Perceived History of Anaphylaxis and Parental Overprotection, Autonomy, Anxiety, and Depression in Food Allergic Young Adults

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Abstract This study examined autonomy, anxiety, depression, and perceptions of parental behavior in 86 food allergic young adults and 344 healthy young adults between the ages of 18 and 22. Participants completed an online survey measuring self-reported autonomy, anxiety, depression, and perceptions of parental behavior. Results indicated that, as a group, food allergic young adults did not differ from healthy peers. However, food allergic young adults who reported having experienced an anaphylactic reaction described their disease as more severe, reported more worry about their disease, and rated their parents as more overprotective than food allergic young adults who reported never having experienced anaphylaxis. The experience of anaphylaxis may be a reliable indicator of food allergic individuals who are at risk for psychological distress.

Keywords Food allergy · Anaphylaxis · Overprotection · Anxiety · Depression

The prevalence of childhood food allergy has increased rapidly over the last several decades. Since the early 1990s, the number of American children and adults with peanut allergy alone has risen 55% (Wood, 2003; Young, 2001)

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and food allergy currently affects 1–2% of the general population. Physicians have postulated that this dramatic increase can be attributed to several factors, including early exposure to allergens such as peanuts either in utero or in breast milk, increased use of sanitizing products in children's environments, and a general increase in atopic diseases (Grundy, Matthews, Bateman, Dean, & Arshad, 2002). However, these hypotheses are merely speculative and no definitive cause has been identified at this time.

Under normal circumstances, food enters the body and is recognized as non-harmful by the immune system. However, a food allergic reaction is a signal that the body has come into contact with a normally non-harmful food that the immune system targets as dangerous (Coss, 2004; Young, 2001). When the immune system detects the food in the body, it releases a protein called IgE which attaches to mast cells around the food (Sicherer, 2006; Young, 2001). The mast cells immediately release histamine into the blood stream, which causes symptoms of an allergic reaction (Sicherer, 2006; Young, 2001).

In the most minor reactions, the individual experiences itchy skin, sneezing, hives, stomach cramps, nausea, and/or diarrhea. However, severe allergic reactions, such as anaphylaxis, affect the entire body and can lead to loss of consciousness and death (Young, 2001). An immediate injection of epinephrine is necessary to control anaphylaxis (Barber, Scott, & Greenberg, 2001; Sicherer, 2006). Anaphylactic reactions have been observed in response to many food allergies but are most commonly experienced by peanut/tree nut allergic individuals (Hourihane, 1997; Mullins, 2003; Sicherer, 2006; Young, 2001).

Food allergic individuals must strictly avoid the food to which they are allergic in anticipation of an allergic reaction (Ewan, 1996; Sicherer, 2006; Young, 2001). Many foods that cause allergic reactions, such as peanuts, tree

nuts, milk, and eggs, are commonly used in products that are not normally associated with them (such as chili and coffee cake) and utensils are frequently used for more than one item (e.g., ice cream scoopers, baking sheets). Food allergic individuals must examine food labels for evidence of allergen traces and be attentive to everything they eat (Avery, King, Knight, & Hourihane, 2003; Bollinger et al., 2006; Coss, 2004; Gowland, 2001; Masia, Mullen, & Scotti, 1998). If ingredients are not explicitly listed on food labels, individuals may need to contact manufacturers to check that the food was not packaged on the same conveyor belts as the food to which they are allergic (Bollinger et al., 2006). It is also challenging for food allergic individuals to eat at restaurants unless the exact ingredients of the food is known (Coss, 2004).

Because many food allergies develop within the first 3 years of life (Fleischer, Conover-Walker, Matsui, & Wood, 2005; Wood, 2003), it is the parents' responsibility to eliminate food allergens from their child's diet and environment. Many parents find it necessary to severely restrict the child's and the family's social activities in order to prevent accidental exposure (Bollinger et al., 2006). Both parents and children report anxiety and worry about possible adverse reactions (Avery et al., 2003; Sicherer, Noone, & Munoz-Furlong, 2001). Parents also report anxiety when relinquishing control over their child's condition (Primeau et al., 2000).

Although there is an abundance of medical research on the physical aspects of food allergy (Young, 2001), the long-term impact of restricted activities outside the home and parent anxiety about food allergy has not been studied. With the exception of a few preliminary studies (Avery et al., 2003; Bollinger et al., 2006; Lyons & Forde, 2004; Primeau et al., 2000), there is virtually no information regarding the development of food allergy over time or the impact of food allergy on the psychosocial functioning of adults. Furthermore, to date there is no information regarding how the psychological impact of the experience of a severe allergic reaction, such as anaphylaxis, may impact the psychosocial functioning of individuals with food allergy.

The developmental psychology literature suggests that some of the experiences of food allergic children may put them at risk for problems in the development of autonomy. For example, a number of studies have shown that limiting young children's opportunities for independent exploration of the environment can interfere with the development of autonomy (Allen, Hauser, Bell, & O'Connor, 1994a; Greenberger, 1984; Ryan, Deci, & Grolnick, 1995). In addition, highly anxious parents and parents who perceive their children to be medically vulnerable have been shown to be more likely to engage in hypervigilant, intrusive, and restrictive parenting behaviors that limit the development

of age-appropriate autonomy (Garrison & McQuiston, 1989; Holmbeck et al., 2002). Children with severe food allergies, especially those who experience a severe allergic reaction (i.e., anaphylaxis), may be particularly likely to have anxious parents and restrictions in their activities, thus increasing the potential impact on their development of autonomy. If true, one would expect diminished autonomy later in life in individuals who experienced severe allergic reactions as a child.

Young adults with a history of severe food allergy reactions also may be at increased risk for self-esteem concerns and negative affect as inadequate autonomy development has been shown to be associated with anxiety and depressive symptoms and decreased self-esteem in adolescence and young adulthood (Allen, Hauser, Eickholt, Bell, & O'Connor, 1994b; Bogels & van Melick, 2004; Ryan et al., 1995; Stanwyk, 1983). In addition, in studies of other medical conditions, symptoms of depression and anxiety have been shown to be related to perceived illness severity (Mesarosova & Ostro, 2005; Scharloo & Kaptein, 1997; Thune-Boyle, Myers, & Newman, 2006). Thus, young adults who report more severe allergic reactions might be expected to experience more psychological distress.

The present study examined autonomy, anxiety, depression, and perceptions of parental behavior in young adults who developed food allergy at an early age (before age 6) and a comparison sample of healthy young adults. We hypothesized that food allergic young adults would report less autonomy, more symptoms of anxiety and depression, and describe their parents as more overprotective than healthy peers. Food allergic young adults who reported that they had experienced a severe allergic reaction were expected to report higher levels of parental overprotection, anxiety, and depression, and lower levels of autonomy than food allergic young adults who had not experienced a severe reaction.

Method

Participants

A total of 586 potential participants between the ages of 18 and 22 were screened. Of the 176 participants who reported having a food allergy, 90 were excluded because the diagnosis of food allergy was made after the age of 6; the remaining 86 met the inclusion criteria of a history of food allergy before the age of 6 and no other non-atopic serious chronic illness. (Due to the high comorbidity of food allergy with asthma and atopic dermatitis, however, participants with comorbid mild or moderate asthma ($N = 41$), atopic dermatitis ($N = 24$) or both asthma and

atopic dermatitis ($N = 7$) were not excluded from this sample.)

Participants were included in the healthy comparison sample if they did not report a history of food allergy or any other chronic medical condition. Fifty-seven participants were excluded because they reported a history of asthma and 19 were excluded because they reported a history of atopic dermatitis. Thus, the final healthy comparison sample was composed of 334 participants.

Mean age of the food allergic sample was 20.75 years ($SD = 1.73$) and mean age of the healthy comparison sample was 20.75 years ($SD = 1.52$). The samples did not significantly differ with respect to age, $t(387) = 0.30$, $p > .05$, sex, $\chi^2(1, n = 419) = 0.19$, $p > .05$, or race, $\chi^2(4, n = 416) = 2.69$, $p > .05$.

The food allergy sample was further subdivided in terms of prior severe reactions. Thirty-two food allergic participants reported that they had experienced an anaphylactic reaction and 50 food allergic participants reported they had not experienced an anaphylactic reaction. The two food allergy sub-samples did not differ with respect to age, $t(80) = -0.16$, $p > .05$., sex, $\chi^2(1, n = 81) = 0.27$, $p > .05$, or race $\chi^2(4, n = 78) = 3.08$, $p > .05$.

Procedure

Participants for both the food allergy sample and healthy comparison sample were recruited via online announcements posted on food allergy support group websites and college forum websites hosted in locations across the United States. Each announcement included a brief explanation regarding who was eligible to participate, what data were being collected, and a link to the survey which was available on an encrypted web server, hosted by Survey Monkey. In accordance with UMBC Institutional Review Board (IRB) requirements, once the participant accessed the study website, he/she was presented a consent form. The participant indicated agreement to participate by proceeding to the first page of the survey. Upon completion of the survey the participant was again asked for permission to use his/her information in the study. If at this point the participant elected not to consent to the study, his/her information was not submitted to the online directory of participant data. If the participant consented both before the survey and after the survey, his/her responses were recorded in the encrypted online directory.

Following the final consent, the participant was directed to a second website where he/she provided his/her name and email address. This information was used for compensation only. Each participant was entered into a drawing to win an Ipod. All participants had an equal chance at winning the Ipod in the drawing. One participant was awarded the prize. Class credit (1.5% points) was also offered to UMBC students enrolled in eligible courses. UMBC students were included in both the food allergy sample and the healthy comparison sample, depending on their report of the presence/absence of a food allergy.

Measures

Demographics

Information regarding age, gender, and race were collected from each participant.

Medical History

Three questionnaires developed by medical professionals collected information regarding participants' food allergy, asthma, and atopic dermatitis medical histories. The food allergy questionnaire tapped into five aspects of the medical condition: the presence of food allergy, the age of diagnosis, symptoms upon allergen exposure, the participant's perceived severity of his/her food allergy, and how worried the participant was about the food allergy. Participants provided information regarding previous symptoms by reporting which of a list of 25 symptoms they had experienced in response to allergen exposure. Perceived history of anaphylaxis was also collected by asking each food allergy participant "Have you ever had an anaphylactic reaction (serious breathing problem or severe allergic reaction) caused by a food allergy?" Both severity and worry were rated on a 7-point Likert scale with higher ratings indicating higher perceived severity and more worry about the food allergy. This information was used to determine eligibility for the study and in exploratory analyses.

Information regarding asthma and atopic dermatitis history was collected because food allergy is commonly comorbid with these conditions. The asthma and atopic dermatitis questionnaires both tapped into five aspects of the medical condition: the presence of asthma/atopic dermatitis, the age of diagnosis, recent symptoms of asthma/atopic dermatitis, the participant's perceived severity of his/her asthma/atopic dermatitis, and how worried the participant was about the asthma/atopic dermatitis. Only information regarding the presence of asthma/atopic dermatitis was used for the purposes of this study.

Parental Bonding Instrument

Participants completed the Parental Bonding Instrument (PBI), a 25-item self-report measure designed to quantify young adults' perceptions of their parents' characteristics during the first 16 years of life (Parker, 1990; Parker, Tupling, & Brown, 1979). Participants responded to items on a 0–3 Likert scale for both mother and father separately.

The PBI was divided into two subscales: 13 items pertaining to the spectrum of parental overprotection versus allowance of autonomy and independence and 12 items pertaining to the spectrum of parental care versus indifference and rejection. Higher subscale scores indicate more parental overprotection and more parental care.

The PBI has demonstrated convergent validity with the Adult Attachment Interview (AAI). When compared with the AAI, the PBI agrees with ratings of autonomous participants by showing that autonomous children tend to give their mothers high care ratings and low overprotection ratings (Manassis, Owens, Adam, West, & Sheldon-Keller, 1999). Test-retest reliability coefficients of .67–.77 for maternal overprotection, .59–.78 for paternal overprotection, .64–.83 for maternal care, and .74–.82 for paternal care have shown that the PBI is stable over a 20-year period (Wilhelm, Niven, Parker, & Hadsi-Palovic, 2005). Finally, the PBI has demonstrated a split-half reliability coefficient of .88 ($p < .001$) (Parker et al., 1979). For the current sample, Cronbach's alpha was .87 for the maternal care scale, .81 for the maternal overprotection scale, .94 for the paternal care scale, and .88 for the paternal overprotection scale.

Interpersonal Dependency Inventory

Young adult autonomy was measured using the Interpersonal Dependency Inventory (IDI), a 48-item self-report measure that taps into the thoughts, beliefs, and feelings related to the need to associate closely with, interact with, and rely upon other valued people (Hirschfeld et al., 1977). Each item is rated on a 4-point Likert scale. The measure consists of three scales: emotional reliance on another person (ER), social self-confidence concerns (SS), and assertion of autonomy (AA). The ER scale reflects a desire for approval and attention from others and a sense of dread over the loss a valued person. The SS scale reflects a need for help when making decisions and taking initiative. Finally, the AA scale reflects a preference to be alone and a basis of self-esteem that is independent of others' approval. As recommended by Hirschfeld et al. (1977), the three subscales were examined separately.

The IDI has demonstrated adequate psychometric properties (Bornstein, 1997; Hirschfeld et al., 1977). Bornstein (1997) demonstrated test-retest reliability coefficients over an 84 week period of .60 ($p < .001$) for the ER scale, .72 ($p < .001$) for the SS scale, and .70 ($p < .001$) for the AA scale. IDI scores have been shown to be stable across mood states as well (Bornstein, Bowers, & Bonner, 1996). Cronbach's alphas for the study sample and were .80 for the assertion of autonomy scale, .79 for the emotional reliance on another person scale, and .80 for the social self-confidence scale.

Beck Anxiety Inventory

Participants completed the Beck Anxiety Inventory (BAI), a 21-item self-report measure that assesses symptoms of anxiety in adolescents and adults (Beck, Epstein, Brown, & Steer, 1988). High scores on the BAI indicate high anxiety. Results of the initial study indicated a test-retest reliability coefficient of .75 over a 1 week period and an internal consistency coefficient of .92 (Beck et al., 1988). Osman, Kopper, Barrios, Osman, and Wade (1997) determined that the BAI has adequate convergent validity with the Brief Symptom Inventory, the State-Trait Anxiety Inventory, and the Cognition Checklist. A Cronbach's alpha of .92 was obtained for this sample.

Center for Epidemiological Studies-Depression scale

Participants completed the Center for Epidemiological Studies—Depression scale (CES-D), a 20-item self-report measure designed to assess the frequency of depressive symptoms (e.g., dysphoria, vegetative symptoms) during the previous week (Radloff, 1977). Higher scores indicate greater frequency of depressive symptoms. Generally, scores of either 16 or 24 are used as cut-off scores to indicate a possible diagnosis of depression (Radloff, 1977). In adolescent and young adult populations, Radloff (1977) suggests that a cut-off of 24 may be more appropriate. Studies indicate that the CES-D has adequate psychometric properties (Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). The CES-D demonstrated a split-half correlation of .85 and an internal coefficient alpha of .92 (Radloff, 1977) and convergent validity with clinician ratings of depression (Radloff, 1977; Weissman et al., 1977). Cronbach's alpha for the current study was .78. The percentage of participants reporting scores above the 16 and 24 cut-off scores are comparable to studies with similar populations (Franko et al., 2005; Van Voorhees et al., 2005).

Data Analysis Plan

The first set of hypotheses was investigated using a series of regression analyses. Although analyses with categorical predictors such as the presence/absence of medical conditions are typically conducted using ANOVA, the authors chose to conduct regression analyses rather than ANOVA for several reasons. First, regression analyses allow for the testing of competing hypotheses. Given that food allergy is highly comorbid with asthma and atopic dermatitis, it is important to determine whether food allergy independently contributes to the psychosocial outcomes measured in this study. Second, this study included unbalanced sample sizes, which is less problematic in regression analyses than

ANOVA analyses. Finally, regression analyses provide a natural measure of effect size (R^2).

Thus, seven hierarchical regression analyses were conducted to test the hypotheses that the presence of food allergy before the age of six predicted perceptions of maternal and paternal overprotection, the three dimensions of autonomy (i.e., young adult assertion of autonomy, emotional reliance on another person, and social self-confidence concerns), and anxiety and depression. For each regression analysis, the presence/absence of asthma and the presence/absence of atopic dermatitis were entered in the first step and the presence/absence of food allergy was entered in the second step.

Seven independent samples *t*-tests were conducted to determine if perceived history of anaphylaxis was related to ratings of maternal and paternal overprotection, ratings of anxiety and depression, and ratings of assertion of autonomy, emotional reliance on another person, and social self-confidence concerns. Two additional independent samples t-tests were conducted to determine if perceived history of anaphylaxis was related to ratings of food allergy severity and worry about food allergy.

Results

After controlling for comorbid asthma and atopic dermatitis, the presence of food allergy did not significantly predict maternal or paternal overprotection, assertion of

autonomy, emotional reliance on another person, anxiety, or depression (R^2 change $\leq .005$, all ps $> .10$). (See Table 1 for means and Table 2 for regression results.)

However, examination of the food allergy sample alone revealed that young adults who said they had experienced an anaphylactic reaction reported higher maternal overprotection on the PBI than young adults who perceived they did not have a history of anaphylaxis, $t(80) = 2.17$, $p < .05$, $d = .38$; $M = 18.34$ $(SD = 7.01)$, 14.92 $(SD = 6.96)$, respectively. Ratings of paternal overprotection on the PBI were in the same direction, but only marginally significant, $t(77) = 1.69$, $p = .10$, $d = .39$.

Additionally, the samples differed with respect to perceived food allergy severity and worry about food allergy. The sample with a perceived history of anaphylaxis reported higher perceived food allergy severity than the sample without a perceived history of anaphylaxis, $t(80) = 6.13$, $p < .001$; $d = 1.38$; $M = 5.91$ $(SD = 1.23)$, 3.84 $(SD = 1.63)$, respectively. Additionally, the sample with a perceived history of anaphylaxis reported more worry about food allergy than the sample without a perceived history of anaphylaxis, $t(80) = 2.84$, $p < .01$, $d = .64$; $M = 4.34$ $(SD = 1.56)$, 3.28 $(SD = 1.71)$, respectively. Overall, young adults who perceived they had a history of anaphylaxis reported more severe food allergy and more worry about their food allergy. (See Table 3 for means and Table 4 for *t*-test results.)

The two anaphylaxis subgroups did not differ with respect to anxiety, $t(80) = -0.37$, $p > .25$, $d = .08$,

Table 1 Mean scores of participants with food allergy by the age of 6 versus control participants

Measure	Food allergy sample					Control sample				
	N	Minimum	Maximum	M	SD	N	Minimum	Maximum	M	SD
Mother: overprotection	81	4.00	32.00	16.18	7.08	329	3.00	33.00	15.26	6.07
Father: overprotection	81	0.00	29.00	12.46	7.34	293	0.00	33.00	12.14	7.22
Anxiety	84	21.00	63.00	31.10	9.34	334	21.00	62.00	29.68	7.80
Depression	84	0.00	47.00	21.31	9.18	334	0.00	44.00	21.19	7.54
Assertion of autonomy	84	19.00	47.00	33.55	6.37	334	20.00	54.00	32.75	5.90
Emotional reliance	84	31.00	64.00	46.86	8.36	334	28.00	65.00	46.72	7.37
Social self-confidence	84	18.00	47.00	33.00	6.51	334	16.00	55.00	34.16	6.66

Table 2 Regression results for food allergy sample versus control sample (controlling for asthma and atopic dermatitis)

Measure	β	t	df	p	R^2 change	F change	p
Mother: overprotection	−0.41	−0.36	3,396	.72	.000	0.13	.72
Father: overprotection	−0.19	−0.14	3,370	.89	.000	0.02	.89
Anxiety	−0.45	−0.30	3,414	.76	.000	0.09	.76
Depression	0.95	0.67	3,414	.51	.001	0.44	.51
Assertion of autonomy	−1.53	−1.42	3,414	.16	.005	2.02	.16
Emotional reliance	0.72	0.53	3,414	.60	.001	0.28	.60
Social self-confidence	2.33	1.95	3,414	.05	.009	3.81	.05

Table 3 Mean scores of participants who experienced anaphylaxis versus participants who did not experience anaphylaxis

Measure	Reported anaphylaxis history					No reported anaphylaxis history				
	N	Minimum	Maximum	M	SD	N	Minimum	Maximum	M	SD
Mother: overprotection	32	4.00	32.00	18.34	7.01	50	4.00	31.00	14.92	6.96
Father: overprotection	31	2.00	29.00	13.84	7.92	48	0.00	29.00	11.08	6.46
Anxiety	32	21.00	46.00	30.44	7.47	50	21.00	63.00	31.24	10.88
Depression	32	11.00	47.00	22.69	9.20	50	0.00	44.00	20.36	9.29
Assertion of autonomy	32	19.00	46.00	33.81	6.18	50	22.00	47.00	33.22	6.58
Emotional reliance	32	31.00	64.00	46.56	8.95	50	32.00	64.00	47.04	8.20
Social self-confidence	32	18.00	47.00	32.06	6.50	50	19.00	44.00	33.50	6.57
Perceived severity	32	3.00	7.00	5.91	1.23	50	1.00	7.00	3.84	1.63
Worry about food allergy	32	1.00	7.00	4.34	1.56	50	1.00	7.00	3.82	1.71

Table 4 *T*-tests for comparisons of participants with a history of anaphylaxis versus participants with no history of anaphylaxis

Measure	t	df	p	d
Mother: overprotection	2.17	80	.030	.38
Father: overprotection	1.69	77	.100	.39
Anxiety	−0.37	80	.720	.08
Depression	1.11	80	.270	.25
Assertion of autonomy	0.41	80	.690	.09
Emotional reliance	−0.25	80	.810	.06
Social self-confidence	−0.97	80	.340	.22
Perceived allergy severity	6.13	80	.001	1.38
Worry about food allergy	2.84	80	.006	.64

depression, $t(80) = 1.11$, $p > .25$, $d = 0.25$, assertion of autonomy, $t(80) = 0.41$, $p > .25$, $d = .09$, emotional reliance on another person, $t(80) = −0.25$, $p > .25$, $d = .06$, and social self-confidence, $t(80) = −0.97$, $p > .25$, $d = .22$.

Finally, the presence of food allergy predicted young adult report of social self-confidence concerns, $\beta = 2.33$, $t(415) = 1.95$, $p = .05$, R^2 change $= .009$, $F(3, 414) = 3.81$, $p = .05$, but in a direction contrary to prediction. Young adults who had food allergy reported fewer social self-confidence concerns than young adults who did not have food allergy.

Discussion

This study represents one of the first attempts to evaluate the psychosocial correlates of growing up with a food allergy. Despite the presence of a potentially life-threatening food allergy, as a whole, young adults with food allergy did not differ from healthy peers in their self-reported assertion of autonomy, emotional reliance on another person, anxiety, or depression. These findings are consistent with studies of other chronic medical conditions which have found that, overall, children and adults with chronic illnesses do not demonstrate more psychological distress than healthy peers (Anderson, Flume, & Hardy, 2001; Helgeson, Synder, Escobar, Siminerio, & Becker, 2007; Noll et al., 2000; Wallander, Thompson, & Alriksson-Schmidt, 2003).

The expected relation between food allergy and overprotective parenting was only evident in young adults who reported they had experienced anaphylaxis. Food allergic young adults who reported a history of anaphylaxis rated their mothers and fathers as more overprotective than food allergic young adults who did not report a history of anaphylaxis. This finding is consistent with the vulnerable child syndrome premise that parents who perceive their child to be medically vulnerable are more likely to engage in overprotective behaviors (Thomasgard & Metz, 1993). It may be the case that the presence of food allergy alone does not predispose parents to overprotect their children. In contrast to other chronic illnesses, food allergic children are not physically impaired, are not required to attend frequent medical appointments, and do not have to adhere to strict medical regimens. As long as they avoid contact with food allergens, they may show no signs of having a potentially serious condition. As a result, their parents may not engage in overprotective parenting unless their perceptions of the child's vulnerability are changed as a result of a firsthand experience with a life-threatening consequence of food allergy (i.e., anaphylaxis). Although a certain degree of protective parenting is adaptive when a child has a food allergy, the measure of global overprotection used in this study suggests that these parents engaged in more protective parenting than is necessary, or that the level of protection that was needed to keep the participants safe may have felt overly protective.

Additionally, young adults who perceived they had a history of anaphylaxis also perceived their food allergy to be more severe and reported more worry about their food

allergy than young adults who perceived they did not have a history of anaphylaxis. Although young adults who perceived they had a history of anaphylaxis did not report significantly higher levels of psychological distress than young adults who perceived they did not have a history of anaphylaxis, studies of children and adults with chronic illness suggest that children and young adults who perceive their condition to be severe may be predisposed to develop psychological distress (Mesarosova & Ostro, 2005; Scharloo & Kaptein, 1997; Thune-Boyle et al., 2006). This speaks to the need to study sub-clinical adjustment outcomes in chronic illness populations and supports the notion that perception of illness severity may be an important predictor of psychological distress. This finding suggests that there may be a subset of young adults who experience a severe allergic reaction, subsequently perceive their food allergy to be very severe and worry about it, and thus, may be at risk for experiencing psychological distress. Anaphylaxis may serve as a marker for identifying those food allergic children and adults who are at risk for developing psychological distress.

Young adults with food allergy reported fewer social self-confidence concerns than young adults without food allergy. This sub-scale of the IDI measured the young adults' need for help when making decisions and taking initiative. Therefore, the results imply that young adults with food allergy see themselves as more likely to make decisions on their own and take initiative than young adults without food allergy. This finding may reflect the need for young adults with food allergy to assume responsibility for monitoring their food intake at an early age and take responsibility for important food choices. However, the fact that similar findings were not seen on the other autonomy scales weakens the confidence one can have in this finding. Replication is needed.

Limitations

Several limitations of this study necessitate discussion. With respect to the measures, the PBI measures retrospective ratings of maternal and paternal overprotection and care during the first 16 years of life. These retrospective reports may not be the most valid source of information about parental behaviors because young adults may not accurately recall parenting behaviors or may have a biased reporting style. A prospective, multiple-rater system would provide a more comprehensive understanding of parental behaviors.

Another limitation was the method of sampling. Although this study sampled young adults across the United States, the majority of the participants was college students and may have represented a skewed, more autonomous or better adjusted sample. It may be that food

allergic young adults with autonomy problems are less likely to attend college. Furthermore, young adults had to have access to and be proficient with a computer and the internet. Although many young adults know how to use computers and the internet, it is possible that less educated or less economically well-off members of the young adult population were not sampled. Finally, a portion of the food allergy sample was recruited from food allergy support groups. It is possible that these participants sought help through support groups because they were experiencing distress and reported higher distress than would be reported in the general food allergy population.

Another study limitation is that the samples were of unequal size. In order to recruit a sufficient number of food allergy participants, it was necessary to over-sample healthy young adults. The fact that the samples were drastically different in size has direct implications for these analyses. The means for the variables of interest of the healthy sample are more robust than the means of the food allergy sample. However, when matched participant analyses were conducted to determine if equal sample sizes and similar participant composition would reveal different results, no differences in the pattern of results were obtained, suggesting that the impact of unequal sample sizes was minimal.

Implications for Future Research

The results of the current study suggest that further investigations of the developmental trajectories of children growing up with a food allergy are warranted. In particular, prospective studies are needed to determine whether parents' and children's perceptions of the child's vulnerability and the severity of the disease change after an anaphylactic reaction and whether the experience of a severe allergic reaction increases parental overprotection.

Conclusions

Research regarding the relationship of food allergy with developmental and psychological outcomes is relatively scarce. This study is one of the first to explore the impact of anaphylaxis on and psychological outcomes and perceptions of parental behaviors in young adults. Results suggest that a severe allergic reaction (anaphylaxis) may affect an individual's perception of food allergy severity and worry about the disease and also may prompt parents to engage in overprotective behaviors. Given the increasing number of children diagnosed with food allergies, it will be important to further investigate the nature of the impact of food allergy and anaphylaxis on child development.

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