity, with items again on a question-specific 7-point scale. The FAIM-TF (ages 13-17 years) and FAIM-Adult forms are the same except for one question that asks about likelihood of death on the adult form.

Adolescent Health Beliefs

An abbreviated version of Jones and colleagues' (2013) food allergy adapted Health Belief Model (HBM) questionnaire (Champion, 1984) was utilized to identify adolescents' perceived barriers (7 items, $\alpha = .65$), susceptibility (3 items, $\alpha = .79$), and severity of their food allergy (3 items, $\alpha = .68$). Internal consistency for the current sample were as follows: perceived barriers ($\alpha = .80$); susceptibility ($\alpha = .87$), severity ($\alpha = .61$). Subsections and items of the HBM questionnaire that are not included include *Perceived benefits* due to poor reliability ($\alpha = .47$), *Cues to action* due to not being relevant to this study's goals, and three items under the *Perceived barriers* due to Jones and colleagues' finding that they had low factor loadings. Items are scored on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree) and summed across each construct, with higher overall scores indicating more strongly held beliefs. This scale has been normed on adolescents aged 13-19 years.

Adolescent Burden of Treatment

A one-item self-report measure to assess Burden of Treatment (BoT) was also given to the adolescents. This item was initially developed by Oude Elberink, van der Heide, Guyatt, and Dubois (2006) in relation to the use of an EAI for venom allergic reactions and further validated with this population (Oude Elberink et al., 2006). The item is scored on a 7-point scale ranging

from 1 (extremely negative) to 7 (extremely positive). The item has since been utilized with individuals with food allergies to assess their perceptions of how burdensome it is to use an EAI for an allergic reaction and found to be significantly correlated with adolescents carrying their EAI's (Saleh-Langenberg et al, 2016).

Adolescent Anxiety

A 9-item general anxiety subscale of the Screen for Child Anxiety Related Emotional Disorders (SCARED) with adolescent self-report has been normed on children and adolescents aged 8-21 years and was used to measure child anxiety (Shemesh et al., 2016; Birmaher et al., 1997; Allison, Nativio, Mitchell, Ren, & Yuhasz, 2013). The Screen for Child Anxiety Related Emotional Disorders (SCARED) is a 41-question anxiety screener developed for children and adolescents (Birmaher et al., 1997). The nine items are scored on a three-point scale from 0 to 2, with 0 signifying not true or hardly ever true, 1 sometimes true, and 2 true or often true. The general anxiety subscale of the SCARED has an internal consistency correlation of .91, and the child GAD score ($t_{43} = 2.76, p = .009$) factor discriminated between this subscale and all others (Birmaher et al., 1997; Birmaher et al, 1999). The internal consistency of the SCARED with the tested sample in this study was $\alpha = .95$.

Adolescent Post-Traumatic Stress Symptoms

The Impact of Event Scale 6 (IES-6) (Thoresen et al., 2010) was used to assess adolescents' PTSS in response to their allergic reaction(s). This scale was only provided to participants who responded "yes" to having experienced anaphylaxis (#1 in Table 1). It consists of six items that are rated on a 5-point continuous scale with rankings ranging from 0 (Not at all) to 4 (Extremely), higher scores indicating more post-traumatic stress symptoms. While scores were considered on a continuous scale, cut-off scores for PTSD were also considered

qualitatively. A cut-off of eight on the IES-6 can be used to maximize sensitivity (.92) while not hindering specificity (.84), positive predictive power of .66, and negative predictive power of .97 (Thorensen et al., 2010). To note, this cut-off score and utilizing the IES-6 provides a shorter questionnaire with better sensitivity and specificity than the IES-R, which with a 30 cut-off total score (Weiss & Marmar, 1997) provides a specificity of .82 and sensitivity of .91. The IES-6 has three subscales: avoidance, hyperarousal, and intrusion. Items indicate how often participants felt or thought the corresponding prompts during the past week. Thorensen and colleagues (2010) report the IES-6 has high internal consistency with coefficient alpha of .80. The internal consistency of the IES-6 in the current study sample was $\alpha = .88$.

Food-Allergy Self-Regulatory Behaviors

Adolescent self-regulation behaviors regarding food allergies were assessed by use of the 7-question Enhancing, Managing, and Promoting Well-Being and Resiliency (EMPOWER) self-regulation questionnaire (Annunziato et al., 2015). Annunziato and colleagues adapted this measure from a previous self-regulation measure that was intended for individuals with diabetes (Anderson et al., 1990). The food-allergy specific measure is split into two parts. The first two continuously scored items identified key tasks that adolescents must master in order to fully care for themselves (i.e., treatment adherence) on a 4-point scale from 1 (never) to 4 (always). As treatment adherence was analyzed in a separate measure, these two items were not included in the final analysis.

The second section of the EMPOWER measured self-regulation, specifically identifying who takes responsibility (parent/caregiver or adolescent) for different food-allergy tasks (Annunziato et al., 2015). This measure was scored on a scale with choices 1 (adults fully responsible), 2 (adolescent and adult share responsibility), or 3 (adolescent fully responsible).

There were two other response options for these questions: 4 (someone else in home responsible) and 5 (no one responsible). These two responses were very rarely endorsed. Only one question had any responses of '4' or '5', with 18 participants responding that no one was responsible for contacting their food allergy team. Following a similar protocol as Annunziato (2015), those responses marked as '4' or '5' were not included in the analysis. Instead these responses were marked as missing data in order to include the participants' other responses. Items one through three were then averaged to identify a score for the 3 response item questions. The average score resulted in a minimum score of 1, with lower scores indicating less adolescent self-regulation of their food allergies and higher scores, maximum of 3, indicating more self-regulation. This average was calculated with and without the question in which participants responded '5' to contacting their food allergy team. As these two scores were significantly correlated in a Bivariate Pearson Correlation ($r = 0.98, p < .001$), it was determined unnecessary to remove participants' responses by removing the entire question and instead responses of '5' for this one question were marked as missing data. Internal consistency of the items measured in the EMPOWER with this study's sample was $\alpha = 0.85$.

Adherence to Self-Care Behaviors

Jones and colleagues (2013) developed four questions to assess adolescents' adherence to self-care behaviors. They included (1) "I carry my EAI at all times", (2) "I try to avoid foods which I know I am allergic to", (3) "When I eat in a restaurant I ask about the ingredients which have been used", (4) "When I eat at a friend's house I ask about the ingredients which have been used" (p. 68-69). These items were measured on a 5-point scale from 1 (never true) to 5 (always true). Higher scores indicated greater adherence ($\alpha = .65$). Internal consistency of this scale

with the tested sample was $\alpha = 0.66$. Refer to Table 3 for a summary of all measures' benchmarks for scale interpretation.

Table 3.

Benchmarks for Scale Interpretation.

Formal Measures in Correlation table (acronym):	Construct Measured	Lower Score Indicates	Higher Score Indicates
<i>FAIM</i> (FAIM)	Appraised Perception of Risk	Less Appraised Risk	More Appraised Risk
<i>Health Belief Model:</i>			
(BAR)	Perceived Barriers of treatment adherence	Less Perceived Barriers	More Perceived Barriers
(SUC)	Perceived Susceptibility of allergic reaction	Perceived Less Susceptible	Perceived More Susceptible
(SEV)	Perceived Severity of allergic reaction	Perceived Less Severe	Perceived More Severe
<i>Burden of Treatment</i> (BoT)	Perceived burden of use of an EAI	Perceived Less Burden	Perceived More Burden
<i>SCARED</i> (ANX)	Generalized Anxiety Symptoms	Less anxiety	More anxiety
<i>IES-6</i> (IES)	Post-Traumatic Stress Symptoms (PTSS)	Less PTSS (Better mental health)	More PTSS (Worse mental health)
<i>EMPOWER</i> (REG)	5- Question Food Allergy Specific Self-Regulation Behaviors (Who is in Charge of Food Allergy Activities)	Less Self-Regulation	More Self-Regulation
<i>Treatment Adherence</i> (ADH)	Treatment Adherence to Food Allergy Self Care Behaviors.	Lower Treatment Adherence	Higher Treatment Adherence

Procedure

Following institutional IRB approval of this study, data were collected using an online survey via REDCap Surveys. The survey was IRB approved and began with an informed consent form. Participants who were under 18 years old were directed to have their parent read the consent form, and then to complete an assent form upon their parents' signature. Participants who were 18 to 19 years old were given their own consent form. Parents who began the survey were given a consent form for their child's participation and then were directed for their child to complete an assent form. After the consent/assent process, the survey was split into the

following sections: (1) Demographics, (2) Food Allergy Specific Questions, (3) Cognitive Symptoms (FAIM, HBM, BoT), (4) Food-Allergy Self-Regulatory Behaviors (EMPOWER) and Adherence to Self-Care Behaviors, ending in (5) Emotional Symptoms (SCARED, IES-6). Participant adolescents were assigned identification numbers that were not linked to personal information. The survey included 56 questions for adolescent participants and used adaptive questioning, so no unnecessary questions were asked after an initial assessment if they did not pertain to the individual (e.g., PTSS questions).

Data Analysis

An a priori power analysis indicated that an estimated 130 to 150 participants were necessary to achieve a power of .80. The data was stored and managed in Excel and analyzed using R Statistical packages. Descriptive Statistics and Food-Allergy Specific demographics were collected and examined. Multiple linear regression analyses were performed using cognitive and emotional factors as independent variables, and behavioral factors as dependent variables. Covariates held constant included ethnicity, age, gender, parent education level, remember having an allergic reaction, and the number of food-allergy related allergic reactions in the past year.

Specifically, Hypothesis #1 predicted food allergy self-regulation using the EMPOWER scale and Hypothesis #2 predicted treatment adherence to food allergy specific self-care behaviors using a treatment adherence scale developed for food allergies, described above. These analyses were completed in order to examine the strength and direction of independent variables (emotional and cognitive symptoms) in predicting adolescents' behaviors. A theory-based path model for each hypothesis was tested using Path Analysis to determine strength and direction of relationships in the models.

Chapter III: Results

Descriptive Statistics

Food Allergy History Profile

The majority of participants reported having experienced anaphylaxis (64.2%), the first marker of identifying participants with food allergies. An increase was seen in each of the subsequent markers: 79 participants (74.5%) reported being prescribed an EAI, 89 (84.0%) participants reported having seen an allergist for their food allergy, and 101 participants (95.3%) reported being diagnosed with a food allergy. The fifth marker of food allergies, allergic symptoms, is detailed in Table 4 below.

Table 4.
Allergic Symptoms Endorsed.

Symptom	Symptom Frequency	Percent
Anaphylaxis	68	64.2%
Vomiting, nausea, cramping, or stomach pain	76	71.7%
Swelling of Lips or Face	67	63.2%
Swelling of body parts other than the face or lips	30	28.3%
Flushing	39	36.8%
Hives	70	66%
Eczema	34	32.1%
Itch	63	59.4%
Coughing	43	40.6%
Wheezing	41	38.7%
Trouble Breathing	49	46.2%
Reduced Blood Pressure	10	9.4%
Increased Blood Pressure	10	9.4%
Increased Heart Rate	31	29.2%
Fainting or Syncope	12	11.3%
Other*	7	6.6%

* Each of the following reported once: Dysphagia, Extreme throat pain, terrible menstrual cramps, throat gets very itchy and irritated, tongue sores/burning, tongue swelling

Food Allergy History Questions

The following food allergy specific questions' wording, response options, and basic statistics are located in Table 5 below. Ninety-eight participants (92.5%) reported remembering having an allergic reaction. The number of allergic reactions in the past year resulting in Emergency Room (ER) visits ranged from 0 to 6, with 77 of participants (79.4%) reporting zero visits to the ER in the past year. Eleven participants (11.3%) reported one visit, four (4.1%) reported two visits, two (2.1%) reported three visits, one (1.0%) reported five visits, and two (2.1%) reported six visits in the past year. Fifty-one (48.1%) of participants report never practicing using an EAI. Thirty-four participants (32.1%) report practicing one time a year, eleven (10.4%) one time every six months, four (3.8%) one time every three months, five (4.7%) one time every month, and one (.9%) multiple times a month. Similar patterns were reported for participants on holding an EAI for reasons other than transfer, with 57 participants (53.8%) reporting 'Never,' 16 (5.1%) reporting 'one time a year,' 14 (13.2%) 'one time every six months,' five (4.7%) 'one time every three months,' six (5.7%) 'one time every month,' and eight (7.5%) 'multiple times a month.'

The participants' concern over the recent price changes and recalls of EAI's in the United States were also measured. Only twenty-nine participants (27.9%) reported no concern over the cost of EAI's. Other response options included slightly concerned (17.3%), somewhat concerned (19.2%), moderately concerned (17.3%), and extremely concerned (18.3%). The majority of participants reported some level of concern if they had to be without an EAI, with 46 (43.8%) reporting extreme concern, 15 (14.3%) reporting moderate concern, five (4.8%) reporting being somewhat concerned, and three (2.9%) reporting slight concern. Of note, a drastic increase occurred with 36 participants (34.3%) reported having no concern if they had to

be without an EAI. Less participants report feeling concern about a recall of their EAI, with 57 participants (54.8%) reporting no concern. Nine participants (8.7%) each reported being ‘slightly’ and ‘somewhat’ concerned about a recall; 15 participants (14.4%) reported moderate concern and 14 reported extreme concern (13.5%).

Table 5.

Food Allergy History Questions:

Question	<i>N</i>	Min	Max	Mean	<i>SD</i>	Response Options	Score
Do you remember having an allergic reaction?	106	0	1	.92	0.265	No	0
						Yes	1
How many times in the past year have you visited the emergency room (ER) due to an allergic reaction from your food allergy?	97	0	6	.43	1.136	# Entered	
How often do you practice using an epinephrine autoinjector (e.g., Epi-Pen, Auvi-Q)?	106	1	6	1.88	1.144	Never	1
						1 time a year	2
						1 time every 6 months	3
						1 time every 3 months	4
						1 time every month	5
						Multiple times a month	6
How often do you hold an epinephrine autoinjector (e.g., Epi-Pen, Auvi-Q) for reasons other than transferring how you are carrying it (e.g., from a backpack to a purse)?	106	1	6	2.16	1.604	Never	1
						1 time a year	2
						1 time every 6 months	3
						1 time every 3 months	4
						1 time every month	5
						Multiple times a month	6
Have you been concerned about the cost of an epinephrine autoinjector (e.g., Epi-Pen, Auvi-Q)?	104	1	5	2.81	1.475	Not at all concerned	1
						Slightly concerned	2
						Somewhat concerned	3
						Moderately concerned	4
						Extremely concerned	5
How would you feel if you had to be without an epinephrine autoinjector (e.g., Epi-Pen, Auvi-Q)?	105	1	5	3.30	1.798	Not at all concerned	1
						Slightly concerned	2
						Somewhat concerned	3
						Moderately concerned	4
						Extremely concerned	5
Have you been concerned about a recall of your epinephrine autoinjector (e.g., Epi-Pen, Auvi-Q)?	104	1	5	2.23	1.547	Not at all concerned	1
						Slightly concerned	2
						Somewhat concerned	3
						Moderately concerned	4
						Extremely concerned	5

Preliminary Analyses of Main Variables

Table 6 provides descriptive statistics of all variables analyzed in the hypotheses as well as correlations of the main variables. The remaining correlations reported consist of food allergy specific anxiety-related items. The benchmarks of each scale are in Table 3 of the Measures section. There were positive significant relationships between appraised perception of risk (FAIM) and all three health belief model measures, perceived barriers ($n = 97, r = .31, p = .002$), perceived susceptibility ($n = 96, r = .39, p < .001$), and perceived severity ($n = 96, r = .30, p = .003$) of food allergy. This indicates the more an adolescent perceives barriers to handling their food allergy, susceptible to an allergic reaction, and severe a food allergy, the more appraised risk. There was also a positive significant relationship between appraised risk and treatment adherence, with higher treatment adherence being correlated with more appraised risk ($n = 96, r = .24, p = .020$).

As expected, all health belief model measures significantly correlated with each other, indicating higher scores on one of the measures was associated with higher levels on the others. Perceived susceptibility ($n = 96, r = .36, p < .001$) and perceived severity ($n = 96, r = .36, p < .001$) were also positively and significantly associated with treatment adherence, indicating the more an adolescent feels they are susceptible to and severe an allergic reaction, the more likely they are to engage in food allergy self-care behaviors. Perceived severity was also negatively and significantly associated with burden of treatment ($n = 96, r = -.21, p = .043$) and anxiety ($n = 94, r = -.21, p = .040$), indicating the more severe adolescents perceive their food allergy, the less burden they perceive from using an EAI and the less generalized anxiety they feel. Similarly, generalized anxiety was negatively and significantly associated with treatment adherence ($n = 94, r = -.22, p = .030$). Interestingly, there was also a significant negative correlation between

appraised risk and generalized anxiety, indicating the higher the anxiety the less the perceived risk or vice versa ($n = 94, r = -.21, p = .038$). Fifty-six of the 68 participants who had experienced anaphylaxis completed the IES-6, measuring PTSS. Twenty-two of the participants reported a score of eight or higher (20.75% of the entire sample), falling at or above the cut-off score of eight indicating potential PTSD. While there was no significant relationship between PTSS and treatment adherence, as expected there was a significant positive relationship between PTSS and generalized anxiety ($n = 55, r = .52, p < .001$).

The results of the main variables in this study were consistent with previous research. Adolescents' mean scores on the FAIM using the Teen Form ($M = 4.01, SD = 0.98$) indicating their level of appraised perception of risk were identical to that reported by Velde and colleagues (2010) ($M = 4.01, SD = 1.09$). Similarly, adolescents with food allergies who completed the perceived barriers (BAR) ($M = 20.12, SD = 6.16$), perceived susceptibility (SUC) ($M = 9.75, SD = 3.40$), and perceived severity (SEV) ($M = 12.67, SD = 2.24$) scales of the health beliefs model scale by Jones and colleagues (2013) reported similar results to this study, reporting mean scores of: BAR ($M = 20.41, SD = 4.62$), SUC ($M = 9.64, SD = 2.60$), and SEV ($M = 11.39, SD = 2.60$). At the time of this study, there were no results reporting adolescent mean scores on the IES-6, BoT, EMPOWER, and Treatment Adherence scales in the research literature.

It is important to note that our sample had a higher mean score on the generalized anxiety disorder scale ($M = 10.68, SD = 6.29$) than in 'non-anxious' clinical samples, as reported in the SCARED's originating study ($M = 6.58, SD = 4.77$) (Birmaher et al., 1997) as well as in a validation study ($M = 5.8, SD = 4.4, 1999$) (Birmaher et al., 1999). This is consistent with previous research that indicated children and adolescents with chronic illnesses are more likely to experience greater anxiety (Chavira et al., 2008).

Table 6.*Descriptive Statistics and Correlations of Main Variables.*

	<i>N</i>	<i>M</i>	<i>Range</i>	<i>SD</i>	FAIM	BAR	SUC	SEV	BoT	ANX	IES	REG	ADH
FAIM	100	4.01	1-6	0.98	-								
BAR	97	20.12	3-35	6.16	.31**	-							
SUC	96	9.75	3-15	3.40	.39**	.30**	-						
SEV	96	12.67	7-15	2.24	.30**	.27**	.43**	-					
BoT	96	2.10	1-5	0.90	.02	.06	-.20	-.21*	-				
ANX	96	10.68	0-18	6.29	.30**	.43**	.16	.16	.23*	-			
IES	56	7.39	0-23	6.33	.23	.30*	.29*	.19	.19	.53**	-		
REG	96	2.13	1-3	0.51	-.05	-.09	.041	-.02	.04	-.01	-.02	-	
ADH	96	16.44	8-20	3.23	.24*	.06	.36**	.36**	-.20	-.22*	.04	-.19	-

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

Note. FAIM = Appraised Perception of Risk, BAR = Perceived Barriers, SUC = Perceived Susceptibility, SEV = Perceived Severity, BoT = Burdon of Treatment, ANX = Generalized Anxiety Symptoms (measured with the SCARED), IES = Post-Traumatic Stress Symptoms, REG = Food-Allergy Self-Regulation Behaviors, ADH = Treatment Adherence to Food Allergy Self Care Behaviors.

Food Allergy Specific Items

Pearson correlations were utilized to determine the relationships between adolescents' food allergy specific items and main variables measured. These correlations are presented below in Table 7. Adolescents' reporting of anaphylaxis history ($n = 100, r = .30, p = .003$) and higher numbers of visits to the ER in the past year due to food allergy ($n = 92, r = .25, p = .017$) reported significantly more appraised risk due to their food allergies. All three health belief measures were positive and significantly associated with adolescents' reporting anaphylaxis as well, with those who have experienced anaphylaxis reporting higher levels of perceived barriers ($n = 97, r = .24, p = .020$), perceived susceptibility ($n = 96, r = .43, p < .001$), and perceived severity ($n = 96, r = .27, p = .009$). Adolescents who reported higher numbers of ER visits in the past year also reported significantly higher perceived susceptibility to an allergic reaction ($n = 89, r = .30, p = .004$), but surprisingly less PTSS symptoms ($n = 53, r = -.28, p = .042$). Anaphylaxis was also positive and significantly correlated with treatment adherence ($n = 96, r = .21, p = .036$) while significantly negatively correlated with self-regulation of food allergy activities ($n = 96, r = -.23, p = .025$). This indicates that adolescents who have experienced anaphylaxis engage in higher treatment adherence while also relying more on their parents for taking charge of food allergy regulatory behaviors.

The frequency of adolescents' reported practicing using their EAI is significantly positively correlated with perceived severity ($n = 96, r = .35, p = .001$) and treatment adherence ($n = 96, r = .40, p < .001$), while significantly negatively correlated with self-regulatory behaviors ($n = 96, r = -.26, p = .010$) and burden of treatment ($n = 96, r = -.21, p = .034$). Thus, adolescents who require more parental assistance in regulating their food allergy activities have higher individual treatment adherence, practice using their EAI more often, and feel less of a

burden from using their EAI. Similarly, adolescents who hold their EAI more often (for reasons other than transferring how they are carrying it) report significantly higher perceived severity ($n = 96, r = .20, p = .046$), higher treatment adherence ($n = 96, r = .35, p = .001$), and lower self-regulation ($n = 96, r = -.22, p = .035$), indicating they rely more on their parents for their food allergies.

The cost of EAI's was positively significantly correlated with adolescent's perceived barriers to treatment adherence ($n = 96, r = .22, p = .028$), but was not significantly correlated with the other scales. Conversely, adolescents' reported concern of being without an EAI was correlated with almost every measure. Concern of being without an EAI was positively significantly correlated with appraised perception of risk ($n = 99, r = .31, p = .002$), perceived susceptibility ($n = 96, r = .45, p < .001$), perceived severity ($n = 96, r = .49, p < .001$), and treatment adherence ($n = 96, r = .65, p < .001$). Adolescents who report concern of being without an EAI report feeling more susceptible to an allergic reaction, a more severe reaction, and higher treatment adherence. Similar to other correlations identified, adolescents' concern of being without an EAI was negatively correlated with burden of treatment ($n = 96, r = -.31, p = .002$) and self-regulation ($n = 96, r = -.29, p = .004$). Finally, adolescents' reported concern about EAI recalls was positively significantly correlated with appraised risk ($n = 98, r = .22, p = .032$), all health belief measures (Barriers $n = 96, r = .21, p = .045$; Susceptibility $n = 95, r = .28, p = .007$; Severity $n = 95, r = .34, p = .001$, and treatment adherence $n = 95, r = .35, p = .001$).

Table 7.*Descriptive Statistics and Correlations of Food Allergy Specific Questions against Main Variables.*

	<i>N</i>	<i>M</i>	Range	<i>SD</i>	FAIM	BAR	SUC	SEV	BoT	ANX	IES	REG	ADH
ANA	106	0.64	0-1	0.48	.30**	.24*	.43**	.27**	-.06	-.04	-.14	-.23*	.21*
RMB	106	0.92	0-1	0.27	-.01	-.08	-.01	.07	-.15	-.06	.10	-.03	-.04
ERV	97	0.43	0-6	1.14	.25*	.20	.30**	.16	.02	.02	-.28*	-.09	.12
PRA	106	1.88	1-6	1.14	.13	-.08	.16	.35**	-.21*	-.19	-.26	-.26*	.40**
HLD	106	2.16	1-6	1.60	.07	-.14	.17	.20*	-.17	-.14	.13	-.22*	.35**
CST	104	2.81	1-5	1.48	.16	.22*	.18	.12	-.12	-.01	-.09	.17	.09
WOT	105	3.30	1-5	1.80	.31**	.20	.45**	.49**	-.31**	-.15	-.01	-.29**	.65**
RCL	104	2.23	1-5	1.55	.22*	.21*	.28**	.34**	-.20	-.10	.02	-.08	.35**

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

Note. ANA = Anaphylaxis, RMB = Remember anaphylactic reaction, ERV = # of ER visits in past year, PRA = Practice using EPI frequency, HLD = hold epi pen frequency, CST = Concern over cost of EPI, WOT = Concern of being without EPI, RCL = Concern over recall of EPI, FAIM = Appraised Perception of Risk, BAR = Perceived Barriers, SUC = Perceived Susceptibility, SEV = Perceived Severity, BoT = Burdon of Treatment, ANX = Generalized Anxiety Symptoms (measured with the SCARED), IES = Post-Traumatic Stress Symptoms, REG = Food-Allergy Self-Regulation Behaviors, ADH = Treatment Adherence to Food Allergy Self Care Behaviors.

Dichotomous Variable Analyses

To better compare the means of two dichotomous measures (remember experiencing allergic reaction and experiencing anaphylaxis) with the main variables and food allergy specific questions, two-tailed independent samples *t*-tests were completed. Cohen's *d* was calculated for each of these comparisons by dividing the obtained *t* value by the square root of the sample size (Wuensch, 2014). Effect sizes of .2 indicated a "small but not trivial" effect, .50 a medium effect, and .80 a large effect (p. 4). These analyses are presented in Tables 8 (ANA) and 9 (RMB). Significant relationships of between means comparisons were only found in the analysis of the dichotomous variable experiencing anaphylaxis (Table 8). Using Cohen's *d*, small effect sizes were found comparing those who have experienced anaphylaxis and those who have not with the following variables: FAIM ($d = -.28$), perceived barriers ($d = -.24$), perceived susceptibility ($d = -.43$), perceived severity ($d = -.27$), treatment adherence ($d = -.22$), EMPOWER ($d = .23$), number of ER visits in past year ($d = -.40$), frequency practice using an EAI ($d = -.39$), frequency hold an EAI ($d = -.33$), concern of the cost of an EAI ($d = -.22$). A medium effect size was found between those who had experienced anaphylaxis and those who had not with concern of being without an EAI ($d = -.56$).

Table 8.*Anaphylaxis Dichotomous Variable Analysis.*

	ANA	N	M	SD	SE	df	t	p	d	95% CI	
FAIM	N	37	3.63	1.14	0.19	56.8	-2.83	0.006	-0.28*	-1.03	-0.18
	Y	63	4.23	0.80	0.10						
BAR	N	34	18.15	6.58	1.13	95	-2.38	0.020	-0.24*	-5.59	-0.50
	Y	63	21.19	5.70	0.72						
SUC	N	33	7.73	3.74	0.65	49.7	-4.21	0.000	-0.43*	-4.55	-1.61
	Y	63	10.81	2.68	0.34						
SEV	N	33	11.85	2.45	0.43	94	-2.68	0.009	-0.27*	-2.17	-0.32
	Y	63	13.10	2.01	0.25						
BoT	N	33	2.18	0.95	0.17	94	0.61	0.543	0.06	-0.27	0.50
	Y	63	2.06	0.88	0.11						
ADH	N	33	15.48	3.07	0.54	94	-2.13	0.036	-0.22*	-2.81	-0.10
	Y	63	16.94	3.23	0.41						
ANX	N	33	11.03	5.16	0.90	82.1	0.43	0.667	0.04	-1.94	3.02
	Y	63	10.49	6.84	0.86						
IES	N	20	8.70	6.51	1.46	53	1.04	0.302	0.14	-1.70	5.39
	Y	35	6.86	6.19	1.05						
REG	N	33	2.29	0.49	0.09	94	2.28	0.025	0.23*	0.03	0.46
	Y	63	2.04	0.50	0.06						
ERV	N	35	0.00	0.00	0.00	61	-3.91	0.000	-0.40*	-1.02	-0.33
	Y	62	0.68	1.36	0.17						
PRA	N	38	1.37	0.82	0.13	99.9	-4.02	0.000	-0.39*	-1.19	-0.40
	Y	68	2.16	1.21	0.15						
HLD	N	38	1.55	1.18	0.19	99.5	-3.35	0.001	-0.33*	-1.51	-0.39
	Y	68	2.50	1.72	0.21						
CST	N	36	2.36	1.52	0.25	102	-2.29	0.024	-0.22*	-1.27	-0.09
	Y	68	3.04	1.41	0.17						
WOT	N	37	2.11	1.70	0.28	103	-5.76	0.000	-0.56**	-2.49	-1.21
	Y	68	3.96	1.50	0.18						
RCL	N	36	1.92	1.57	0.26	102	-1.52	0.133	-0.15	-1.11	0.15
	Y	68	2.40	1.52	0.18						

Effect sizes: *.2 indicates a “small but not trivial” effect, **.50 a medium effect, and ***.80 a large effect

Note. ANA = Anaphylaxis, ERV = # of ER visits in past year, PRA = Practice using EPI frequency, HLD = hold epi pen frequency, CST = Concern over cost of EPI, WOT = Concern of being without EPI, RCL = Concern over recall of EPI, FAIM = Appraised Perception of Risk, BAR = Perceived Barriers, SUC = Perceived Susceptibility, SEV = Perceived Severity, BoT = Burden of Treatment, ANX = Generalized Anxiety Symptoms (measured with the SCARED), IES = Post-Traumatic Stress Symptoms, REG = Food-Allergy Self-Regulation Behaviors, ADH = Treatment Adherence to Food Allergy Self Care Behaviors.

Table 9.

Remember Allergic Reaction Dichotomous Variable Analysis.

	RMB	N	M	SD	SE	df	t	p	d	95% CI	
FAIM	N	No	7	4.06	1.41	98	0.14	0.890	0.01	-0.71	0.82
	Y	Yes	93	4.00	0.95						
BAR	N	No	7	21.86	2.67	95	0.77	0.443	0.08	-2.94	6.68
	Y	Yes	90	19.99	6.34						
SUC	N	No	7	9.86	3.98	94	0.09	0.932	0.01	-2.55	2.78
	Y	Yes	89	9.74	3.38						
SEV	N	No	7	12.14	2.67	94	-0.64	0.523	-0.07	-2.31	1.18
	Y	Yes	89	12.71	2.21						
BoT	N	No	7	2.57	1.13	94	1.43	0.155	0.15	-0.19	1.20
	Y	Yes	89	2.07	0.88						
ADH	N	No	7	16.86	3.89	94	0.36	0.723	0.04	-2.08	2.99
	Y	Yes	89	16.40	3.20						
ANX	N	No	8	11.88	6.36	94	0.56	0.577	0.06	-3.32	5.94
	Y	Yes	88	10.57	6.31						
IES	N	No	4	5.25	4.57	53	-0.75	0.459	-0.10	-9.05	4.14
	Y	Yes	51	7.71	6.43						
REG	N	No	7	2.19	0.54	94	0.31	0.761	0.03	-0.34	0.46
	Y	Yes	89	2.12	0.51						
ERV	N	No	8	0.25	0.71	95	-0.47	0.637	-0.05	-1.04	0.64
	Y	Yes	89	0.45	1.17						
PRA	N	No	8	1.38	0.52	104	-1.30	0.198	-0.13	-1.38	0.29
	Y	Yes	98	1.92	1.17						
HLD	N	No	8	1.88	1.46	104	-0.52	0.603	-0.05	-1.48	0.87
	Y	Yes	98	2.18	1.62						
CST	N	No	8	2.88	1.55	102	0.13	0.894	0.01	-1.01	1.16
	Y	Yes	96	2.80	1.48						
WOT	N	No	8	3.63	1.92	103	0.52	0.603	0.05	-0.97	1.66
	Y	Yes	97	3.28	1.80						
RCL	N	No	8	2.63	1.85	102	0.75	0.456	0.07	-0.70	1.56
	Y	Yes	96	2.20	1.53						

Effect sizes: *.2 indicates a “small but not trivial” effect, **.50 a medium effect, and ***.80 a large effect

Note. RMB = Remember anaphylactic reaction, ERV = # of ER visits in past year, PRA = Practice using EPI frequency, HLD = hold epi pen frequency, CST = Concern over cost of EPI, WOT = Concern of being without EPI, RCL = Concern over recall of EPI, FAIM = Appraised Perception of Risk, BAR = Perceived Barriers, SUC = Perceived Susceptibility, SEV = Perceived Severity, BoT = Burdon of Treatment, ANX = Generalized Anxiety Symptoms (measured with the SCARED), IES = Post-Traumatic Stress Symptoms, REG = Food-Allergy Self-Regulation Behaviors, ADH = Treatment Adherence to Food Allergy Self Care Behaviors.

Hypothesis Testing

The purpose of this study was to test a model that explains how the cognitive and emotional components of food allergies predict food-allergy specific adolescent self-regulation behaviors. Multiple linear regression and path models were utilized to identify model fit. Each analysis was run with covariates held constant to determine best fit, specifically race, age, gender, parent education level, whether adolescents remember having an allergic reaction, and the number of food-allergy related allergic reactions in the past year.

Hypothesis 1: Self-Regulation Responsibility (EMPOWER)

It was hypothesized that higher scores on cognitive symptom measures (FAIM, BoT, and HBM) and higher scores on emotional symptom measures (SCARED and IES-6) would lead to lower scores of self-regulation on the EMPOWER measure. The EMPOWER measure asked questions about whether adolescents, parents, or both were responsible for certain behaviors needed to take care of food allergies, such as making doctor appointments, calling a doctor and asking questions, noticing allergic reactions, and explaining food allergy to others.

Regression Model predicting Self-Regulation Behaviors

Cognitive and emotional variables were used to predict EMPOWER scores. Specifically, appraised perception of risk (FAIM), health belief model factors of perceived barriers of treatment adherence (BAR), perceived susceptibility of allergic reaction (SUC), perceived severity of allergic reaction (SEV), perceived burden of treatment (BoT), and generalized anxiety symptoms (SCARED) were used to predict adolescent food-allergy self-regulation behaviors (EMPOWER), controlling for all covariates (see Table 10). The overall model was significant ($F = 8.50, p < .001, \text{Unadjusted } R^2 = .61$). Results indicate that more perceived barriers predict lower scores on the EMPOWER, indicating parents take more responsibility of managing food

allergy related activities. Additionally, older participants and those who identify as female predict higher EMPOWER scores, indicating more self-regulation. The IES-6 was not included in this analysis as it significantly decreased the number of subjects included and the overall model from 96 to 46. The model including the IES-6 with the same covariates accounted for seventy-two percent of the variance with the sample that completed this measure ($F = 5.89, p < .001, \text{Unadjusted } R^2 = .72$).

Table 10.
Regression Model Predicting EMPOWER Score Including Covariates

	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R^2	<i>F</i>	Unadjusted R^2
<i>Model</i>						8.50***	0.61
FAIM	-0.02	0.049	.722	-.033	0.001		
HBM: BAR	-0.02	0.007	.005**	-.251	0.049		
HBM: SUC	0.01	0.015	.590	.053	0.002		
HBM: SEV	-0.03	0.022	.199	-.122	0.010		
BoT	-0.02	0.049	.692	-.034	0.001		
SCARED	-0.01	0.007	.094	-.142	0.017		
AGE	0.15	0.018	< .001***	.720	0.401		
GENDER	0.23	0.106	.031*	.196	0.029		
RACE	-0.03	0.044	.472	-.059	0.003		
EDU	0.01	0.021	.762	.026	0.001		
ANA	0.21	0.153	.166	.118	0.012		
ERV	.004	0.040	.927	.008	0.000		

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

This model was also tested using only cognitive factors (FAIM, HBM, BoT) to predict EMPOWER scores, controlling for covariates (see Table 11). The model remained significant and accounted for similar variance as the overall model including emotional factors ($F = 8.7 p < .001, \text{Unadjusted } R^2 = .58$). Perceived barriers, age, and gender demonstrated a similar pattern as the overall model.

Table 11.*Regression Model with Cognitive Factors Predicting EMPOWER Score Including Covariates*

<i>Model</i>	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R ²	F	Unadjusted R ²
						8.70***	0.58
FAIM	-0.03	0.048	.524	-.058	0.003		
HBM: BAR	-0.02	0.007	.003**	-.271	0.057		
HBM: SUC	0.01	0.015	.512	.065	0.003		
HBM: SEV	-0.01	0.021	.623	-.045	0.001		
BoT	-0.02	0.050	.694	-.034	0.001		
AGE	0.15	0.018	< .001***	.712	0.392		
GENDER	0.22	0.108	.047*	.181	0.025		
RACE	-0.04	0.044	.411	-.067	0.004		
EDU	0.01	0.021	.411	.054	0.002		
ANA	0.20	0.156	.208	.108	0.010		
ERV	< 0.01	0.041	.984	.002	0.000		

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

The model was also tested using only emotional factors (SCARED and IES-6) to predict EMPOWER scores, controlling for age (see Table 12). Using the SCARED with covariates to predict EMPOWER, the model was significant ($F = 11.29$, $p < .001$, Unadjusted $R^2 = 0.53$). The model remained significant when the IES-6 was included in the model while also controlling for covariates, but included significantly less participants ($F = 7.83$, $p < .001$, Unadjusted $R^2 = .64$). Similar to both previously tested models, age significantly predicted EMPOWER scores for emotional factors; however, gender did not.

Table 12.*Regression Model with Emotional Factors Predicting EMPOWER Score Including Covariates*

	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R ²	F	Unadjusted R ²
<i>Model: SCARED ONLY</i>						11.29***	0.53
SCARED	-0.01	0.007	.166	-.116	0.013		
AGE	0.14	0.018	< .001***	.681	0.377		
GENDER	0.19	0.106	.078	.158	0.021		
RACE	-0.05	0.045	.278	-.092	0.008		
EDU	0.01	0.022	.690	.036	0.001		
ANA	0.25	0.157	.111	.139	0.017		
ERV	-0.03	0.039	.463	-.063	0.004		
<i>Model: SCARED + IES</i>						7.83***	0.64
SCARED	< -0.01	0.012	.716	-.049	0.001		
IES-6	< 0.01	0.011	.939	.010	0.000		
AGE	0.16	0.022	< .001***	.769	0.513		
GENDER	0.12	0.131	.378	.100	0.008		
RACE	-0.06	0.052	.302	-.111	0.011		
EDU	0.03	0.029	.403	.096	0.007		
ANA	-0.09	0.198	.652	-.050	0.002		
ERV	-0.05	0.075	.543	-.071	0.004		

p* < 0.05, *p* < 0.01, ****p* < .001***Path Model Analyses***

Path models were analyzed to predict EMPOWER scores. The *IES-6* was not included in the path analysis as an emotional factor since only approximately half of the participants potentially had experienced PTSS while also experiencing anaphylaxis. The SCARED was the only emotional measure in the models, while the cognitive measures included the FAIM, BAR, SUC, SEV, and BoT. As planned a priori, the covariates of age, gender, race, level of parents' education, whether adolescents remember a reaction, and number of ER visits in the past year were included in each model. Using generalized anxiety as a mediator between cognitive variables with covariates and EMPOWER scores did not significantly add to the model (see Table 13). Directional relationships between generalized anxiety with covariates and self-

regulation with cognitive variables as mediators can be seen in Table 14. Number of ER visits in the past year significantly and positively predicted FAIM scores, perceived barriers, and perceived susceptibility.

Table 13.

Path Model Predicting Adolescent Self-Regulation (EMPOWER) with ANX as Mediator Including Covariates

<i>Regress on</i>		<i>b</i>	<i>SE</i>	<i>p</i>
ANX	FAIM	-0.81	0.750	.278
	BAR	0.13	0.112	.247
	SUC	-0.20	0.223	.363
	SEV	-0.54	0.327	.102
	BoT	0.63	0.745	.398
	AGE	0.19	0.265	.482
	GENDER	1.49	1.608	.353
	RACE	-5.00	2.341	.033*
	EDU	-0.08	.316	.796
	RMB	0.97	2.405	.686
	ERV	0.41	0.629	.512
REG	ANX	-0.01	0.006	.110
	FAIM	-0.04	0.045	.415
	BAR	-0.02	0.007	.008**
	SUC	0.01	0.013	.600
	SEV	-0.02	0.020	.361
	BoT	-0.003	0.045	.948
	AGE	0.14	0.016	< .001 ***
	GENDER	0.24	0.096	.014*
	RACE	-0.18	0.143	.202
	EDU	0.004	0.019	.851
	RMB	0.20	0.143	.159
ERV	-0.001	0.038	.987	

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

Table 14.

*Path Model Predicting Adolescent Self-Regulation (EMPOWER) with COG as Mediator
Including Covariates*

<i>Regress on</i>		<i>b</i>	<i>SE</i>	<i>p</i>
FAIM	ANX	-0.03	0.016	.055
	AGE	0.03	0.030	.440
	GENDER	0.20	0.235	.392
	RACE	0.30	0.355	.403
	EDU	-0.01	0.048	.909
	RMB	-0.09	0.358	.806
	ERV	0.24	0.090	.009**
BAR	ANX	0.02	0.102	.850
	AGE	0.31	0.261	.236
	GENDER	2.03	1.541	.188
	RACE	4.08	2.327	.079
	EDU	-0.11	0.315	.719
	RMB	-1.97	2.347	.402
	ERV	1.23	0.589	.037*
SUC	ANX	-0.12	0.055	.030*
	AGE	0.24	0.141	.091
	GENDER	0.63	0.835	.452
	RACE	-0.89	1.260	.482
	EDU	-0.06	0.170	.739
	RMB	-0.11	1.271	.930
	ERV	0.96	0.319	.003**
SEV	ANX	-0.09	0.037	.011*
	AGE	0.19	0.095	.049*
	GENDER	-0.56	0.561	.321
	RACE	-0.36	0.848	.672
	EDU	-0.01	0.115	.958
	RMB	0.75	0.855	.383
	ERV	0.36	0.214	.092
BoT	ANX	0.02	0.015	.138
	AGE	-0.03	0.038	.416
	GENDER	0.46	0.227	.042*
	RACE	0.55	0.343	.111
	EDU	-0.06	0.046	.197
	RMB	-0.67	0.346	.053
	ERV	0.01	0.087	.899
REG	FAIM	-0.04	0.045	.415
	BAR	-0.02	0.007	.008**
	SUC	0.01	0.013	.600
	SEV	-0.02	0.020	.361
	BoT	-0.003	0.045	.948
	ANX	-0.01	0.006	.110
	AGE	0.14	0.016	< .001***
	GENDER	0.24	0.096	.014*
	RACE	-0.18	0.143	.202
	EDU	0.004	0.019	.851
	RMB	0.20	0.143	.159
	ERV	-0.001	0.038	.987

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

Hypothesis 2: Treatment Adherence

The second hypothesis predicted higher scores on cognitive symptom measure (FAIM, BoT, and HBM) and higher scores on emotional symptom measures (SCARED and IES-6) would lead to lower scores on the Treatment Adherence Scale, which measured factors such as carrying an EAI, avoiding foods, asking about ingredients, and looking at ingredient lists.

Regression Model predicting Treatment Adherence Behaviors

Cognitive and emotional variables were used to predict treatment adherence behaviors. Specifically, appraised perception of risk (FAIM), health belief model factors (BAR, SUC, & SEV), perceived burden of treatment (BoT), and generalized anxiety symptoms (SCARED) were used to predict adolescents' treatment adherence behaviors, controlling for all covariates (see Table 15). The overall model was significant ($F = 3.167, p = .001, \text{Unadjusted } R^2 = .37$). More perceived susceptibility predicted higher treatment adherence, while increased age predicted a lower treatment adherence. The IES-6 was not included in this analysis. Including the IES-6 in the same model was also significant, accounting for approximately sixty-four percent variance in the sample who completed this measure ($F = 4.046, p < .001, \text{Unadjusted } R^2 = .64$).

Table 15.*Regression Model Predicting Treatment Adherence Score Including Covariates*

	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R^2	F	Unadjusted R^2
<i>Model:</i>						3.167**	0.37
FAIM	0.35	0.392	.381	.102	0.007		
HBM: BAR	-0.07	0.058	.203	-.143	0.016		
HBM: SUC	0.30	0.119	.014*	.314	0.061		
HBM: SEV	0.30	0.173	.085	.210	0.030		
BoT	-0.33	0.392	.404	-.093	0.007		
SCARED	-0.02	0.056	.675	-.045	0.002		
AGE	-0.46	0.142	.002**	-.361	0.100		
GENDER	0.04	0.844	.965	.005	0.000		
RACE	0.29	0.347	.406	.086	0.007		
EDU	0.24	0.166	.158	.154	0.020		
ANA	-1.63	1.215	.186	-.143	0.017		
RMB	0.19	0.320	.557	.065	0.003		

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

A model using only cognitive factors (FAIM, HBM, BoT) to predict treatment adherence scores, controlling for covariates accounted for the same amount of variance as the overall model including emotional factors (see Table 16). This model was significant ($F = 3.499$, $p < .001$, Unadjusted $R^2 = .36$) and again demonstrated a similar pattern as the overall model considering perceived susceptibility and age.

Table 16.*Regression Model with Cognitive Factors Predicting Treatment Adherence Score Including Covariates*

	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R ²	F	Unadjusted R ²
<i>Model:</i>						3.499***	0.36
FAIM	0.43	0.374	.251	.129	0.013		
HBM: BAR	-0.08	0.057	.184	-.146	0.017		
HBM: SUC	0.32	0.117	.009**	.330	0.068		
HBM: SEV	0.31	0.163	.058	.218	0.035		
BoT	-0.32	0.389	.409	-.090	0.006		
AGE	-0.44	0.141	.002**	-.347	0.093		
GENDER	-0.05	0.839	.954	-.006	0.000		
RACE	0.25	0.342	.472	.072	0.005		
EDU	0.24	0.164	.153	.154	0.020		
ANA	-1.56	1.211	.202	-.135	0.015		
RMB	0.12	0.315	.708	.041	0.001		

p* < 0.05, *p* < 0.01, ****p* < .001

Finally, this model was also tested using only emotional factors (SCARED and IES-6) to predict treatment adherence scores (see Table 17). Holding covariates constant and not including the IES-6, the model approached significance ($F = 2.09, p = .056, \text{Unadjusted } R^2 = .171$), with age negatively predicting treatment adherence. Adding the IES-6 to the model and holding covariates constant led the model to be significant, and increased the amount of variance accounted for in the model ($F = 3.674, p = .003, \text{Unadjusted } R^2 = .457$). Lower levels of generalized anxiety and younger age negatively predicted higher treatment adherence. More PTSS as indicated by the IES-6 also predicted higher treatment adherence scores.

Table 17.*Regression Model with Emotional Factors Predicting Treatment Adherence Score Including Covariates*

	<i>b</i>	<i>SE</i>	<i>p</i>	β	Semi partial R^2	<i>F</i>	Unadjusted R^2
<i>Model: SCARED ONLY</i>						2.09	.17
SCARED	-0.11	0.057	.069	-.203	0.040		
AGE	-0.33	0.152	.034*	-.260	0.055		
GENDER	-0.09	0.874	.922	-.011	0.000		
RACE	0.45	0.375	.230	.134	0.017		
EDU	0.22	0.181	.227	.143	0.017		
ANA	-1.17	1.298	.371	-.103	0.009		
ERV	0.55	.324	.092	.192	0.034		
<i>Model: SCARED + IES</i>						3.674*	.46
SCARED	-0.32	0.095	.002**	-.563	0.181		
IES-6	0.27	0.083	.002**	.529	0.168		
AGE	-0.48	0.170	.008**	-.375	0.122		
GENDER	-0.19	1.002	.847	-.027	0.001		
RACE	0.69	0.403	.098	.222	0.045		
EDU	-0.10	0.222	.668	-.061	0.003		
ANA	-4.20	1.522	.009**	-.373	0.118		
ERV	0.43	0.58	.463	.106	0.009		

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$ ***Path Model Analyses***

A path model was analyzed in order to predict treatment adherence scores. Similar to the first hypothesis, the *IES* was not included. When generalized anxiety was used as a mediator with covariates to explain the relationships between cognitive, emotional, and behavioral variables, perceived severity became significant (see Table 18), which was not significant in the overall model. When cognitive variables were used as mediators with covariates included in the model, new significant relationships were found (see Table 19). Accounting for anxiety as an independent variable, the more susceptible an adolescent feels to having an allergic reaction ($b = 0.24, p = .022$), the more severe an adolescent perceived their food allergy ($b = 0.34, p = .025$), and the younger the adolescent ($b = -0.37, p = .003$), the higher their treatment adherence.

Adolescents who identify as more than one race ($b = 2.49, p = .025$) also report higher levels of treatment adherence.

Table 18.

Path Model Predicting Adolescent Treatment Adherence with ANX as Mediator Including Covariates

<i>Regress on</i>		<i>b</i>	<i>SE</i>	<i>p</i>
ANX	FAIM	-0.81	0.750	.278
	BAR	0.13	0.112	.247
	SUC	-0.20	0.223	.363
	SEV	-0.54	0.327	.102
	BoT	0.63	0.745	.398
	AGE	0.19	0.265	.482
	GENDER	1.49	1.608	.353
	RACE	-5.00	2.341	.033*
	EDU	-0.08	0.316	.796
	RMB	0.97	2.405	.686
	ERV	0.41	0.629	.512
REG	ANX	-0.01	0.050	.797
	FAIM	0.29	0.349	.404
	BAR	-0.05	0.052	.328
	SUC	0.24	0.104	.022*
	SEV	0.34	0.154	.025*
	BoT	-0.32	0.346	.358
	AGE	-0.37	0.123	.003**
	GENDER	-0.01	0.747	.986
	RACE	2.49	1.111	.025*
	EDU	0.24	0.146	.103
	RMB	-1.40	1.113	.210
ERV	0.22	0.292	.454	

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

Table 19.*Path Model Predicting Adolescent Treatment Adherence with COG as Mediator Including Covariates*

<i>Regress on</i>		<i>b</i>	<i>SE</i>	<i>p</i>
FAIM	ANX	-0.03	0.016	.055
	AGE	0.03	0.040	.440
	GENDER	0.20	0.235	.392
	RACE	0.30	0.355	.403
	EDU	-0.01	0.048	.909
	RMB	-0.09	0.358	.806
	ERV	0.34	0.090	.009**
BAR	ANX	0.02	0.102	.850
	AGE	0.31	0.261	.236
	GENDER	2.03	1.54	.188
	RACE	4.08	2.327	.079
	EDU	-0.11	0.315	.719
	RMB	-1.97	2.347	.402
	ERV	1.23	0.589	.037*
SUC	ANX	-0.12	0.055	.030*
	AGE	0.239	0.141	.091
	GENDER	0.63	0.835	.452
	RACE	-0.89	1.260	.482
	EDU	-0.06	0.170	.739
	RMB	-0.11	1.271	.930
	ERV	0.96	0.319	.003**
SEV	ANX	-0.09	0.037	.011*
	AGE	0.19	0.095	.049*
	GENDER	-0.56	0.561	.321
	RACE	-0.36	0.848	.672
	EDU	-0.01	0.115	.958
	RMB	0.75	0.855	.383
	ERV	0.36	0.214	.092
BoT	ANX	0.02	0.015	.138
	AGE	-0.03	0.038	.416
	GENDER	0.46	0.227	.042*
	RACE	0.55	0.343	.111
	EDU	-0.06	0.046	.197
	RMB	-0.67	0.346	.053
	ERV	0.01	0.087	.899
REG	FAIM	0.29	0.349	.404
	BAR	-0.05	0.052	.328
	SUC	0.24	0.104	.022*
	SEV	0.34	0.154	.025*
	BoT	-0.32	0.346	.358
	ANX	-0.01	0.050	.797
	AGE	-0.37	0.123	.003**
	GENDER	-0.01	0.747	.986
	RACE	2.49	1.111	.025*
	EDU	0.24	0.146	.103
	RMB	-1.40	1.113	.210
	ERV	0.22	0.292	.454

* $p < 0.05$, ** $p < 0.01$, *** $p < .001$

Chapter IV: Discussion

The purpose of this study was to test a model that explains how adolescents with food allergies' cognitive and emotional symptoms predict or influence their food allergy behaviors, aiming to identify areas to target to improve adolescents' safety. Cognitive symptoms analyzed included adolescents' perceived barriers to treatment adherence, susceptibility to an allergic reaction, severity of an allergic reaction, and burden of treatment when using an EAI. Emotional symptoms analyzed included generalized anxiety and PTSS. These factors were then used to predict adolescents' (1) self-regulation of food allergy related tasks, such as noticing allergic reactions, explaining FA to others, making doctor appointments, calling a doctor and asking questions. Cognitive and emotional factors were also used to predict adolescents' (2) treatment adherence, such as carrying an EAI, avoiding foods they are allergic to, and asking for and looking at ingredient lists. Secondary study questions included (1) which factors increased adaptive behaviors, measured on the EMPOWER and treatment adherence scales and (2) how PTSS affected adaptive behaviors.

The main variables for which measures were used in previous research were all consistent with previous findings, specifically appraised perception of risk (FAIM) (van der Velde et al., 2010) and health beliefs, including perceived barriers, susceptibility, and severity (Jones et al., 2013). Reported generalized anxiety was higher than in the general population; however, this construct was consistent with generalized anxiety symptoms that individuals with chronic illness report (Chavira et al., 2008). Cognitive symptoms of appraised perception of risk and the health belief model overall were all positively and significantly correlated with each other, while burden of treatment was only negatively and significantly correlated with perceived

severity. In contrast, Jones and colleagues (2013) found that the only significant correlations in cognitive symptoms with their sample were between susceptibility and severity.

Increased perception of risk, perceived susceptibility and severity were all significantly correlated with higher treatment adherence, while perceived barriers had no significant relationship with self-regulatory behaviors. Increased anxiety was significantly correlated with increased appraised perception of risk, increased perceived barriers to treatment, and increased perceived burden of treatment. As expected, increased anxiety was also significantly correlated with higher reported PTSS. Interestingly, higher anxiety symptoms in this population were correlated with lower treatment adherence, and PTSS in general was not correlated with adaptive behaviors. Potentially as this sample already presented with higher levels of anxiety, those participants with the highest levels of anxiety and PTSS may also be demonstrating functional impairment due to their anxiety. This pattern is consistent with Chavira and colleagues (2008) findings, which indicated that individuals with physical illnesses and comorbid anxiety disorders have greater functional impairment.

Food allergy specific questions were included in the study to identify adolescents' concern about current events surrounding EAI's availability (cost, recalls, being without) as well as to identify adolescents' daily behaviors regarding EAI's (frequency of practicing or holding an EAI). Adolescents who reported more concern with the cost of EAI's also reported more perceived barriers to treatment adherence. Of note, adolescents who reported more concern of a recall of their EAI reported higher appraised risk, greater susceptibility, severity, and treatment adherence. Adolescents who reported having experienced anaphylaxis were more likely to report more appraised perception of risk, as well as more perceived barriers to treatment, susceptibility, and severity of their food allergies. Anaphylaxis was one of the food allergy specific factors that

predicted less self-regulation of their own food allergy, indicating they relied more on a parent than themselves, as well as higher treatment adherence. Adolescents who practiced using and who held their EAI more often and those who expressed more concern about being without their EAI also reported less self-regulation of their food allergy and higher treatment adherence.

Hypothesis 1 proposed adolescents reporting higher scores on cognitive and emotional scales would predict lower scores in self-regulation on the EMPOWER measure. This hypothesis was tested using both multiple linear regression and path analyses to determine strength and direction of the relationships between the variables. As only 68 participants reported experiencing anaphylaxis and thus completed the IES-6, this measure was not included in these analyses unless otherwise noted because doing so would have significantly decreased the number of usable subjects' responses. The following models were tested: (A) all cognitive, emotional variables, age, and gender regressing independently onto EMPOWER scores, (B) all cognitive variables, age and gender regressing independently onto EMPOWER scores, (C) generalized anxiety and age predicting EMPOWER scores, and (D) generalized anxiety, PTSS, and age predicting EMPOWER scores. All four multiple linear regression models tested were found to be significant, supporting Hypothesis 1.

Similar paths were tested (1) with cognitive variables and covariates predicting EMPOWER scores with generalized anxiety (emotional variable) as a mediator, and (2) with generalized anxiety and covariates predicting EMPOWER scores with cognitive variables as mediators. Increased age and less perceived barriers consistently predicted more self-regulation (higher EMPOWER scores) in all regression and path models tested. Models testing all variables independently as well as with cognitive factors as independent variables (generalized anxiety as a mediator) also found those who identified as female significantly predict higher

EMPOWER scores. These results indicate that cognitive and emotional variables likely predict whether adolescents take more responsibility for food allergy behaviors, specifically if adolescents perceive there are less barriers to those behaviors, are older, or are female.

Hypothesis 2 proposed adolescents reporting higher cognitive and emotional scores would predict lower scores in treatment adherence. The same processes were used as in the first hypothesis to test the model. Almost all models tested in Hypothesis 2 used multiple linear regression were statistically significant, with the model using only SCARED as a psychological variable predicting treatment adherence approaching significance. As a reminder, Hypothesis 2 used a treatment adherence measure for the outcome variable, which addressed specific safety behaviors regarding food allergies, such as carrying an EAI, avoiding foods, checking ingredients lists, etc. In contrast, Hypothesis 1 used a self-regulation measure that addressed whether an adolescent, parent, or both took responsibility for certain necessary actions. While the same predictor variables were used in both hypotheses, the amount of variance in explaining adolescents' treatment adherence behaviors was less than in explaining adolescents' self-regulation behaviors. It appears the measured cognitive variables influence adolescents' transition to self-regulation activities more than individual treatment adherent behaviors. For example, adolescents reported they take responsibility for actions, such as noticing allergic reactions and explaining their food allergy to others when they are required to do so, but do not necessarily check food labels and carry their EAI every time they are given the opportunity to do so.

Increased perceived susceptibility and decreased age significantly predicted higher treatment adherence. It was expected that the more susceptible and severe an adolescent perceives their food allergy to be, the more likely they would engage in higher treatment

adherence. However, one very important finding in this study is that the older adolescents are, the lower their treatment adherence. This is consistent with previous research that adolescents are more prone to risk-taking behaviors (Chipps, 2013) as well as studies that indicate the likelihood of death due to allergic reactions and risk-taking behaviors increase in adolescence (Bock et al., 2001; Macadam et al., 2012; Pumphrey & Gowland, 2007). This is also the time period that responsibility is being transferred from parent to child for food allergy management (LeBlanc et al., 2003).

This study's results indicate that while adolescents increase in age, they do increase in their self-regulatory behaviors, consistent with the transition period described by LeBlanc, Goldsmith, and Patel (2003); however, results also indicate that during this period they decrease their treatment adherence behaviors. Cognitive variables (perception of risk, barriers, susceptibility, severity, and burden of treatment) appear to have some influence on the directional relationship between age and treatment adherence. The amount of variance explained in the overall model explaining adolescent self-regulation (61%) was substantially higher than the variance explained in the overall treatment adherence model (37%). Age was a driving factor in explaining the variance in both of these models, although age explained more variance with self-regulation (40%) than with treatment adherence (10%), considering the semi-partial R^2 values. Age thus captures more variance in the model of self-regulation than in treatment adherence, which is developmentally appropriate. What is unclear in the analyses of self-regulation and treatment adherence is parents' influence on these behaviors. Potentially adolescents may not take responsibility for certain food allergy tasks due to parents not allowing them to, especially if an adolescent had experienced a severe allergic reaction.

Limitations

It is unclear how to interpret parental education as a variable, as it is possible adolescents may have reported their own levels of education instead of parents. Approximately 18% of participants reported their parents had not completed high school which appeared a bit high for this population, as 16% reported a 4-year degree. More clarification is needed through replication of this study to further investigate parental education as well as all of the demographic variables' relationships with adolescent treatment adherence and self-regulation. The IES-6 was not used in all analyses, as a large enough sample did not experience anaphylaxis in order to include their scores in all analyses. Thus, for most of the regressions and path analyses the emotional variables included only the generalized anxiety scores on the SCARED. When the IES-6 was used as appropriate for comparison, emotional factors appeared to have more of an effect on the models. Future research may seek to replicate these measures with only adolescents who have experienced anaphylaxis.

The burden of treatment measure included only one item and based on basic statistical analyses did not appear to have a significant effect in the tested sample with the other cognitive measures. While appraised perception of risk, perceived barriers, perceived susceptibility, and perceived severity all significantly correlated with each other, burden of treatment did not. As previously mentioned, the EMPOWER potentially is not only assessing adolescents' levels of self-regulation but also their parents' transition of control. Future research will be needed to delineate how parents affect adolescents' transition to independent control of their food allergies. Finally, as the method of this study was survey research, there is the potential for participants to report socially desirable responses. The trends demonstrated in the participants' scores in this

study were undoubtedly similar to that of previous research and continue to demonstrate significant patterns of responding.

Implications for Future Research and Clinical Practice

The findings in this study suggest direct applications for both future research and clinical practice. It will be important to engage in applied research with adolescents directly assessing areas for individual intervention to increase treatment adherence behaviors, especially as adolescents age. Questions to address include the environment that adolescents respond to intervention most, which may include general doctor's clinics, integrated behavioral health, specialist or allergist clinics, schools, or another setting. Even though increased age has been consistently identified as a predictor for decreased treatment adherence as well as risky behavior, no specific age or construct has been identified to predict the timeline for this change. A potential area for both research and clinical interest may be monitoring adolescents' risk behaviors in order to identify an optimal time for intervention before risky behaviors or attitudes toward food allergies begin to present themselves.

Cognitive variables of perceived barriers, susceptibility, severity, and appraised risk of food allergy all appear to have a significant impact when combined when predicting both self-management behaviors and treatment adherence. These are areas that clinicians can monitor and provide intervention should they identify an adolescent is beginning to report low treatment adherence. More research is required with this population to determine whether adolescents' report of treatment adherence may be affected by social desirability. Potentially adolescents may find reporting lower levels of treatment adherence to be socially desirable. Behavior checks completed by medical professionals could provide a more accurate report of adolescents' food allergy behaviors. For example, a medical provider could ask an adolescent to produce an EAI

they are carrying during a doctor's visit. Including medical providers in these checks may also lead adolescents to share food allergy specific anxiety symptoms or concerns.

Recent research has been delving into college-age young adults who have food allergies and their treatment adherence patterns in carrying an EAI. Duncan and Annunziato (2018) reported inconsistent carrying habits of undergraduate students, and overall poor treatment adherence. Duncan and Annunziato's findings are in line with this study's, concluding that perception of worse consequences of an allergic reaction increased treatment adherence. Duncan and Annunziato recommend research into how the increased cost of EAI affect college students' treatment adherence. This study found a significant correlation between cost and perceived barriers. However, the current study found positive significant correlations between participants' concern of (1) being without an EAI and a (2) recall of an EAI with the following variables: (A) appraised risk, (B) perceived susceptibility, (C) perceived severity, and (D) treatment adherence. This indicates more research into the current state of EAIs in the United States is needed, not only including the cost but also concern about recalls and needing to be without an EAI. Clinicians working with adolescents and young adults with food allergies should monitor their client's feelings toward these current events as well.

Conclusion

This study investigated how self-management and treatment of food-allergic adolescents can be predicted by cognitive and emotional factors. Results indicated that as adolescents age, they begin to take more responsibility for food allergy responsibilities and regulation; however, they also engage in less treatment adherence behaviors. Self-regulatory behaviors are higher in adolescents who perceive less barriers to treatment, as well as participants who identify as female. Treatment adherence is higher in those who perceive they are more susceptible to an

allergic reaction. More research is needed regarding screening and interventions to address this developmental period of transitioning responsibility in adolescents with food allergies.

Screening may be beneficial to assess the cognitive factors tested in this study as well as adolescents' reactions to the current state of EAIs (i.e., cost and recalls). Doing so will assist in identifying those who need additional intervention to increase food-allergy specific self-regulation and treatment adherence.

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APPENDIX B: INFORMED CONSENT- PARENT

East Carolina University



Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

IRB Study # **UMCIRB 17-000654**

Title of Research Study: A Model of Self-Regulation In Adolescents with Food Allergy

Principal Investigator: Katy Scott Sage (Person in Charge of this Study)

Institution, Department or Division: East Carolina University, Psychology Department

Address: 223 Rawl Building

Telephone #:(252) 328-5826

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?

The purpose of this research is to examine the link between food allergies and self-regulation in adolescents. Your child is being invited to take part in this research because your child has at least one food allergy. The decision for your child to take part in this research is yours to make. By doing this research, we hope to examine whether more dysregulated thinking and emotions are related to worse medical risk outcomes. If you volunteer for your child to take part in this research, your child will be one of about 150 to do so.

Are there reasons I should not take part in this research?

I understand I should not volunteer for this study if I am under 18 years of age, or I am not a parent of a child who suffers from one or more food allergies.

What other choices do I have if I do not take part in this research?

You can choose for your child to not participate at any time. You and your adolescent will not be penalized in any way for choosing not to complete participating in this study.

Where is the research going to take place and how long will it last?

The research will be conducted through an online survey. The total amount of time your child will be asked to volunteer for this study is about 10-25 minutes.

What will my child be asked to do?

Your child will be asked to complete an online survey, which will consist of two sections: (1) Demographics, food allergy, and family background, (2) Adolescent Functioning, assessing health beliefs, anxiety, and self-regulatory behaviors.

What might I experience if I take part in the research?

We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you or your child would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you or your child but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

The primary investigator and research team are the only people that will have access to your survey information.

How will you keep the information you collect about me secure? How long will you keep it?

All survey data will be entered into a database that will be stored on a private Internet server provided by ECU. No survey data will be kept in the same location as personally identifying information (email if you provide it). A participant ID (assigned in sequential order starting with 1) will be associated with survey responses.

After study completion, the de-identified data sets will be kept for eight years and then destroyed. Given the longitudinal nature of this study, the youngest children (age 12) that will be participants would be age 18 after eight years. No plans to use the de-identified data in future research have been formed as of this study's commencement.

What if I decide I don't want to continue in this research?

Your child can stop at any time after it has already started. There will be no consequences if he/she stops will not be criticized. Your child will not lose any benefits that he/she normally receives.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator Katy Scott Sage at scottka15@ecu.edu or (252)328-5826.

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971.

I have decided I want my child to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that my child can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights of my child.
- I may print consent document, and it is mine to keep.

Parent's Name (TYPE) Signature

Date

Please take time to print this page if you would like a copy for your records.

APPENDIX C: INFORMED CONSENT- ADULT

East Carolina University



Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

IRB Study # **UMCIRB 17-000654**

Title of Research Study: A Model of Self-Regulation In Adolescents with Food Allergy

Principal Investigator: Katy Scott Sage (Person in Charge of this Study)

Institution, Department or Division: East Carolina University, Psychology Department

Address: 223 Rawl Building

Telephone #:(252) 328-5826

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?

The purpose of this research is to examine the link between food allergies and self-regulation in adolescents. You are being invited to take part in this research because you are 18 or 19 years old and have at least one food allergy. The decision to take part in this research is yours to make. By doing this research, we hope to examine whether more dysregulated thinking and emotions are related to worse medical risk outcomes. If you volunteer to take part in this research, you will be one of about 150 adolescents to do so.

Are there reasons I should not take part in this research?

I understand I should not volunteer for this study if I am under 18 years of age, or I am not a parent of a child who suffers from one or more food allergies.

What other choices do I have if I do not take part in this research?

You can choose not to participate at any time. You will not be penalized in any way for choosing not to complete participating in this study.

Where is the research going to take place and how long will it last?

The research will be conducted through an online survey. The total amount of time your child will be asked to volunteer for this study is about 10-25 minutes.

What will I be asked to do?

You will be asked to complete an online survey, which will consist of two sections: (1) Demographics, food allergy, and family background, (2) Adolescent Functioning, assessing health beliefs, anxiety, and self-regulatory behaviors.

What might I experience if I take part in the research?

We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

The primary investigator and research team are the only people that will have access to your survey information.

How will you keep the information you collect about me secure? How long will you keep it?

All survey data will be entered into a database that will be stored on a private Internet server provided by ECU. No survey data will be kept in the same location as personally identifying information (email if you provide it). A participant ID (assigned in sequential order starting with 1) will be associated with survey responses.

After study completion, the de-identified data sets will be kept for eight years and then destroyed. Given the longitudinal nature of this study, the youngest children (age 12) that will be participants would be age 18 after eight years. No plans to use the de-identified data in future research have been formed as of this study's commencement.

What if I decide I don't want to continue in this research?

You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator Katy Scott Sage at scottka15@ecu.edu or (252)328-5826.

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.

- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I may print this consent document, and it is mine to keep.

Participant's Name (TYPE) Signature

Date

Please take time to print this page if you would like a copy for your records.

APPENDIX D: MINOR ASSENT



Assent Form Things You Should Know Before You Agree To Take Part in this Research

IRB Study # **UMCIRB 17-000654**

Title of Study: A Model of Self-Regulation In Adolescents with Food Allergy

Person in charge of study: Katy Scott Sage

Where they work: East Carolina University

Study contact phone number: (252)328-5826

Study contact E-mail Address: scottka15@ecu.edu

*** If you have trouble reading any words you may ask your parent to help you read this***

People at ECU study ways to make people's lives better. These studies are called research. This research is trying to find out how your food allergies affect your thinking, emotions, and behaviors.

Your parent(s) needs to give permission for you to be in this research. You do not have to be in this research if you don't want to, even if your parent(s) has already given permission.

You may stop being in the study at any time. If you decide to stop, no one will be angry or upset with you.

Why are you doing this research study?

The reason for doing this research is to look at how you take care of your food allergies.

Why am I being asked to be in this research study?

We are asking you to take part in this research because you have a food allergy, and we would like to understand how it affects you.

How many people will take part in this study?

If you decide to be in this research, you will be one of about **150** people taking part in it.

What will happen during this study?

You will be asked to complete a survey that has two parts: (1) The first part will tell us about your food allergies, and (2) the second part will tell us about your thoughts and feelings. If you need your parents to help you read the questions, that is okay but please answer them on your

own. You can complete the online survey anywhere you like, at any time. It will take about 15-25 minutes for you to complete.

Who will be told the things we learn about you in this study?

The researchers who are working on this study are the only people who have access to your answers but they will not know your name. The information that you are giving the researchers will allow us to understand and help adolescents like you who have food allergies.

What are the good things that might happen?

Sometimes good things happen to people who take part in research. These are called “benefits.” The benefits to you of being in this study may be that you can help us understand the fascinating topic of food allergies.

What are the bad things that might happen?

Sometimes things we may not like happen to people in research studies. These things may even make them feel bad. These are called “risks.” The risks of this study are very low. Things may also happen that the researchers do not know about right now. You should report any problems to your parents and to the researcher.

Will you get any money or gifts for being in this research study?

We will not be able to pay you for the time you volunteer while being in this study.

Who should you ask if you have any questions?

If you have questions about the research, you and your parents should ask the people listed on the first page of this form. If you have other questions about your rights while you are in this research study you may call the Institutional Review Board at 252-744-2914.

If you decide to take part in this research, you should type your name below. It means that you agree to take part in this research study.

Type your name here if you want to be in the study

Date

APPENDIX E: UMCIRB APPROVAL DOCUMENTATION



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284 · www.ecu.edu/ORIC/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
To: [Katherine Scott](#)
CC: [Christy Walcott](#)
[Katherine Scott](#)
Date: 5/8/2017
Re: [UMCIRB 17-000654](#)
A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 5/7/2017 to 5/6/2018. The research study is eligible for review under expedited category #7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Assent- Child	Consent Forms
Consent- Adult	Consent Forms
Consent- Parent	Consent Forms
Dissertation Proposal	Study Protocol or Grant Application
Flyer	Recruitment Documents/Scripts
SURVEY	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building · Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284
www.ecu.edu/ORIC/irb

Notification of Continuing Review Approval: Expedited

From: Social/Behavioral IRB
To: [Katherine Scott](#)
CC: [Christy Walcott](#)
[Katherine Scott](#)
Date: 5/18/2018
Re: [CR00006898](#)
[UMCIRB 17-000654](#)
A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

The continuing review of your expedited study was approved. Approval of the study and any consent form(s) is for the period of 5/18/2018 to 5/17/2019. This research study is eligible for review under expedited category #7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
Assent- Child(0.01)	Consent Forms
Consent- Adult(0.01)	Consent Forms
Consent- Parent(0.01)	Consent Forms
Dissertation Proposal(0.02)	Study Protocol or Grant Application
Flyer(0.02)	Recruitment Documents/Scripts
SURVEY(0.04)	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.



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600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284**
www.ecu.edu/ORIC/irb

Notification of Continuing Review Approval: Expedited

From: Social/Behavioral IRB
To: [Katherine Scott](#)
CC: [Christy Walcott](#)
[Katherine Scott](#)
Date: 6/7/2019
Re: [CR00007784](#)
[UMCIRB 17-000654](#)
A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

The continuing review of your expedited study was approved. Approval of the study and any consent form(s) is for the period of 6/6/2019 to 6/5/2020. This research study is eligible for review under expedited category #7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
Assent- Child(0.01)	Consent Forms
Consent- Adult(0.01)	Consent Forms
Consent- Parent(0.01)	Consent Forms
Dissertation Proposal(0.02)	Study Protocol or Grant Application
Flyer(0.02)	Recruitment Documents/Scripts
SURVEY(0.04)	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
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Οφφχ 252-744-2914 •Φωξ 252-744-2284 •
rede.ecu.edu/umcirb/

□

Closure Notification

From: Social/Behavioral IRB
To: [Katherine Sage](#)
CC: [Katherine Sage](#)
[Christy Walcott](#)
Date: 5/19/2020
Re: [FR00001400](#)
2020 Final Report for UMCIRB 17-000654
A MODEL OF SELF-REGULATION IN ADOLESCENTS WITH FOOD ALLERGY

I am pleased to inform you that your request to close this study has been approved on 5/18/2020.

It is your responsibility to ensure that you retain all research related documents, including the consent form(s), if applicable, for a period of no less than three years. If you have any questions or need for any reason to re-open this research study, please contact the UMCIRB office prior to implementing any research actions.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

