Food Allergy and Attentional Coping in Adults

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Food Allergy and Attentional Coping in Adults

Jessica A. Gauchel

A Thesis in the Field of Psychology
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Abstract

Food allergy affects approximately 9 million adults in the Unites States. The only medically approved treatment is avoidance of the allergenic food. Research has found food allergy to be associated with anxiety, depression, and lower quality of life, but has primarily focused on children. Little research has explored these associations in adults, and even less has examined the relationship between coping and food allergy in adults. Attentional coping is associated with ongoing symptom management for asthma, diabetes, and other illness. This study investigated the relationship between attentional coping and food allergy in adults (n=230) by examining the mean differences between adults with food allergy and adults without food allergy on scores for 3 attentional coping subscales: English-language Mainz Coping Inventory (MCI) Vigilance subscale (MCI-V), Coping Inventory for Stressful Situations (CISS) Task scale (CISS-T), and CISS Emotion scale (CISS-E); examining the correlation between years since allergy diagnosis and scores on attentional coping subscales; and examining the correlation between years since first reaction and scores on attentional coping subscales. Exploratory analyses were conducted on 2 avoidant coping subscales: MCI Cognitive Avoidance (MCI-CA) and CISS Avoidance scale (CISS-A). ANOVAs found a significant mean difference in scores on the CISS-A, with adults with food allergy scoring higher than those without. There was a significant sex effect for the MCI-V, CISS-T, and CISS-A. Regression analyses found a significant negative correlation between years since diagnosis and attentional coping scores, and found a positive correlation between years since diagnosis and scores
on MCI-CA, with more years since diagnosis predicting higher scores. Findings support the need for additional research on food allergy and coping in adults.
This thesis is dedicated to my mother, Arlene Glasser, whose intelligence, kindness, and grace I remember every day.
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Chapter I
Introduction

Do adults with food allergy engage in different styles of coping than their non-food allergic peers? Knowledge of coping style among adults with food allergy will contribute to understanding the possible limitations and challenges present for this population. In addition to the impact on coping in daily life, understanding coping style may provide insight into additional areas of support necessary for this population to engage in and achieve success with new and innovative treatments which may save them from life-threatening reactivity. Significant resources have been directed toward studying the relationship between anxiety and/or depression and food allergy in children and their families, but little research has sought to examine these relationships in adults with food allergy.

Food allergy refers to an immune mediated adverse response to food (Addolorato et al., 1998; Sicherer & Sampson, 2010), characterized by a close temporal relationship between ingestion of the allergen and onset of localized or generalized symptoms (e.g., respiratory, cardiovascular, gastrointestinal, itching or swelling of skin) (Boden & Burks, 2012; Gupta, Lau, Sita, Smith, & Greenhawt, 2013; Lieberman & Pattanaik, 2012; Seitz, Pfeuffer, Raith, Brocker, & Trautman, 2008; Teufel et al., 2007). Approximately 3-8% of children in the United States have one or more diagnosed food allergy (Ravid et al., 2012; Sicherer & Sampson, 2010). By age 16 approximately 80% of food allergies will resolve (Savage, Matsui, Skripak & Wood, 2007; Sicherer & Sampson, 2010; Skripak, Matsui,
Mudd & Wood, 2007). The factors most significantly related to resolution of childhood food allergy are a history of mild to moderate reactions, having no symptoms other than eczema, and being allergic to only one food, and the allergen in question (i.e., resolution for milk, egg, and soy allergy are more likely than resolution for shellfish, tree nut, and peanut allergy) (Gupta et al., 2013). But for children with multiple food allergies or severe symptomatology including hives, swelling, or anaphylaxis, the likelihood of natural resolution of their food allergy is greatly reduced (Gupta et al., 2013). Together, an estimated 9 million adults, or approximately 4% of adults in the United States, have a diagnosed food allergy (National Institute of Allergy and Infectious Diseases, 2006; U.S. Census Bureau, 2010).

At present, the only medically recommended treatment for non-resolved food allergy is avoidance of the allergenic food and emergency management when ingestion occurs (Goodman, 2013; Gowland, 2001; Gowland, 2002; Teufel et al., 2007). Although the AMA recognizes and advocates abstinence as the only method of treatment for severe food allergy, there are a number of alternative treatments under development and study. One of the more promising of these treatments is immunotherapy, consisting of various styles of systematic exposure and desensitization (via sub-lingual administration and/or oral ingestion of the offending allergens) (Keet et al., 2012; Moran, Vickery, & Burks, 2013). Should immunotherapy treatment prove effective in long-term management of food allergy symptoms, it will offer new hope for disease management. Active participation in immunotherapy, however, will require that patients engage in regular exposure to the allergens they have heretofore avoided.
Food Allergy

Food allergy affects “more than 1-2% but less than 10%” of the United States population (Schneider Chafen et al., 2010). Many studies cite prevalence at 8% of children and 4-5% of adults (e.g., Longo, Berti, Burks, Krauss, & Barbi, 2013; Sicherer & Sampson, 2003). Symptoms of food allergy may range from brief, localized itching to a life threatening, immediate, acute, systemic hypersensitivity reaction known as anaphylaxis (Anderson & deShazo, 1991; Kemp & Lockey, 2009; Lieberman & Pattanaik, 2012; Seitz, Pfeuffer, Raith, Brocker, & Trautman, 2008; Wood et al., 2014). Anaphylaxis comprises a range of symptoms occurring alone or concurrently, and occurring within a short time of exposure to the allergen. Symptoms may include but are not limited to itching or swelling of skin, lips, tongue, or airways; increased heart rate and respiration; abdominal pain, or diarrhea (Sampson, 2008; Seitz et al., 2008).

Approximately 500,000 people experience food-related anaphylaxis each year in the United States, and in 2001 Bock and colleagues estimated that 3 in every 10,000 anaphylactic episodes in the United States was fatal, resulting in approximately 150 deaths due to food allergy per year (Bock, Munoz-Furlong, & Sampson, 2001). Most people who die have prior knowledge of their food allergy, and prior to death were able to identify the causative allergen.

For people with food allergy, there is a great deal of uncertainty in managing their condition. Some are able to tolerate small amounts of the food to which they are allergic, whereas others may experience reactivity to extremely small amounts. Estimates of relevant eliciting doses (ED) vary widely. A 2002 study calculated an ED for 50% of
adult participants with peanut allergy (ED50) as 3 mg of peanut protein (approximately 12 mg of whole peanut) or 1/50th of a peanut (Wensing, Penninks, Hefle, Koppelman, Bruijnzeel-Koomen, & Knulst, 2002), but a 2014 study calculated ED50 as 225.37 mg of whole peanut (Blumchen et al., 2014). Although there is evidence that patients with a history of more severe food allergy symptoms have lower reactivity thresholds than those with less severe symptoms (Wensing et al., 2009), this is no sure predictor of ED or reaction severity. No tests exist to discriminate groups, so all individuals with food allergy must exercise extreme caution to avoid accidental ingestion of the allergenic food.

Anxiety and Depression

In the United States approximately two-thirds of people who experience anaphylaxis from accidental ingestion experience it outside the home (Bock, Munoz-Furlong, & Sampson, 2007). Given the ongoing threat and the burden of avoiding accidental exposure, as well as the emphasis among medical providers on the importance of carrying epinephrine and always being prepared to treat accidental ingestions, anxiety might be expected among people with food allergies (Jones & Scurlock, 2006). Studies have shown a high comorbidity in children between allergies and mood disorders, with higher than expected rates of allergies present in children with anxiety and higher than expected levels of anxiety and depression in children with food allergies (Kovalenko, Hoven, Wu, Wicks, Mandell, & Tiet, 2001; Monga & Manassis, 2006; Patten & Williams, 2007; Schmidt-Traub & Bamler, 1997). Children with food allergies are frequently referred for psychiatric assessment due to allergy-related anxiety (Jones & Scurlock, 2006; Monga & Manassis, 2006).
Among children with food allergy, anxiety levels increase with frequency and severity of food allergy symptoms (Ostblom, Egmar, Gardulf, Lilja, & Wickman, 2008). Children with food allergy exhibit high levels of fear of adverse events, symptoms of separation anxiety, anxiety and fear about eating, and greater concern regarding managing their condition than children with diabetes mellitus (Avery, King, Knight, & Hourihane, 2003; King, Knibb, & Hourihane, 2009; Shanahan, Zucker, Copeland, Costello, & Angold, 2014). Adults with food allergy have higher rates of trait anxiety and depression, and allergy status and one’s perceived ability to effectively manage their health interact to affect anxiety, resulting in adults with food allergy and high health competence reporting the highest anxiety levels (Addolorato, 1998; Bolger, DeLongis, Kessler, & Schilling, 1989). Earlier research has shown the link, in a healthy adult sample, between daily stressors and negative mood, including anxiety (Bolger et al., 1989). This relationship supports the expectation that adults with food allergy, especially those actively engaged with managing their condition, would suffer from elevated levels of anxiety.

Numerous empirical studies have suggested a relationship between the physical correlates of allergies and mood disorders. It is theorized that people with allergies exhibit cholinergic hyper responsiveness and andrenergic hypo responsiveness in the autonomic nervous system. Similar imbalance has been found in the central nervous system of people with depression (Marshall, 1993). Research has shown that neurotransmitters and neuromodulators (e.g., serotonin, histamine, vasoactive intestinal peptide) known to serve as mediators in the limbic system are also found in the mucous and blood plasma of allergic rhinitis patients (Bell, Kasnoski, Kagan, and King, 1990). A
variety of allergens have been shown to provoke affective and cognitive symptoms, including triggering panic disorders in people susceptible to them (King, 1981; Sugerman, Southern, & Curan, 1982). It is also theorized that a blunted cortisol response to stress may be common to anxiety and allergic atopy (dermatitis, rhinitis, and/or asthma). Research, however, supports this link only in chronic allergic inflammatory processes such as those involved with allergic asthma and dermatitis, not for IgE-mediated food allergy (Buske-Kirschbaum, Von Auer, Krieger, Weis, Rauh, & Hellhammer, 2003).

It is tempting to look to these data to explain the correlation between increased symptoms of mood disorder and food allergies. Elevated levels of allergen-specific IgE antibodies have been found among subjects with depression as compared to subjects with alcoholism, schizophrenia, and healthy controls (Sugerman, Southern, & Curan, 1982). These studies identified a relationship between mood and atopic allergies (e.g., eczema or seasonal allergic rhinitis) but found no relationship between mood and food allergy (Bell, Jasnoski, Kagan, & King, 1990; Buske-Kirschbaum, Ebrecht, Kern, Gierens, & Hellhammer, 2008; Kagan, 1990). At present there is insufficient evidence supporting an argument that a common physical etiology can explain the link between food allergy and depression or anxiety.

Whereas we have evidence of a common etiology for environmental allergies and anxiety, as relates to food allergy anxiety may instead be a consequence. In a 2014 study of anaphylaxis in the United States, 48% of reactions were caused by exposure to medication or food, 19% of reactions were caused by insect stings and no anaphylactic reactions were reported in response to environmental allergies (Wood et al., 2014). An
examination of anxiety as a potential consequence of food allergy would be an interesting area for study. It is, however, beyond the scope of the current investigation.

It is held that a moderate level of anxiety serves a protective function, and results in maladaptive behavior only when it is too high or too low. When anxiety is chronically elevated or is extremely high, the resultant behavior is fearful, avoidant, and over responsive (Avery et al., 2003; Mandell et al., 2005; Primeau et al., 2000). When anxiety is chronically low or is extremely low it results in reduced caution and preparedness, and can lead to accidental exposure and possible death (Mandell, Curtis, Gold, & Hardie, 2005; Primeau et al., 2000). In families of children with food allergy, increased anxiety following initial diagnosis motivates self-education, information-gathering, and implementation of a management plan. Once strategies are implemented, anxiety drops. After a prolonged period without an allergic episode, anxiety and vigilance reduce and precautionary strategies relax (Mandell et al., 2005). Thus this differentiation between adaptive and maladaptive anxiety identifies a degree of moderate anxiety as a potentially useful tool in coping, especially in the presence of elevated risk as in the case of food allergy.

Quality of Life

In addition to anxiety and depression, numerous studies have found a relationship between food allergy and reports of decreased quality of life, or general well-being across a number of objective and subjective factors (Wallander, 2001). Daily management of symptoms and avoidance of exposure is a major life stressor for children with food allergy and their parents. Compared to healthy controls, they report negative impact on
social participation, school performance and attendance, and overall physical well-being (Bollinger, Dahlquist, Mudd, Sonntag, Dillinger, & McKenna, 2004; Calsbeek, Rijken, Bekkers, Dekker, & van Berge Hemegouwen, 2006; Gowland, 2002; Herbert & Dahlquist, 2008; King, Knibb, & Hourihane, 2009; Mandell et al., 2005; Primeau et al., 2000; Roy and Roberts, 2011). One study examining quality of life for children with food allergy, children with diabetes mellitus, and healthy children found that those with food allergy reported the lowest overall quality of life (Avery et al., 2003). Although there have been fewer studies examining quality of life in adults with food allergy, those that have been reported show similar findings. Compared to healthy controls, adults with food allergy report more pain, greater social limitations, poorer overall health, and less vitality (Flokstra-de Blok et al., 2010). When compared with adults with chronic rheumatological disease, adults with peanut allergy reported greater disruption in family relations and less efficacy in developing coping skills (Primeau et al., 2000). Impairment to health-related quality of life was higher for adolescents and adults with food allergy than those with rheumatoid arthritis, diabetes mellitus, irritable bowel syndrome, asthma, and healthy controls (Flokstra de Blok et al., 2010).

Coping

Given evidence of increased depression and anxiety and decreased quality of life, questions arise as to whether people with food allergy have impaired coping, and why some people with food allergy show better adjustment than others. A difference in coping style may play a role in the latter. Coping is an individual’s constantly shifting cognitive and behavioral efforts to manage threats and demands appraised as threatening or which
strain to overload the individuals resources (Lazarus & Folkman, 1984). Coping also refers to specific behaviors and strategies employed to regulate response to stressful situations (Weinstein, Brown, & Ryan, 2009).

Coping behaviors are thought to reflect one of two fundamental aims: attention or avoidance. Attentional coping (e.g., sensitization, monitoring, vigilance) directs the individual towards threat or the threat-relevant information of a particular stressful situation (Bijttebier, Vertommen, & Steene, 2001; Krohne, 1993a; Roth & Cohen, 1986). Avoidant coping (repression, blunting, cognitive avoidance) directs the individual away from threat or the threat-relevant information of a particular stressful situation (Bijttebier, Vertommen, & Steene, 2001; Krohne, 1993a).

Maladaptive anxiety can be examined within the attentional and avoidant coping framework. Among adults with food allergy, those whose greatest perceived stressor is the physical threat of accidental allergen exposure would employ an attentional coping response to render that threat avoidable. Chronic use of the attentional coping response or chronically elevated anxiety could lead to fearful behaviors (e.g., refusing to eat food they didn’t prepare themselves, regardless of listed ingredients, prep style, or other relevant factors) (Carver & Schier, 1993; Krohne, 1989). Those whose greatest perceived stressor is the emotional arousal or fear associated with potential accidental allergen exposure (fear of fear itself), would employ an avoidant coping response to reduce the emotional impact of the threat. Chronically blunted anxiety or chronic use of the avoidant coping response could lead to relaxing safety precautions and emergency-response preparedness (e.g., forgetting to tell restaurant staff about their allergy and risking cross-contamination or hidden ingredients) (Carver & Schier, 1993).
Much of the research on coping and health focuses on reactive coping wherein individuals cope with an immediate issue such as surgery, diagnosis, or illness onset (Jones, Hadjistavropoulos, & Gullickson, 2014; Matsushita, Murata, Matsushima, Sakata, Miyasaka, & Aso, 2007). Other studies examine reactive coping and the ongoing management of illness, focusing on mitigating stressors associated with ongoing and/or worsening symptoms or illness-related challenges (Frazier, 2000; Giese-Davis et al., 2014). A few studies have examined proactive coping and illness, focusing on management of symptoms and maintenance of health over time, such as with management of insulin-dependent diabetes (Jaser, Linsky, & Grey, 2014; Wiejman et al., 2005). Whereas proactive coping for insulin-dependent diabetes requires regular administration of insulin and careful monitoring of blood sugar, food allergy requires complete avoidance of the allergenic substance(s) and despite the best avoidance measures can still result in unintended exposure. For individuals with food allergy, proactive coping necessarily involves ongoing anticipatory risk assessment and management.

LaVeist, Thorpe, Pierre, Mance, & Williams (2014) noted an absence of research investigating anticipatory coping, which they define as steps taken by individuals to mitigate likely future stressors. To understand anticipatory coping and its impact on health, they studied individuals living in high-crime and/or low-quality residential conditions with high risk of experiencing racially discriminatory treatment. Although the socio-economic and socio-political implications may be significant and different from those experienced by individuals with food allergy, this population is similarly at risk of potential threat initiating from outside. The authors found that individuals living in high-
crime and/or low quality neighborhoods experience a chronic state of heightened vigilance. These findings contribute to work linking coping style and health outcome, such as quality of life (Gandhi, Jedel, Hood, Mutlu, Swanson, & Keshavarzian, 2014), disease progression of HIV (Ironson et al., 2005), healing of diabetic ulcers (Vedhara et al., 2010), severity of lupus symptoms (Hanley, 2001), and others. The authors note that this attentional coping may be an important risk factor for poor mental health and/or mental health difficulties, including depression and anxiety (LaVeist et al., 2014).

Attentional and avoidant coping refer both to context and disposition. An individual’s coping disposition is a habitual pattern of response to stress using strategies from one group or the other, over a number of situations (Krohne & Hock, 2011). A person is not defined as an attentional or avoidant coper based on his or her coping behavior in a given situation. Rather, this classification is made when a behavioral pattern is present.

Krohne’s Modes of Coping Methods (MCM) recognizes coping as “rigid” when a person habitually engages in one style and refrains from the other across situations of varying controllability and predictability (Krohne, 1989). The MCM identifies a person with “flexible coping” as having low frequencies of both attentional and avoidant strategies, whereas a person with “unsuccessful coping” regularly employs both attentional and avoidant coping strategies (Krohne, 1989). The MCM’s conceptualization of “unsuccessful coping” has been equated to dispositional anxiety (Kohlman, Singer, & Krohne, 1998). Coping research, however, demonstrates that different coping strategies are not representative of a presence or lack of anxiety; subsets of anxious individuals may respond to threatening situations by engaging attention, avoidance, or both (Avero,
Thus, one cannot assume that coping among adults with food allergy is solely representative of high levels of anxiety. LaVeist and colleague’s (2014) findings of an association between attentional coping and guarding against external threat, however, further support the expectation of a pattern of vigilance or attentional coping among adults with food allergy. Therefore, it is expected that adults with food allergies will be more likely to utilize attentional coping style than adults with no history of food allergy.

As has been discussed, individuals with food allergy must exercise extreme caution to avoid accidental ingestion of the allergenic food(s). There is evidence that chronic use of attentional coping over time can result in cognitive exhaustion, risk-taking, and even in denial (Lazarus, 1999; Mishel, 1988; Sampson, Munoz-Furlong, & Sicherer, 2006). Studies have found, however, that in the context of chronic illness, use of avoidant coping is associated with poor symptom and disease management. Rassart and colleagues found that over a 5 year period, young adults with type 1 diabetes who engaged more in avoidant coping showed poor glycemic control (Rassart, Luyckx, Oris, Goethals, Moons, & Weets, 2015). Among adolescents with celiac disease, those who achieved strict adherence to their gluten-free diet used fewer avoidant coping strategies than their non-compliant peers (Wagner, Zeiler, Grylli, Berger, Huber, Woeber, Rhind, & Karwautz, 2015). Whereas poor disease management for some illnesses can lead to increased symptoms and even severe decline over time, poor disease management among individuals with food allergy can lead to rapid onset of anaphylaxis and to death. The findings discussed above raise the question as to whether ongoing attentional coping is
required for successful management of food allergy and avoidance of allergen-induced reactivity, and whether the attentional coping may increase or decrease over time.

There is a growing body of research exploring the relationship between food allergy and anxiety. It is common for such research to reference vigilance as a natural response to the ever-present risk of exposure (Coulson & Knibb, 2007; Ravid et al., 2012; Roy & Roberts, 2011; Teufel et al., 2007). These references, however, fail to provide an operational definition of vigilance, and use the term to connote a marker or symptom of anxiety rather than a means or style of coping. The current project adds to existing research on coping and food allergy in adults and adds to existing understanding of the challenges faced by individuals with food allergies who may wish to participate in exposure-based alternative treatments. Whereas there is a large and growing body of literature exploring the relationship between food allergy and comorbid mood disorder in children, there is little published exploring this relationship in adults, and even less is published exploring the relationship between food allergy and coping in adults.

This study advances current research and understanding by exploring the relationship between food allergy and coping in adults. Is food allergy associated with higher levels of attentional coping? Is ongoing attentional coping a hallmark of successful management of food allergy? Does the length of time a person has dealt with food allergy affect the degree of attentional coping? Are there other mediating factors? To those ends, I submit three hypotheses:

H1: Adults with food allergy will exhibit higher levels of attentional coping than adults with no history of food allergy.

H2: Among adults with food allergy, years since diagnosis will be positively correlated with levels of attentional coping.
H3: Among adults with food allergy, years since first reaction will be positively correlated with levels of attentional coping.
Chapter II

Method

This correlational study recruited participants through Amazon Mechanical Turk (Mturk), a transactional virtual community which serves as an online clearinghouse connecting workers to paid tasks. Research has found that when used to collect experimental data, MTurk and other transactional virtual communities produce data consistent with those collected from traditionally recruited participants (Bates & Lanza, 2013; Buhrmester, Kwang, & Gosling, 2011). In addition, studies testing the validity and reliability of data gathered via MTurk have shown high validity, good internal consistency, and high test-retest reliability over a two-week period (Behrend, Sharek, Meade, & Wiebe, 2011; Buhrmester et al., 2011).

Participants

Participants in this study were paid $1.00 to complete the survey, which was expected to take approximately 15-20 minutes. Participants who did not meet the inclusion criteria were not permitted to move beyond the first screen of the survey and were not paid. All participants who met the inclusion criteria and who proceeded past the first page were paid, regardless of whether they completed the survey. Although the survey questions were not expected to be upsetting, there was potential for the experience to cause discomfort for participants because they were asked to think of hypothetical stressful situations, and to recollect real-life stressful situations. Because of this potential for discomfort, it was important that participants be able to cease participation without forfeiting payment.
The sample was restricted by age (over eighteen years), geography (living in the United States), and language (fluent in English). Respondents’ sex (male, female) was reported as it was required for proper scoring of the CISS. Age at diagnosis of food allergy and age at first anaphylaxis were reported to allow for exploration of mediating effects on the degree of attentional coping. This information was also used to determine respondents’ food allergy status, in conjunction with a question asking whether the respondent has an epinephrine autoinjector prescription prescribed by a doctor for the treatment of accidental ingestion of the allergenic food.

The goal was to recruit 100 participants with food allergy and 100 participants without food allergy, totaling 200 participants. The survey was posted twice. For survey 1, an announcement (Appendix A) was made on Mturk inviting English-speaking adults over the age of 18 and living in the United States to participate in the survey. 134 responses were collected within 2 hours, with 115 respondents without food allergy and 19 participants with food allergy. For survey 2, an announcement (Appendix B) was made on Mturk inviting English-speaking adults over the age of 18 and living in the United States who also met the allergy inclusion criteria (have experienced at least one anaphylactic reaction to food AND have had a doctor’s diagnosis including a positive skin-prick AND have a prescription for an epinephrine delivery device prescribed to treat accidental ingestion of an allergenic food). There were 115 responses within 2 hours.

From the 249 respondents, 230 participants were selected. Nine were excluded because they answered only a few questions, 3 were excluded because they indicated age at diagnosis older than their current age, and 1 was excluded because the respondent indicated age at diagnosis and age at first reaction older than their current age. Three
were excluded because they were identified as low outliers (2) or high outliers (1) by SPSS diagnostics, and 3 were excluded because they were manually identified as high outliers in accordance with the CISS manual’s instructions for score interpretation.

Measures

Before participants completed the survey, they provided biographical and demographic information (Appendix C), including: age, sex, race, allergy status, age at diagnosis, age at first reaction, and whether or not they have an epinephrine autoinjector prescribed to treat a food allergy. Previous research has found a moderate correlation between perceived and actual coping. Because perceived and actual coping don’t correlate perfectly, it was necessary to ensure the survey contained questions about both (Ptacek, Pierce, & Thompson, 2006; Shikai, Nagata, Kitamura, 2014). The survey consisted of one existing validated coping measure comprising perceived (in this case, anticipated) scenarios and one existing, validated coping measure comprising questions about past experiences.

Coping style was measured by the English-language Mainz Coping Inventory (MCI; Krohne et al., 2000; Appendix D) which contains questions about how respondents might hypothetically cope if faced with particular stressful situations. The MCI is an 8-item self-report questionnaire which examines habitualized and actual coping through the presentation of fictitious situations, half of which represent physical threat (subscale MCI-P) and half of which represent ego threat (subscale MCI-E). Each of the 8 situations is paired with 5 attentional (vigilant) and 5 avoidant (cognitive avoidant) coping strategies to allow for the separate measurements of the two coping dispositions.
Participants indicate on a true-false scale which of the listed strategies they generally use in a given situation (Hock & Krohne, 2004; Krohne, 1993b; Krohne et al., 2000). Strategies associated with vigilance/attention and avoidance can be scored separately on each subscale (MCI-P and MCI-E). Overall measures of vigilance (MCI-V) and cognitive avoidance (MCI-CA) are calculated by summing scored answers separately across all subscale situations, yielding a score of 0-40 for vigilance/attention and a score of 0-40 for avoidance, where a score of 0 indicates strategies within that coping disposition are not used and a score of 40 indicates strategies within that coping disposition are frequently used (Debeer, Raes, Claes, Vrieze, Williams, & Hermans, 2012). Confirmatory factor analysis has shown evidence of independence of the vigilance and cognitive avoidance factors (Krohne et al., 2000). Test-retest reliability of internal consistency has been found to range between 0.74 and 0.84 at initial test, and between 0.70 and 0.84 at 2 weeks (Krohne et al., 2000). Concurrent validation has been shown through comparisons to the Coping Orientation to Problem Experienced (COPE) measure (Carver et al., 1989) and the Social Problem-Solving Inventory (SPSI; D’Zurilla & Nezu, 1990). Attentional coping is scored by the MCI-V subscale (Krohne et al., 2000).

Coping style was also measured using the Coping Inventory for Stressful Situations (CISS; Endler & Parker, 1994; Appendix E), which asks respondents to think back to a time they have encountered particular stressful situations. The CISS is a 48-item self-report questionnaire assessing coping strategies on three subscales, with 16 items per subscale. The CISS subscales are task-oriented (CISS-T subscale), emotion-oriented (CISS-E subscale) and avoidance-oriented (CISS-A subscale) coping (Endler & Parker, 1994). Respondents are asked to indicate on a 5-point Likert scale the degree to
which they engage in particular coping activities when they encounter a stressful, difficult, or upsetting situation. Responses on the CISS range from 1 = not at all to 5 = very much. On each subscale possible scores range from 16 to 80, where a score of 16 indicates the subscale’s specific coping activities are never used and a score of 80 indicates frequent use of those activities. Confirmatory factor analysis showed evidence of independence of the task-, emotion-, and avoidance-coping factors, and identical factor structures were found for men and women (Endler & Parker, 1994). Internal reliability scores have been reported to be good, with test-retest reliability of internal consistency ranging between 0.85 and 0.95 at initial test and between 0.51 and 0.73 at 6 weeks (Endler & Parker, 1994). Concurrent validation has been provided through comparisons to the Coping Strategies Indicator (CSI; Amirkhan, 1990) and the Defense Style Questionnaire (DSQ; Bond & Vaillant, 1986). Attentional and avoidant coping are defined and conceptualized differently across various theories, studies, and measures (Avero, et al., 2003; Bijttebier, et al., 2001; Cosway, Endler, Sadler, & Deary, 2000). Attentional coping is scored by the CISS-E scale and CISS-T subscales (Endler & Parker, 1999).

Procedure

The study was designed to look broadly for differences in attentional coping between adults with food allergy and adults without food allergy. Two (MCI-V, CISS-T) 2 (male, female) X 2 (control, allergy) analyses of variance were conducted to compare differences in attentional coping. An additional (CISS-E) 2 (male, female) X 2 (control, allergy) analysis of variance was conducted to compare differences in attentional coping
for exploratory purposes. Follow-up exploratory analyses of variances were conducted for the attentional coping subscales. Regression analyses were performed using data for all participants in the allergy group. Follow-up exploratory regression analyses were performed using data for all participants who provided age at diagnosis and age at first reaction, regardless of membership in the control or allergy group (see Table 1).

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Allergy Group</th>
<th>Total n</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
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<td>31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>134</td>
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<td>Female</td>
<td>53</td>
<td>43</td>
<td>96</td>
<td>41.7</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
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<td>3</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
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<td>6</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>5</td>
<td>6</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>White/Caucasian</td>
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<td>166</td>
<td>72.5</td>
</tr>
<tr>
<td>Other/Multiracial</td>
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<td>1</td>
<td>4</td>
<td>1.7</td>
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</tbody>
</table>

As discussed above, the demographic and biographical questions, MCI, and CISS were combined into a survey that was posted on harvard.qualtrics.com. An Mturk account was created for the purpose of distributing the survey. Detailed information and consent forms (Appendix F for survey 1, Appendix G for survey 2) preceded the survey and participants were reminded twice that they could opt out of the survey without penalty. Completion of the survey averaged 10 minutes, though it was expected to take longer. Participants were paid anonymously through MTurk.
Chapter III
Results

This study explored the relationship between food allergy and attentional coping in order to augment existing research on correlates of food allergy, mood disorder, and coping. Three hypotheses were tested. Hypothesis 1 predicted that food allergy status would correlate positively with scores of attentional coping (MCI-V, CISS-T). Hypothesis 2 predicted that among participants with food allergy, length of time since diagnosis (years since diagnosis) would positively correlate with scores of attentional coping (MCI-V, CISS-T). Hypothesis 3 predicted that among participants with food allergy, length of time since first reaction (years since first reaction) would positively correlate with scores of attentional coping (MCI-V, CISS-T).

Demographic and biographical data (Appendix C) were captured at the beginning of the survey. Age and sex were used to convert raw scores on the CISS to standard scores, using a CISS-provided scoring sheet (see Appendix H). Answers to the question regarding age were used to determine participation eligibility. Answers to the questions regarding history of anaphylactic reactivity to food, doctor’s diagnosis of food allergy, and epinephrine autoinjector prescription were used as inclusion criteria for the allergy group.

Of the 230 participants selected for this research, 58.3% identified as male and 41.7% identified as female; 1.3% identified as American Indian or Alaskan Native, 13.1% identified as Asian or Pacific Islander, 6.5% identified as black or African American, 4.8% identified as Hispanic or Latino, 72.2% identified as white or Caucasian,
and 1.7% identified as other or mixed race (see Table 1). The mean age was 34, with a range of 18-69 years. Within the allergy group (n=116), the mean age at diagnosis was 15, with a unimodal distribution and a range of 1-51 years and the mean age at first reaction was 13, with a unimodal distribution and a range of 1-51. There were many respondents who did not meet all of the allergy group requirements, but who provided data regarding diagnosis or reaction. Among all participants (allergy and control groups) who reported being diagnosed with a food allergy (n=177), the mean age at diagnosis was 13 with a unimodal distribution and a range of 1-55 years. Among all participants (allergy and control groups) who reported having experienced an anaphylactic reaction (n=178), the mean age at first reaction was 12, with a unimodal distribution and a range of 1-59.

Before testing hypothesis 1, all of the key variables in the planned analysis of variance were examined to determine if they differed by sex. A significant difference was found between males and females for both the MCI–V and the CISS-T scale. Sex was therefore included in the ANOVAs as a separate factor. The means and standard deviations for these tests of sex are seen in Table 2.

Prior research in coping has been inconsistent regarding whether a difference exists between coping in men and coping in women. Some investigations have shown significant differences (Matheson & Anisman, 2012; Unruh, 1996) whereas other research finds no differences (El-Shormilisy, Strong, & Meredith, 2015; Lazarus, 2000). In the CISS’ conceptualization of coping, the emotion-oriented subscale falls between task (attentional) and avoidance coping (Endler & Parker, 1999). Because of its location between attentional and avoidant coping and because of the present research’s finding of
Table 2

Means and Standard Deviations on the Measure of Attentional and Avoidant Coping Scores as a Function of Allergy Status and Sex in Adults

<table>
<thead>
<tr>
<th>Group</th>
<th>Sex</th>
<th>Mean</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
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<td></td>
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</tr>
<tr>
<td></td>
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<td>7.2</td>
<td>61</td>
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<tr>
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<td>Female</td>
<td>30.4</td>
<td>7.1</td>
<td>53</td>
</tr>
<tr>
<td></td>
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<td>7.2</td>
<td>114</td>
</tr>
<tr>
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<td>5.9</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>30.7</td>
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<td>Total</td>
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<tr>
<td></td>
<td>Female</td>
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<td>6.2</td>
<td>96</td>
</tr>
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<td></td>
<td>Total</td>
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<td>229</td>
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<td>11.7</td>
<td>96</td>
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<tr>
<td></td>
<td>Total</td>
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<td>53</td>
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<td></td>
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<td>114</td>
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<tr>
<td></td>
<td>Female</td>
<td>54.1</td>
<td>11.8</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Total</td>
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<td>11.3</td>
<td>230</td>
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<tr>
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<td></td>
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<td>5.7</td>
<td>61</td>
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<tr>
<td></td>
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<td>53</td>
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<td></td>
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<td>25.6</td>
<td>7.1</td>
<td>114</td>
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<tr>
<td>Allergy</td>
<td>Male</td>
<td>25.6</td>
<td>5.7</td>
<td>71</td>
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<td></td>
<td>Female</td>
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<td>Total</td>
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<td>6.2</td>
<td>114</td>
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<tr>
<td>Total</td>
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<td>26.5</td>
<td>5.7</td>
<td>132</td>
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<tr>
<td></td>
<td>Female</td>
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<td>7.5</td>
<td>96</td>
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<tr>
<td></td>
<td>Total</td>
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<td>6.6</td>
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<td>Male</td>
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<td>10.9</td>
<td>61</td>
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<tr>
<td></td>
<td>Female</td>
<td>49.4</td>
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<td></td>
<td>Total</td>
<td>53.4</td>
<td>12.0</td>
<td>114</td>
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<tr>
<td>Allergy</td>
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<td>11.5</td>
<td>73</td>
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<td></td>
<td>Female</td>
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<td>12.4</td>
<td>43</td>
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<tr>
<td></td>
<td>Total</td>
<td>57.2</td>
<td>12.2</td>
<td>116</td>
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<tr>
<td>Total</td>
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<tr>
<td></td>
<td>Female</td>
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<tr>
<td></td>
<td>Total</td>
<td>55.4</td>
<td>12.2</td>
<td>230</td>
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</tbody>
</table>

Note: Abbreviations: MCI-V = English-language Mainz Coping Inventory Vigilance Scale; CISS-T = Coping Inventory for Stressful Situations Task Scale; CISS-E = Coping Inventory for Stressful Situations Emotion Scale; MCI-CA = English-language Mainz Coping Inventory Cognitive Avoidance Scale; CISS-A = Coping Inventory for Stressful Situations Avoidance Scale.
a significant sex difference, the CISS-E scale was added to the analysis of attentional coping measures. To determine the usefulness of the CISS E scale as a measure of attentional coping, the 3 subscales were analyzed for correlation (see Table 3). Analysis found the CISS-T and CISS-E to be inversely correlated in the sample. This negative correlation supported the assumption that they reflect unique functions, though it is unclear if those functions are competing or complementary. The MCI-V was positively correlated with the CISS-T and with the CISS-E. These positive correlations are consistent with the theoretical premise that despite representing different conceptualizations, they are all measures of attentional coping.

Table 3

<table>
<thead>
<tr>
<th></th>
<th>MCI-V</th>
<th>CISS-T</th>
<th>CISS-E</th>
<th>MCI-CA</th>
<th>CISS-A</th>
</tr>
</thead>
<tbody>
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<td>MCI-V</td>
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<td>—</td>
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<tr>
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<td>.231**</td>
<td>-.219**</td>
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<td>.374**</td>
<td>.341**</td>
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</table>

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

Note: Abbreviations see Table 2.

The differences by sex and inclusion of the CISS-E meant that 2-way ANOVAs with allergy (control/allergy) and sex (male/female) as factors and the 3 coping scores as dependent variables were employed to answer the questions. Thus, 3 2-way ANOVAs were conducted to test this hypothesis.

It was predicted that food allergy status would correlate positively with scores of attentional coping (MCI-V, CISS-T, CISS-E). There was no difference in MCI-V scores, F(1, 225) = .159, ns, based on allergy status (see Table 4). In this analysis sex was a
significant factor, F(1, 225) = 6.033, p = .015. Independent of allergy status, females had significantly higher scores on the MCI-V subscale than males (for female respondents, mean = 31, standard deviation = 6.249, and N = 96; for male respondents, mean = 28, standard deviation = 6.520, and N = 133). The interaction of sex and allergy was not significant, F(1, 225) -.022, ns. There was no difference in CISS-T scores, F(1,226) = .052, ns, based on allergy status. In this analysis sex was a significant factor, F(1, 226) = 9.433, p = .002. Independent of allergy status, females had significantly higher scores on the CISS-T subscale than males (for female respondents, mean = 53, standard deviation = 11.706, and n = 96; for male respondents, mean = 49, standard deviation = 9.694, and n = 134). The interaction of sex and allergy was not significant, F(1, 226) = .090, ns. There was no difference between mean CISS-E scores, F(1, 226) = 2.985, ns, based on allergy status. In this analysis, sex was not a significant factor, F(1, 226) = .282, ns, and the interaction of sex and food allergy was also not significant, F(1, 226) = .093, ns.

Although there were no significant mean differences between the allergy and control groups across any of the 3 measures, the CISS-E subscale scores trended towards significance, F(1, 226) = 2.985, p = .085. As discussed above, the decision to include the CISS-E subscale as an attentional coping measure was based upon the coping conceptualization used in the design of the CISS measure, wherein the CISS-E subscale falls between task (attentional) and avoidance coping (Endler & Parker, 1999). Because of the location of the CISS-E subscale between attentional and avoidant coping, and its trend towards significance, 2 additional 2-way ANOVAs with allergy (control/allergy) and sex (male/female) as factors and the two avoidant subscales (MCI-CA, CISS-A) as
dependent variables were employed as follow-up exploratory examination of this relationship.

**Table 4**

*Results of ANOVAs for the Measure of Attentional Coping Scores as a Function of Allergy Status and Sex in Adults*

<table>
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<th>Measure</th>
<th>Source</th>
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<th>df2</th>
<th>F</th>
<th>Sig.</th>
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</thead>
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<td>.159</td>
<td>.691</td>
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<tr>
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<td>Sex</td>
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<td>225</td>
<td>6.033</td>
<td>.015*</td>
</tr>
<tr>
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<td>Allergy*Sex</td>
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<td>225</td>
<td>.022</td>
<td>.883</td>
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<td>.820</td>
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<td>.596</td>
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<td>.751</td>
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</table>

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

*Note: Abbreviations: Abbreviations see Table 2.*

Before proceeding with the comparison of means, an analysis for correlation was again completed including the 3 attentional coping scales and the 2 avoidant coping scales (Table 3). The CISS-A subscale and MCI-CA subscale were positively correlated in the sample, supporting the assumption that both are measures of avoidant coping. The CISS-A subscale was positively related to the MCI-V subscale and the CISS-E subscale, indicating the presence of a relationship. The MCI and CISS both conceptualize attentional and avoidant coping as opposite styles, however, so a positive correlation in the sample between the MCI-V subscale and CISS-A subscale was unexpected and did not support the assumption that these measures, given their focus on opposite coping styles, would be negatively correlated.
There was no difference in MCI-CA scores, F(1, 224) = .274, ns, based on allergy status (see Table 4). In this analysis sex was a significant factor, F(1, 224) = 9.458, p = .002. Independent of allergy status, males had significantly higher scores on the MCI-CA subscale than females (for male respondents, mean = 26.5, standard deviation = 5.7, and n = 132; for female respondents, mean = 23.8, standard deviation = 7.5, and n = 96). The interaction of sex and allergy was not significant, F(1, 224) = 2.629, ns. There was a significant difference in CISS-A scores, F(1, 226) = 4.334, p = .038, based on allergy status. Independent of sex, respondents in the allergy group had significantly higher scores on the CISS-A subscale than respondents in the control group (for allergy group, mean = 57.3, standard deviation = 12.2, and n = 116; for control group, mean = 53.42, standard deviation = 12.0, and n = 114). There was also a significant difference in CISS-A scores, F(1,226) = 20.537, p = .000, based on sex. Independent of allergy status, male respondents had significantly higher scores on the CISS-A subscale than female respondents (for male respondents, mean = 58.4, standard deviation = 11.2, and n = 134; for females, mean = 51.1, standard deviation = 12.2, and n = 96). The interaction of sex and allergy was not significant, F(1, 226) = .101, ns.

It also was predicted that among participants in the allergy group, (n=116,) years since diagnosis would be positively correlated with scores of attentional coping (MCI-V subscale, CISS-T subscale, CISS-E subscale). This hypothesis was tested using 3 regression analyses. In each case, participant sex was included as a predictor in the regression model, based on earlier results indicating that sex differences might exist in the manifestation of coping strategies. Both predictors were entered at one time into the equation. The model test statistics and coefficients for these 3 analyses can be seen in
Table 5. The model containing the predictors “Yrs_Dx_Allergy” and “Sex” with outcome variable “MCI-V” was not significant, $F(2, 113) = 2.01$, ns. None of the predictors was significant at the .05 level. The model containing the predictors “Yrs_Dx_Allergy” and “Sex” with outcome variable “CISS-T” was not significant, $F(2, 113) = 2.73$, ns. Years since diagnosis did not predict scores, but sex was significant at the .05 level, with males scoring higher on the CISS-T subscale than females. The model containing the predictors “Yrs_Dx_Allergy” and “Sex” with outcome variable “CISS-E” was not significant, $F(2, 113) = 0.83$, ns. Neither years since diagnosis nor sex were significant at the .05 level.

Exploratory follow-up analyses were run using the attentional coping subscales as outcome variables. The model containing the predictors “Yrs_Dx_Allergy” and “Sex” with outcome variable “MCI-CA” was not significant, $F(2, 113) = 1.55$, ns. The model containing the predictors “Yrs_Dx_Allergy” and “Sex” with outcome variable “CISS-A” was not significant, $F(2, 113) = 4.47$, $p = .01$, and the model predicted 6% of the variance in the MCI-V scores (adjusted $R^2 = .06$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the CISS-A subscale than males.

Finally, it was predicted that among participants in the allergy group, (n=116), length of time since first reaction (years since first reaction) would be positively correlated with scores of attentional coping (MCI-V subscale, CISS-T subscale, CISS-E subscale). Hypothesis 3 was tested using 3 regression analyses. In each case, participant sex was included as a predictor in the regression model, based on earlier results indicating that sex differences might exist in the manifestation of coping strategies. Both predictors were entered at one time into the equation. The model test statistics and coefficients for the regression analyses can be seen in Table 5. The model containing the
predictors “Yrs_Rx_Allergy” and “Sex” with outcome variable “MCI-V” was not significant, F(2, 114) = 1.68, ns. Neither of the coefficients for these predictors was significant at the .05 level. The model containing the predictors “Yrs_Rx_Allergy” and “Sex” with outcome variable “CISS-T” was not significant, F(2, 113) = 2.73, ns. Years since diagnosis did not predict scores, but sex was significant at the .05 level, with males scoring higher on the CISS-T subscale than females. The model containing the predictors “Yrs_Rx_Allergy” and “Sex” with outcome variable “CISS-E” was not significant, F(2, 113) = .83, ns. Exploratory follow-up analyses were run using the attentional coping subscales as outcome variables. The model containing the predictors “Yrs_Rx_Allergy” and “Sex” with outcome variable “MCI-CA” was significant, F(2, 113) = 3.27, p = .04, and the model predicted 4% of the variance in the MCI-CA scores (adjusted $R^2 = .04$). The coefficient “Yrs_Rx_Allergy” was significant at the .05 level, with respondents with more years since first reaction scoring higher on the MCI-CA subscale. The model containing the predictors “Yrs_Rx_Allergy” and “Sex” with outcome variable “CISS-A” was significant, F(2, 113) = 4.46, p = .01, and the model predicted 6% of the variance in the MCI-V scores (adjusted $R^2 = .06$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the CISS-A subscale than males.

Further exploratory follow-up analyses (discussed in more detail in the “Discussion” section of this paper) were conducted again, using scores of all study respondents who included years since diagnosis and years since first reaction, regardless of whether they reported having an epinephrine autoinjector prescription (see Table 5). The model containing the predictors “Yrs_Dx_All” and “Sex” with outcome variable “MCI-V” was significant, F(2, 173) = 6.49, p = .00, and the model predicted 6% of the
variance in the MCI-V scores (adjusted $R^2 = .06$). The coefficient “Sex” was significant at the .05 level, with males scoring higher on the MCI-V subscale than females. The model containing the predictors “Yrs_Dx_All” and “Sex” with outcome variable “CISS-T” was significant, $F(2, 174) = 4.94$, $p = .01$, and the model predicted 4% of the variance in the CISS-T scores (adjusted $R^2 = .04$). The coefficient “Sex” was significant at the .05 level, with males scoring higher on the CISS-T subscale than females. The model containing the predictors “Yrs_Dx_All” and “Sex” with outcome variable “CISS-E” was significant, $F(2, 174) = 4.07$, $p = .02$, and the model predicted 3% of the variance in the CISS_E scores (adjusted $R^2 = .03$). The coefficient “Yrs_Dx” was significant at the .05 level, with respondents with fewer years since diagnosis scoring higher on the CISS-E subscale. The model containing the predictors “Yrs_Dx_All” and “Sex” with outcome variable “MCI-CA” was not significant, $F(2, 172) = .97$, ns. Neither of the coefficients were significant at the .05 level. The model containing the predictors “Yrs_Dx_All” and “Sex” with outcome variable “CISS-A” was significant, $F(2, 174) = 7.49$, $p = .00$, and the model predicted 7% of the variance in the CISS-A scores (adjusted $R^2 = .07$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the CISS-A subscale than males.

The model containing the predictors “Yrs_Rx_All” and “Sex” with outcome variable “MCI-V” was significant, $F(2, 174) = 3.37$, $p = .04$, and the model predicted 3% of the variance in the MCI-V scores (adjusted $R^2 = .03$). The coefficient “Sex” was significant at the .05 level, with males scoring higher on the MCI-V subscale than females. The model containing the predictors “Yrs_Rx_All” and “Sex” with outcome variable “CISS-T” was significant, $F(2, 175) = 6.22$, $p = .00$, and the model predicted 6%
of the variance in the CISS-T scores (adjusted $R^2 = .06$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the CISS-T subscale than males. The model containing the predictors “Yrs_Rx_All” and “Sex” with outcome variable “CISS-E” was not significant, $F(2, 175) = 2.97$, ns. The model containing the predictors “Yrs_Rx_All” and “Sex” with outcome variable “MCI-CA” was significant, $F(2, 173) = 5.9$, $p = .00$, and the model predicted 5% of the variance in the MCI-CA scores (adjusted $R^2 = .05$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the MCI-CA subscale than males and the coefficient “Yrs_Rx” was significant at the .05 level, with respondents with more years since first reactions scoring higher on the MCI-CA subscale. The model containing the predictors “Yrs_Rx_All” and “Sex” with outcome variable “CISS-A” was significant, $F(2, 175) = 8.01$, $p = .00$, and the model predicted 7% of the variance in the CISS-A scores (adjusted $R^2 = .07$). The coefficient “Sex” was significant at the .05 level, with females scoring higher on the CISS-A subscale than males.
Table 5

Multiple Regression Results for Predictors – Yrs_Dx, Yrs_Rx, Sex, and Coping Outcome Variables – MCI-V, CISS-T, CISS-E, MCI-CA, CISS-A.

<table>
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<th>Predictors</th>
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<th>CISS-E</th>
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*p<.05. **p<.005. ***p<.001.

Note: $R^2$ reported is the adjusted $R^2$. Abbreviations: Yrs_Dx_Allergy = Years Since Diagnosis Allergy Group (n=114); Yrs_DxYrs_Dx = Years Since Diagnosis; Yrs_Rx = Years Since First Reaction; MCI-V = English-language Mainz Coping Inventory Vigilance Scale; CISS-T = Coping Inventory for Stressful Situations Task Scale; CISS-E = Coping Inventory for Stressful Situations Emotion Scale; MCI-CA = English-language Mainz Coping Inventory Cognitive Avoidance Scale; CISS-A = Coping Inventory for Stressful Situations Avoidance Scale.
Chapter IV
Discussion

Within the body of literature exploring the relationships between food allergy and anxiety, depression, and quality of life, vigilance is frequently referenced as a natural response to the risk of exposure and reactivity. As discussed above, these references fail to provide an operational definition for the term and offer little (if any) discussion of the role of coping in managing food allergy or the role of food allergy in development and implementation of coping style. This project was designed to advance current research and understanding of coping and food allergy among adults, and to assess the need for further research on coping style in this population.

This research was intended to broadly explore the connection between food allergy, coping style, and the impact the amount of time a person lives with food allergy has on coping. It was predicted that adults with food allergy would score higher on attentional coping subscales than adults without food allergy. It was also predicted that among adults with food allergy, scores on attentional coping measures would be positively correlated to the length of time they had lived with this knowledge. Finally, it was predicted that among adults with food allergy, scores on attentional coping measures would be positively correlated to the length of time that had passed since first reaction.

Measures
Conceptualizations of coping vary across theories. Although the initial research design of
this study included examining the relationship between food allergy and attentional coping, a decision was made early on to include the CISS E scale. In the CISS’ conceptualization of coping, the emotion-focused subscale (CISS E scale) falls between task (attentional) and avoidance coping (Endler & Parker, 1999). Whereas task coping describes purposeful efforts intended to resolve, restructure, or alter the problem or situation and avoidant coping describes efforts to avoid or distract oneself from the problem or situation, emotion coping describes self-oriented efforts to reduce stress (Endler & Parker, 1999). Although its actions are directed inward, emotion coping involves active engagement with the problem or situation, and thus fits into the category of attentional coping for the purposes of this research. For this reason, as well as the findings of sex differences on scores of the MCI-V subscale and the CISS-T subscale, the CISS-E subscale was included as an attentional coping measure and included for analysis of all 3 hypotheses. When analyses of variance showed no support for H1, exploratory analyses were designed to include the avoidant coping subscales MCI-CA and CISS-A. Examination of the correlation among the 3 attentional subscales and 2 avoidant subscales resulted in expected and unexpected findings (see Table 3). As expected, the two subscale pairings of opposite factors of the same scale (MCI-V/MCI-CA; CISS-T/CISS-A) were not significantly correlated in the sample, supporting reports of independence of the subscales (Endler & Parker, 1994; Krohne et al., 2000). A significant negative correlation or a lack of significant positive correlation was expected between the attentional and avoidant subscales of the MCI and CISS (MCI-V/CISS-A; CISS-T/MCI-CA). Instead these measures were found to be significantly positively correlated with one another in the sample. Scores on the avoidant subscale of the MCI were significantly
positively correlated with scores on the attentional subscale of the CISS, as were avoidant CISS scores significantly positively correlated with attentional MCI scores. These findings illustrate the lack of a shared conceptualization of coping across the two measures and the need for development of a tool to accurately measure coping across conceptualizations (attention/avoidance, problem-/emotion-focused, and combinations thereof). In designing this study, it was not possible to find a reliable, validated measure that would apply perfectly across attentional coping behaviors and responses.

Mean Differences and Regression Analyses

This research did not support the hypothesis that there would be a difference in mean scores on attentional coping measures between adults with food allergy and adults without food allergy; there was no significant difference in the mean attentional coping scores of adults with food allergy compared to adults without food allergy on any of the 3 attentional coping scales. Among the 5 subscales analyzed, only the CISS-A subscale was found to have a significant difference in the mean scores of the allergy group and control group, with adults in the food allergy group scoring significantly higher than those in the control group.

For the hypothesis that years since diagnosis would positively predict attentional coping scores among adults with food allergy, none of the models were significant. Exploratory inclusion of the avoidant coping scales found a significant relationship for the model analyzing sex and years since diagnosis with the CISS-A subscale. In this model, however, years since diagnosis was not a significant coefficient, and sex was a significant coefficient, with females scoring higher than males. For the hypothesis that
years since first reaction would positively predict attentional coping scores among adults with food allergy, none of the models were significant. Exploratory inclusion of the avoidant coping scales found a significant relationship for the model analyzing sex and years since first reaction with the MCI-CA subscale. In this model, years since first reaction was the only significant coefficient. The greater the number of years since first reaction, the higher the score on the MCI-CA subscale. The model analyzing sex and years since first reaction with the CISS-A subscale was also significant, and sex was the only significant coefficient, with females scoring higher on the measure than males.

During completion of the version of the survey posted on MTurk without food allergy requirements (survey 1), 59 participants who reported not having an epinephrine autoinjector prescription provided age at diagnosis and age at first reaction. In exploratory follow-up to H2 and H3, the regressions were run again, including data for participants from the control group who met the diagnosis and reaction criteria, but not the epinephrine prescription criterion. This decision was informed by prior findings of differences in treatment-seeking and healthcare-seeking related to a wide range of variables including but not limited to socioeconomic status (Svedsen, Dorte, Larsen, Stovring, Hansen, & Soendergaard, 2013), sex (Smith, Battersby, & Harvey, 2015), personality traits (Sells, Waters, Schwandt, Kwako, Heilig, George, & Ramchandani, 2016), and severity of symptoms (Baibergenova, Thabane, Akhtar-Danesh, Levine, Gafni, & Ieraci, 2006). These and other factors may have contributed to inclusion criteria disqualification of participants with a food allergy diagnosis who actively engage in managing and coping with food allergy on an ongoing basis. Future research should aim to design inclusion criteria which capture as many food allergic participants as possible.
Inclusion of data from the expanded sample resulted in many more significant findings. For H2, predicting that years since diagnosis would positively predict attentional coping scores among adults with food allergy, regression analyses were rerun including the allergy group and the control group participants who had provided ages for diagnosis and first reaction (n=175). Avoidant coping subscale scores were also included in these exploratory analyses. Significant correlations were found for the models analyzing sex and years since diagnosis, and the MCI-V subscale, the CISS-T subscale, the CISS-E subscale, and the CISS-A subscale. Of these 4 significant correlations, years since diagnosis was a significant negative predictor only for scores on the CISS-E subscale, with respondents with greater years since diagnosis scoring lower on the CISS-E subscale. For H3, predicting that years since first reaction would positively predict attentional coping scores among adults with food allergy, regression analyses were rerun using the allergy group and the control group participants who had provided ages for diagnosis and first reaction (n=175). Like with the exploratory follow-up analyses for H2, the exploratory follow-up analyses for H3 included the avoidant coping subscale scores. Significant correlations were found for the models analyzing sex and years since first reaction and the MCI-V subscale, the CISS-T subscale, the MCI-CA subscale, and the CISS-A subscale. Of these 4 significant correlations, years since first reaction was a significant positive predictor only for scores on the MCI-CA subscale, with respondents scoring higher on the MCI-CA the greater the number of years since first reaction. Inclusion of scores of the relevant control group respondents did not provide further support for H2 or H3. Although a significant relationship was found between years since diagnosis and the attentional coping subscale CISS-E, the direction of the relationship
was opposite what was expected. Further, the only significant relationship between years since first reaction and coping wherein years since first reaction was a significant predictor was with the MCI-CA subscale, providing evidence of a significant positive relationship between years since first reaction and avoidant coping.

Analyses examining H1 (and exploratory follow-up) found evidence of respondents with food allergy scoring higher in avoidant coping (CISS-A) than those without food allergy. Analyses of H2 (including exploratory follow-up) found evidence of a significant negative relationship between years since diagnosis and attentional coping. Analyses of H3 (including exploratory follow-up) found evidence of a significant positive relationship between years since first reaction and avoidant coping. These findings do not support the current study’s a priori hypotheses, but are consistent with previous findings.

The findings of a significant negative relationship between years since diagnosis and attentional coping may be understood through a habituation or desensitization model. It is possible effective management of the disease leads to reduced perception of the danger associated with allergen exposure. This reduced perception of danger in turn results in a reduction of mitigating response (Slovic, Fischoff, & Lichtenstein, 1986). Prior findings show that mastery, in the context of illness, mediates the relationship between uncertainty and the perception of danger (Mishel, Padilla, Grant, & Sorenson, 1991), and repeated or continual experience of a potential danger has been found to result in desensitization or habituation to the risk (Richardson, Sorensen, & Soderstrom, 1987). It is possible successful attentional efforts to avoid allergen exposure, which result in the
avoidance of allergen exposure, in turn contribute to a reduced perception of danger and a
relaxing of said attentional efforts.

The findings of a significant positive relationship between food allergy and
avoidant coping and a significant positive relationship between years since diagnosis and
avoidant coping are supported by findings of a time decay effect associated with ongoing
use of attentional coping. Studies have found chronic use of attentional coping in ongoing
management of uncertainty can result in cognitive exhaustion and a shift toward avoidant
coping, including increased risk taking and denial (Lazarus, 1999; Mishel, 1988;
Sampson et al., 2006). Avoidant coping, however, has been shown to be correlated with
poor symptom- and disease-management (e.g., poor glycemic control for adults with type
2 diabetes; poor diet adherence for individuals with celiac disease) (Rassart et al., 2015;
Wagner et al., 2015). Thus, the findings of the current research beg the question as to
efficacy of symptom- and disease-management among the food allergy group (and the
members of the control group who reported years since diagnosis and years since first
reaction).

Measures of frequency and severity of reactions experienced by study participants
are necessary to better understand the current study’s findings. Frequency of allergen
exposure and reactions, severity of reactions, and information regarding the length of
time since the most recent reaction would all allow findings to be understood within the
contexts of the aforementioned habituation and time effect. Also relevant, individuals
with a low eliciting dose (ED) will experience more severe allergic symptoms and more
frequent reactions than those with high EDs (Wensing et al., 2002). To better understand
study participants’ range of experience and factors affecting coping, data should be
collected on disease- and symptom-management, including efforts to mitigate risk of allergen exposure and preparedness to quickly respond to allergen exposure and reactivity (e.g., always carrying an epinephrine auto-injector).

Although sex was not included as a factor or predictor in the design of the a priori hypotheses, it was found to have a significant effect. Regardless of food allergy status, findings showed a mean difference in coping scores between male and female participants. Prior research has contributed conflicting findings regarding gender differences in coping. Some studies have reported that women engage more in emotion-focused coping (similar in concept to the CISS-E subscale) than men (Matheson & Anisman, 2012; Unruh, 1996) and other studies have reported a lack of significant difference (El Shormilisy et al., 2015; Lazarus, 1999). Although the current study found differences in coping between male and female respondents, analyses do not support the prior finding that women engage more than men in emotion-focused coping. CISS-E was the only subscale for which there was no significant difference in mean scores by sex. In the original and follow-up exploratory analyses of H1, female respondents scored significantly higher on attentional coping subscales (MCI-V, CISS-T) and male respondents scored significantly higher on avoidant coping subscales (MCI-CA, CISS-A).

Several prior studies which focused on gender differences in disease- and symptom-management found that women performed better than men. Research examining adults with diabetes found females performed better than males in self-management of diet and blood sugar (Chiu & Wray, 2011), they relied less on their spouse to manage their illness (Hara, Hisatomi, Ito, Nakao, Tsuboi & Ishihara, 2014), and
they were found to have more knowledge than men regarding the disease, symptom management, and consequences of poor blood sugar control (Lemes dos Santos, Rodrigues dos Santos, Ferrari, Fonseca, & Ferrari, 2014). It is possible the current study’s findings of sex differences on attentional and avoidant coping scores correlate with these reported gender differences in disease management. Additional research is needed to examine this possibility.

Limitations and Considerations for Future Research

The current project was built upon the premise that adults with food allergy have impaired coping, manifested as increased attentional coping, as compared to adults without food allergy. Unfortunately, the aforementioned limitations with coping measures, and the lack of a shared conceptualization of coping across measures and theories, resulted in an inability to assess coping impairment in the current study. The MCI, which conceptualizes coping as either attentional or avoidant, assesses coping as fitting into 1 of 3 categories: rigid (engaging more in one style than the other), flexible (low frequencies of both styles), and unsuccessful (high frequencies of both styles) (Krohne, 1989). Thus, for the MCI, coping assessments are a function of scores on each dimension’s scale as well as the relationships between the 2 dimensions. In contrast, the CISS conceptualizes coping as attentional, emotion-focused, or avoidant and assesses coping on each dimension independent of the others, utilizing a 9-point scale from “very much below average” for the lowest scores to “very much above average” for the highest (see Appendix I) (Endler & Parker, 1999). No information is provided describing how “averages” were collected, nor does the manual state whether average is a corollary for
The CISS manual recommends assessing scores together as well as separately, but categorical classification of each dimension is ultimately independent of the scores on the other dimensions. The creation of broader measures of coping which work across conceptualizations would allow future study to first assess overall efficacy and/or health of coping before drilling down to understand the differences in use of different coping styles.

Data were gathered using the online services MTurk and Qualtrics. These services provide convenience and efficiency for survey respondents who need only an internet connection or data network to participate, and for the researcher who can quickly, easily, and inexpensively recruit from a very large potential study pool. There are also, however, potential disadvantages to using these online tools for data gathering. Because the survey is hosted remotely, there is no one present to clarify confusing language, provide additional instructions, or to answer participant questions. Inclusion criteria (age, English-language fluency, geographic location, and allergy status) were advertised during participant recruitment, but because the survey was taken anonymously and remotely, there is no way to verify the sample. Additionally, participation was limited to people who have access to a computer or smartphone, an internet or data network connection, and the knowledge of MTurk as a potential income source. There are likely socioeconomic and educational biases in the data.

Data gathered through self-report methodologies have greater potential for bias than data gathered through experimental methodologies. Potential for random responding is always present for questionnaires, and is of particular concern given the anonymous, online presentation of this survey. Because MTurk uses a task-based pay rate rather than
a time-based pay rate, participants may be incentivized to rush through measures quickly to earn more money. In addition, social desirability may bias responses of participants who want to be seen in a positive or socially desirable manner, or who attempt to select an answer they believe will be viewed as right or correct. Assurances of confidentiality may help to minimize social desirability issues, but likely do not eliminate it.

Furthermore, the subject matter covered in this research has the potential to exacerbate issues with self-report. Thinking back to stressful situations can lead participants to engage in self-evaluation and self-judgement of their previous behaviors, and can also lead participants to recall uncomfortable feelings, or to re-experience that discomfort. Such self-judgement and/or discomfort may increase the likelihood of a social desirability bias.

Language regarding the epinephrine autoinjector requirement was different in recruitment materials as compared to the survey. Whereas recruitment materials indicated that inclusion required “a current prescription,” the survey asked only if the respondent had “a prescription.” The epinephrine autoinjector inclusion criteria was intended to provide additional evidence that participants in the food allergy group had been diagnosed with food allergy by a doctor. Requiring that the prescription be current, however, eliminates individuals with food allergy who may have been prescribed an autoinjector but let their prescription lapse or never filled it. An individual’s failure to keep current with the autoinjector may suggest a failure to cope effectively or difficulty with disease management, potentially biasing the sample.

As discussed, measures of frequency and severity of reactions experienced by study participants are necessary to better understand the current study’s findings.
Frequency of allergen exposure and reactions, severity of reactions, and length of time since the most recent reaction are all necessary to better explore the effect of habituation and to examine the reported time effect. In addition, future research should aim to collect data on disease- and symptom-management, including efforts to mitigate risk of exposure and preparedness to quickly respond to exposure and reactivity, to better explore the relationship between sensitivity, ED, and coping.

Once data were collected, they were manually exported from Qualtrics to Microsoft Excel, and then to SPSS. All data from respondents who did not meet the inclusion criteria were permanently deleted from Qualtrics before the data was exported. Thus, in reporting demographics and descriptive statistics in the Participant section of this paper, it was not possible to include descriptive statistics on the overall number of respondents. All responses which were manually deleted in this manner were deleted because they didn’t meet the minimum age requirement (survey 1 and survey 2) or because they didn’t meet the allergy requirements (survey 2).

All respondents, regardless of which survey they completed, were presented with the measures in the same order: demographic and biographical questions, MCI, CISS. Failure to randomize the order of the coping measures potentially confounds the data. As discussed in the Method section of this paper, the MCI contained questions posed as hypothetical scenarios, and asked respondents to rate how they would likely respond. In contrast, the CISS contained questions that instructed respondents to answer how they have previously responded to a variety of common stressful situations. Answering questions about coping with a set of hypothetical events could potentially alter
subsequent answers to recalled events, and future research should take care to randomize measures.

The CISS contains 3 primary subscales (task, emotion, avoidance), and 2 additional subcomponent subscales (distraction, social diversion). The 3 primary subscales utilized in the present study each contain 16 items, and the remaining 2 subcomponent subscales contain 8 items (distraction) and 5 items (social diversion). Because the primary subscales and subcomponent subscales don’t all have the same number of items, CISS scoring and interpretation requires transformation of the scores into standardized, linear T-scores with a mean of 50 and a standard deviation of 10. Transformation was completed manually, utilizing the CISS score sheet (Appendix H), which required age category (adolescent, adult) and sex (male, female). For this reason, when demographic information was collected from participants, the question was worded to ask for sex rather than gender, and provided only the 2 options used by the CISS. Requiring that respondents select from these 2 choices is problematic for several reasons. Sex can be defined and interpreted in numerous ways, referring to legal classification, sex organs, hormones, chromosomes, or self-identification and can be interpreted as representing binary categories (male, female) or a continuum. In addition, allowing only 2 choices forces inadequate options upon any respondent whose identity does not fit into a binary conceptualization of gender, and renders invisible any respondent with intersex status. Forcing participants to identify with the broad categories of “male” and “female” misses an opportunity for more nuanced and accurate categorization of respondents, and potentially more powerful analyses of the relationships among factors. It has been suggested that use of a binary gender conceptualization in research illustrates
psychologists’ aim to simplify models for parsimony (Betancourt & Lopez, 1993). Focusing in a simplistic way on a complex dimension of identity, however, represents a kind of false economy in that it reduces complexity, nuance, and context of findings (Cole, 2009). As long as psychological measures’ scoring relies on a binary sex or gender conceptualization, and as long as they ignore intersex status, this failure to capture additional complexity and nuance will remain prevalent.

Conclusions

Findings of this study encourage further research on the relationship between coping and food allergy in adults. While the a priori hypothesis predicting increased attentional coping in adults with food allergy was not supported, findings indicate significant relationships between the presence of food allergy and coping style. Findings encourage additional research on the potential time decay of attentional coping strategies when utilized to manage the ongoing uncertainty of food allergy. Future research should aim to determine whether reduced attentional coping is indicative of cognitive exhaustion, habituation, or both. Findings also encourage further research on the increase in avoidant coping strategies as time since first reaction grows. Future research should aim to determine the mechanisms by which this increase in avoidant coping occurs.

These findings have implications for future issues related to treatment and management of food allergy in adults. Increased avoidant coping and/or decreased attentional coping could be impediments to participation in immunotherapy, the only potential treatment for food allergy, as participation in immunotherapy will require active engagement with disease-management and implementation of attentional coping
strategies. Studies have found evidence that avoidant coping is a predictor of poor symptom-management. For individuals with food allergy, poor symptom-management could be deadly. This presents a challenge in the maintenance of ongoing symptom- and disease-management efforts for adults with food allergy, and identifies an area of potential intervention for practitioners working with this population. This research helps to identify needs related to capturing data regarding coping style and implementation of coping strategies, identifies a need for further research on the relationship between coping and food allergy in adults, and helps to clarify directions for said future research.
Appendix A

Study Information Sheet - Survey 1

**Answer a survey about food allergy and coping.** Thank you for your interest in participating in this survey! I am a graduate student concentrating in psychology at the Harvard University Extension School. I am seeking **English-speaking United States citizens over the age of 18 who have been diagnosed with a food allergy via skin prick testing, have experienced an allergic reaction to food that required treatment with an epinephrine (epi-pen) shot, and who have a current epinephrine prescription for treating ingestion of the allergenic food** for participation in an online survey.

**Participation is voluntary.** It is your choice whether or not to participate in this research. If you choose to participate, you may change your mind and leave the study at any time. Refusal to participate or stopping your participation will involve no penalty or loss of benefits to which you are otherwise entitled.

**What is the purpose of this research?** The purpose of this research is to examine the relationship between food allergy and coping style among English-speaking adults in the United States.

**How long will I take part in this research?** Your participation will involve completion of a 10-20 minute survey.
What can I expect if I take part in this research? As a participant, you will complete an online survey asking for general demographic information and you will be asked to respond to a series of questions regarding how you might react to a variety of everyday situations. You may skip any question without penalty. The data we collect will be stored on Harvard University’s secure, password protected server, and will be destroyed on or before May 31, 2021. Participants whose Amazon profiles are not set as private may be identifiable through their Amazon Turk ID. We will make no attempt to identify participants in this manner.

What are the risks and possible discomforts? Questions in this survey will address typical life experiences. Questions may remind you of previous stressful situations and may make you uncomfortable. If that happens, you may stop answering questions.

Are there any benefits from being in this research study? We do not expect any direct benefits to you or others from your taking part in this research. However, possible benefits include contributing to the understanding of coping and food allergy among adults.

Will I be compensated for participating in this research? You will be compensated $1.00 through Mechanical Turk for completion of the survey. Stopping your participation will involve no penalty or loss of benefits to which you are otherwise entitled.
If I take part in this research, how will my privacy be protected? What happens to the information you collect? The only identifiable information that will be collected is your MTurk ID, however the dataset we will retain and from which we will work will not contain MTurk IDs. The information we collect will be analyzed by the researcher(s) and may be reviewed by people checking to see that the research is done properly. The information may also be seen by a thesis committee.

If I have any questions, concerns or complaints about this research study, who can I talk to? The researcher for this study is Jessica Gauchel who can be reached at (617) 956-2957, 33 Kirkland Street Quincy Street, Cambridge, MA 02138; jgauchel@fas.harvard.edu. The faculty sponsor is Dante Spetter, Part Time Research Advisor in the Human Sciences and Continuing Education/Special Programs Instructor at Harvard University Division of Continuing Education, who can be reached at 51 Brattle Street, Cambridge, MA 02138, (617) 496-4967, and spetter@hudce.harvard.edu.

- If you have questions, concerns, or complaints
- If you would like to talk to the research team
- If you think the research has harmed you, or
- If you wish to withdraw from the study

This research has been reviewed by the Committee on the Use of Human Subjects in Research at Harvard University. They can be reached at 617-496-2847, 1414 Massachusetts Avenue, Second Floor, Cambridge, MA 02138, or cuhs@fas.harvard.edu for any of the following:
• If your questions, concerns, or complaints are not being answered by the research team
• If you cannot reach the research team
• If you want to talk to someone besides the research team, or
• If you have questions about your rights as a research participant
Appendix B

Study Information Sheet - Survey 2

Answer a survey about food allergy and coping. Thank you for your interest in participating in this survey! I am a graduate student concentrating in psychology at the Harvard University Extension School. I am seeking English-speaking United States citizens over the age of 18 for participation in an online survey.

Participation is voluntary. It is your choice whether or not to participate in this research. If you choose to participate, you may change your mind and leave the study at any time. Refusal to participate or stopping your participation will involve no penalty or loss of benefits to which you are otherwise entitled.

What is the purpose of this research? The purpose of this research is to examine the relationship between food allergy and coping style among English-speaking adults in the United States.

How long will I take part in this research? Your participation will involve completion of a 10-20 minute survey.

What can I expect if I take part in this research? As a participant, you will complete an online survey asking for general demographic information and you will be asked to respond to a series of questions regarding how you might react to a variety of everyday
situations. You may skip any question without penalty. The data we collect will be stored on Harvard University’s secure, password protected server, and will be destroyed on or before May 31, 2021. Participants whose Amazon profiles are not set as private may be identifiable through their Amazon Turk ID. We will make no attempt to identify participants in this manner.

**What are the risks and possible discomforts?** Questions in this survey will address typical life experiences. Questions may remind you of previous stressful situations and may make you uncomfortable. If that happens, you may stop answering questions.

**Are there any benefits from being in this research study?** We do not expect any direct benefits to you or others from your taking part in this research. However, possible benefits include contributing to the understanding of coping and food allergy among adults.

**Will I be compensated for participating in this research?** You will be compensated $1.00 through Mechanical Turk for completion of the survey. Stopping your participation will involve no penalty or loss of benefits to which you are otherwise entitled.

**If I take part in this research, how will my privacy be protected? What happens to the information you collect?** The only identifiable information that will be collected is your MTurk ID, however the dataset we will retain and from which we will work will not contain MTurk IDs. The information we collect will be analyzed by the researcher(s) and
may be reviewed by people checking to see that the research is done properly. The information may also be seen by a thesis committee.

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- If you have questions, concerns, or complaints
- If you would like to talk to the research team
- If you think the research has harmed you, or
- If you wish to withdraw from the study

This research has been reviewed by the Committee on the Use of Human Subjects in Research at Harvard University. They can be reached at 617-496-2847, 1414 Massachusetts Avenue, Second Floor, Cambridge, MA 02138, or cuhs@fas.harvard.edu for any of the following:

- If your questions, concerns, or complaints are not being answered by the research team
- If you cannot reach the research team
• If you want to talk to someone besides the research team, or
• If you have questions about your rights as a research participant
Appendix C
Demographic and Biographical Information

1. Age (open ended)
2. Sex (male, female)
3. Race (American Indian or Alaskan Native, Asian or Pacific Islander,
   Black/African American, Hispanic/Latino, White/Caucasian, Other please specify
   [open ended])
4. If you have ever experienced an anaphylactic reaction to food, what was your age
   at the time of your first anaphylactic reaction? (I have never experienced an
   anaphylactic reaction to food, 1-100)
5. If your doctor has diagnosed you as having a food allergy using a skin-prick, what
   age were you when diagnosed? (I have never been diagnosed by a doctor as
   having a food allergy, 1-100)
6. Do you have a prescription for an epi-pen (or other epinephrine delivery device)
   that was prescribed to treat you in case of ingestion of a food you are allergic to?
   (I have a prescription – yes, I have a prescription – no)
Appendix D

English-language Mainz Coping Inventory

No.: ________               Sex: ________               Age: _______              Date: ____________

On the following pages, some situations are listed that you will have either experienced yourself in one way or another, or that you can imagine vividly.

You will find a number of sentences accompanying every situation. These sentences comprise thoughts and ideas that could arise in such situations. There are two possible answers behind every sentence, i.e. "true" and "false".

Please, try to imagine that you are in these situations and then, please, check the circle that indicates whether the thoughts or ideas that are listed usually occur to you ("true") or not ("false").

Copyright: Section of Personality Research, Psychological Institute, Johannes Gutenberg-Universität Mainz
1. Imagine that you have to make a speech to a group of people (i.e. participants of a course or seminar, parents at a meeting at their children's school) in about one hour.

In this situation...

1. I carefully review the topics I'm going to present. ....................O           O
2. I tell myself: "Everything will go well." ......................................O           O
3. I don't think about the speech any more. .................................O           O
4. I think about what I can do if I lose track of what I wanted to say. ........................................................................O           O
5. I'm considerably more strained than most people I know. ......O           O
6. I prefer to talk with friends about something different than the speech. .................................................................O           O
7. I think about which questions might be asked after the speech. .................................................................................O           O
8. I stay completely calm. ..............................................................O           O
9. I remember the advice of people who already had to make a similar speech. .................................................................O           O
10. I tell myself: "I've been able to cope with situations that were far more trying." ..........................................................O           O
2. Imagine that you haven't been to the dentist for quite a long time. You are now sitting in his waiting room because you are having problems with your teeth.

In this situation ...

<table>
<thead>
<tr>
<th></th>
<th>true</th>
<th>false</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I imagine that the treatment will be quite unpleasant for me.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>2. I tell myself that the dentist probably can treat the reason for the toothache quickly and effectively.</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>3. I stay completely calm.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>4. In the waiting room, I carefully read the information leaflets about tooth diseases and treatments.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>5. I wonder whether anything might go wrong in the course of the dental treatment (such as while drilling).</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>6. I remember previous dental treatments.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>7. I tell myself: &quot;Until now, my teeth have always been in a quite good condition, so this time, as well, it won't be anything serious.&quot;</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>8. I try to think as little as possible about the impending treatment.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>9. I don't lose my composure as easily as most others.</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>10. I wonder whether one treatment will be sufficient or whether further treatment will be necessary.</td>
<td>✓</td>
<td>❌</td>
</tr>
</tbody>
</table>
3. Imagine that you will have an important examination the next morning.

In this situation...

true  false

1. I imagine that I could be surprised by unexpected questions. .................................................. O O
2. I try not to think about the examination and do something else. O .................................................. O O
3. I remember previous examinations. .............................. O O
4. I stay calmer than most people I know. .......................... O O
5. I tell myself that the examination will probably proceed in a fair way. .................................................. O O
6. I review the catalogue listing the questions that will be asked during the examination. .......................... O O
7. I tell myself: "I will pass this examination at any rate." ........ O O
8. I once again ask my friends who have already taken the examination which questions they were asked. .......................... O O
9. I tell myself: "I've coped with situations that were far more difficult." .................................................. O O
10. I think about what I can do if I have difficulties with some questions. .................................................. O O
4. Imagine that you are walking alone through town in the late evening. A group of people, who look suspicious, approach you from out of a side street.

In this situation ...

<table>
<thead>
<tr>
<th></th>
<th>true</th>
<th>false</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I stay completely calm. ..................................................O</td>
<td>O</td>
</tr>
<tr>
<td>2.</td>
<td>I think about what they are up to. ........................................O</td>
<td>O</td>
</tr>
<tr>
<td>3.</td>
<td>I think about the various ways of getting help in case of danger. ..........................................................O</td>
<td>O</td>
</tr>
<tr>
<td>4.</td>
<td>I tell myself: &quot;They must have been in a bar and now they are going home.&quot; ..........................................................O</td>
<td>O</td>
</tr>
<tr>
<td>5.</td>
<td>I look at a shop window. .......................................................O</td>
<td>O</td>
</tr>
<tr>
<td>6.</td>
<td>I watch the people carefully. ................................................O</td>
<td>O</td>
</tr>
<tr>
<td>7.</td>
<td>I tell myself: &quot;I really shouldn't have walked along here.&quot; ..........................................................O</td>
<td>O</td>
</tr>
<tr>
<td>8.</td>
<td>I act as if those people have nothing to do with me. ............O</td>
<td>O</td>
</tr>
<tr>
<td>9.</td>
<td>I remember similar situations. ................................................O</td>
<td>O</td>
</tr>
<tr>
<td>10.</td>
<td>I tell myself that those people probably are completely harmless. ..........................................................O</td>
<td>O</td>
</tr>
</tbody>
</table>
5. Imagine that you applied for a job and that, in a few minutes, your application interview will start.

In this situation...

<table>
<thead>
<tr>
<th></th>
<th>true</th>
<th>false</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I think of things I could have done to be better prepared for the talk.</td>
<td>O</td>
</tr>
<tr>
<td>2.</td>
<td>I think about how to behave if the talk takes a critical turn.</td>
<td>O</td>
</tr>
<tr>
<td>3.</td>
<td>I stay completely relaxed.</td>
<td>O</td>
</tr>
<tr>
<td>4.</td>
<td>I turn to something else (i.e. I watch the pictures which hang on the wall in the corridor, I read magazines).</td>
<td>O</td>
</tr>
<tr>
<td>5.</td>
<td>I tell myself: &quot;It won't be all that bad.&quot;</td>
<td>O</td>
</tr>
<tr>
<td>6.</td>
<td>I carefully read the wording of the job advertisement once again.</td>
<td>O</td>
</tr>
<tr>
<td>7.</td>
<td>I remember similar situations which were very important for me.</td>
<td>O</td>
</tr>
<tr>
<td>8.</td>
<td>I imagine the consequences if I don't get the job.</td>
<td>O</td>
</tr>
<tr>
<td>9.</td>
<td>I stay calmer than most people I know in a similar situation.</td>
<td>O</td>
</tr>
<tr>
<td>10.</td>
<td>I decide not to think about the interview any more.</td>
<td>O</td>
</tr>
</tbody>
</table>
6. Imagine that you are a front seat passenger next to an obviously inexperienced driver. Road conditions are poor due to snow and ice.

In this situation ...

true  false

1. I tell myself: "In future, I 'll only go on rides like this if I have informed myself better about the road conditions." ................................................................. O  O

2. I tell myself that we will arrive safely. ........................................... O  O

3. I tell myself: " When one has fastened one's seat belt and is moreover driving so slowly, nothing much can happen." ................................................................. O  O

4. I carefully watch the driver and the road. ........................................ O  O

5. I stay completely calm. ................................................................. O  O

6. I tell myself: " As a passenger, one often perceives the driver's way of driving as unsteady, whereas in fact he's driving quite well." ................................................................. O  O

7. I just stop looking at the road but relax. ........................................ O  O

8. I try to tell in advance when he's going to make a mistake. ...... O  O

9. I imagine everything that could go wrong. ........................................ O  O

10. I remember similar situations. ................................................................. O  O
7. Imagine that you have made a mistake on the job which shouldn't have happened and that you are to have a talk with your boss.

In this situation...

<table>
<thead>
<tr>
<th></th>
<th>true</th>
<th>false</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I stay calmer than most of my colleagues.</td>
<td>O</td>
</tr>
<tr>
<td>2.</td>
<td>I remember similar unpleasant situations.</td>
<td>O</td>
</tr>
<tr>
<td>3.</td>
<td>I ask my colleagues what I have to expect from this situation.</td>
<td>O</td>
</tr>
<tr>
<td>4.</td>
<td>I think about what I can do if he reproaches me.</td>
<td>O</td>
</tr>
<tr>
<td>5.</td>
<td>I tell myself: &quot;Until now, I have done quite a good job, so it won't go all that badly for me.&quot;</td>
<td>O</td>
</tr>
<tr>
<td>6.</td>
<td>I tell myself, that I've coped with situations that were far more trying.</td>
<td>O</td>
</tr>
<tr>
<td>7.</td>
<td>I calmly finish all the other tasks first.</td>
<td>O</td>
</tr>
<tr>
<td>8.</td>
<td>I imagine how unpleasant it could get.</td>
<td>O</td>
</tr>
<tr>
<td>9.</td>
<td>I first relax and don't think about the talk.</td>
<td>O</td>
</tr>
<tr>
<td>10.</td>
<td>I think about how this mistake could happen and how I can avoid a repetition.</td>
<td>O</td>
</tr>
</tbody>
</table>
8. Imagine that you are sitting in an airplane. The flight has been turbulent for quite a while now, the "No Smoking" and "Fasten Seat Belts" signs have lit up.

In this situation ...

<table>
<thead>
<tr>
<th></th>
<th>true</th>
<th>false</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I pay attention to how the other passengers behave.</td>
<td>O</td>
</tr>
<tr>
<td>2.</td>
<td>I tell myself the signs &quot;No Smoking&quot; and &quot;Please Fasten Seat Belts&quot; light up for inconsequential reasons which, in reality, don't mean anything.</td>
<td>O</td>
</tr>
<tr>
<td>3.</td>
<td>I think about how I could behave in an emergency case.</td>
<td>O</td>
</tr>
<tr>
<td>4.</td>
<td>I put on the earphone and listen to music.</td>
<td>O</td>
</tr>
<tr>
<td>5.</td>
<td>I read the security instruction for emergencies and look for the nearest emergency exit.</td>
<td>O</td>
</tr>
<tr>
<td>6.</td>
<td>I read my newspaper or a book.</td>
<td>O</td>
</tr>
<tr>
<td>7.</td>
<td>I listen to the sound of the engines.</td>
<td>O</td>
</tr>
<tr>
<td>8.</td>
<td>I tell myself: &quot;These are completely normal turbulences that occur during every flight.&quot;</td>
<td>O</td>
</tr>
<tr>
<td>9.</td>
<td>I ask the crew and pay attention to the announcements.</td>
<td>O</td>
</tr>
<tr>
<td>10.</td>
<td>I stay completely calm and cool.</td>
<td>O</td>
</tr>
</tbody>
</table>
Appendix E
Coping Inventory for Stressful Situations (CISS)

Instructions: The following are ways people react to various difficult, stressful, or upsetting situations. Please circle a number from 1 to 5 for each item. Indicate how much you engage in these types of activities when you encounter a difficult, stressful, or upsetting situation.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

1. Schedule my time better.
2. Focus on the problem and see how I can solve it.
3. Think about the good times I’ve had.
4. Try to be with other people.
5. Blame myself for procrastinating.
6. Do what I think is best.
7. Become preoccupied with aches and pains.
8. Blame myself for having gotten into this situation.
9. Window shop.
10. Outline my priorities.
11. Try to go to sleep.
12. Treat myself to a favorite food or snack.
13. Feel anxious about not being able to cope.
15. Think about how I solved similar problems.
16. Tell myself that it is really not happening to me.
17. Blame myself for being too emotional about the situation.
18. Go out for a snack or meal.
20. Buy myself something.
21. Determine a course of action and follow it.
22. Blame myself for not knowing what to do.
23. Go to a party.
24. Work to understand the situation.
25. “Freeze” and not know what to do.
26. Take corrective action immediately.
27. Think about the event and learn from my mistakes.
28. Wish that I could change what happened or how I felt.
29. Visit a friend.
30. Worry about what I am going to do.
31. Spend time with a special person.
32. Go for a walk.
33. Tell myself that it will never happen again.
34. Focus on my general inadequacies.
35. Talk to someone whose advice I value.
36. Analyze the problem before reacting.
37. Phone a friend.
38. Get angry.
39. Adjust my priorities.
40. See a movie.
41. Get control of the situation.
42. Make an extra effort to get things done.
43. Come up with several different solutions to the problem.
44. Take some time off and get away from the situation.
45. Take it out on other people.
46. Use the situation to prove that I can do it.
47. Try to be organized so I can be on top of the situation.
48. Watch TV.
Appendix F

Consent Form - Survey 1

Statement of Consent

Please print or save a copy of this page for your records. By clicking the survey link below, you consent to participate and to answer questions in this survey and you confirm that you speak English fluently, you are a citizen of the United States of America, and you are at least 18 years old.

Make sure to leave this window open as you complete the survey. At the end of the survey, you will receive a code to paste into the box below to receive credit for taking our survey. When you are finished, you will return to this page to paste the code into the box. Please do not hesitate to contact me with questions,

jgauchel@fas.harvard.edu.

Thank you for your consideration,

Jessica Gauchel
Statement of Consent

Please print or save a copy of this page for your records. By clicking the survey link below, you consent to participate and to answer questions in this survey and you confirm that you speak English fluently, you are a citizen of the United States of America, and you are at least 18 years old. You also confirm:

1. You have experienced at least one anaphylactic reaction to food in your life.
2. You have been diagnosed by a doctor as having a food allergy (using skin prick testing).
3. You have a current prescription for an epi-pen (or other epinephrine delivery device) that was prescribed to treat you in case of ingestion of a food you are allergic to.

Make sure to leave this window open as you complete the survey. At the end of the survey, you will receive a code to paste into the box below to receive credit for taking our survey. When you are finished, you will return to this page to paste the code into the box. Please do not hesitate to contact me with questions,

jgauchel@fas.harvard.edu.

Thank you for your consideration,
Appendix H

CISS Score Sheet

CISS-Adult by Normal Endler, Ph.D., F.R.S.C., & James A. Parker, Ph.D.

Name:_________________________________________________________ Date: _____/_____/______

<table>
<thead>
<tr>
<th>Task</th>
<th>Emotion</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>%ile</td>
<td>T</td>
<td>M</td>
</tr>
<tr>
<td>99</td>
<td>75</td>
<td>&gt;82</td>
</tr>
<tr>
<td>99</td>
<td>74</td>
<td>82</td>
</tr>
<tr>
<td>99</td>
<td>73</td>
<td>81</td>
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<td>30</td>
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<td>----</td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>38</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>37</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>1</td>
<td>26</td>
<td>35</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>&lt;35</td>
</tr>
</tbody>
</table>

| %ile | T | M | F | M* | FP | M | F | M8 | FP | M | F | M* | FP | T | %ile |

MHS Copyright 1990, Multi-Health Systems Inc. All rights reserved. In the U.S., P.O. Box 950, North Tonawanda, NY 14120-0950. 1-800-456-3003. In Canada, 3770 Victoria Park Ave., Toronto, ON M2H 3M6, 1-800-268-6011, 1-416-492-2627, fax 1-416-492-3343.
Appendix I

Scoring Guidelines for the Coping Inventory for Stressful Situations

<table>
<thead>
<tr>
<th>Range</th>
<th>Guideline</th>
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<tbody>
<tr>
<td>Above 70</td>
<td>Very much above average</td>
</tr>
<tr>
<td>66 – 70</td>
<td>Much above average</td>
</tr>
<tr>
<td>61 – 65</td>
<td>Above average</td>
</tr>
<tr>
<td>56 – 60</td>
<td>Slightly above average</td>
</tr>
<tr>
<td>45 – 55</td>
<td>Average</td>
</tr>
<tr>
<td>40 – 44</td>
<td>Slightly below average</td>
</tr>
<tr>
<td>35 – 39</td>
<td>Below average</td>
</tr>
<tr>
<td>30 – 34</td>
<td>Much below average</td>
</tr>
<tr>
<td>Below 30</td>
<td>Very much below average</td>
</tr>
</tbody>
</table>
References


concerns related to the burden of food allergy. *Immunology and Allergy Clinics of North America, 32*, 85-95.


