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Which Foods Should a Child with Food Allergy Avoid? The Role of Parental Knowledge in
Food Avoidance Appraisals

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Running Head: Foods to Avoid

Abstract

This study explored factors that influence the accuracy of caregivers' appraisals of the foods their children with food allergy should avoid. Seventy-two caregivers of children with food allergy completed measures of caregiver educational attainment, food allergy knowledge, food allergy worry, and a questionnaire assessing whether or not their child should avoid specific foods (the Foods to Avoid Test). Unnecessary avoidance was indicated when a caregiver reported their child should avoid a food item, even though that item was safe for their child based on their food allergy (i.e., false positive). Lack of appropriate avoidance was represented by caregivers reporting a food did not need to be avoided when it should be avoided based on the child's food allergy (i.e., false negative). Caregivers with lower educational attainment and less food allergy knowledge and whose children were more recently diagnosed had more false negative appraisal errors. In contrast, false positive appraisal errors were most strongly related to parental worry about food allergy. The findings suggest that screening for food allergy general knowledge and food avoidance appraisals may help identify gaps in caregivers' knowledge and ultimately prevent accidental exposures and/or unnecessary avoidance.

Food allergies are becoming increasingly more common, as approximately 8% of children in the United States are diagnosed with at least one food allergy (Gupta et al., 2011). To manage food allergies properly, children must restrict their diet to avoid allergic reactions (American College of Allergy, Asthma & Immunology, 2015b). However, since food is a major part of daily life and because many common allergens (e.g., traces of milk and peanuts) can be found in popular food items, avoidance of allergens can be challenging (Bollinger et al., 2006). This task has the potential to be particularly demanding for caregivers, especially those of young children, who are responsible for monitoring and making food choices for their children (Bollinger et al., 2006; Cohen, Noone, Muñoz-Furlong, & Sicherer, 2004; King, Knibb, & Hourihane, 2009; Muñoz-Furlong, 2003; Primeau et al., 2000; Rouf, White, & Evans, 2011). Parents vary in their ability to interpret and apply food recommendations from physicians. For example, some parents may fail to ensure avoidance of food items that could be harmful, thereby increasing their child's risk of a severe allergic reaction. However other parents may have their child avoid more foods than necessary, which needlessly limits their child's access to safe foods.

Avoiding food allergens can be challenging for parents for several reasons. Cross-contamination, which refers to trace amounts of an allergen coming into contact with another food not intended to contain it (Sicherer, 2018), contributes to confusion in interpreting whether a food is safe to eat. In the United States, the Food Allergen Labeling and Consumer Protection Act (FALCPA) requires that the food industry explicitly state possible cross-contamination on their labels for the most common food allergens including milk, soy, egg, wheat, nuts and seafood. However, the mandate does not apply to many food items, including packaged fresh meat, poultry or egg products (Food and Drug Administration, 2018; Sicherer, 2018). Additionally, potential allergens may not be overtly labeled on food items, but rather listed as a

spice, natural or artificial flavor, as is often the case for garlic and sesame (Sicherer, 2018). Further, substitute foods (which remove components of a food) may not remove the allergenic proteins, as is the case with some egg substitutes. In addition, foods manufactured outside of the US may not follow the FALCPA regulations. Altschul and colleagues (2001) reported on a number of other issues regarding food labels in food allergy, including differences between ingredient labels on inner packaging and outer packaging, as well as ingredients visible in the product that were not listed on the label. Given these nuances in food labeling, food allergy knowledge (i.e., how to distinguish between safe foods and those to avoid) is imperative for those caring for children with food allergy.

Caregivers also need to know all of the different terms that can be used for an allergen (e.g., milk may be labeled as casein), which can be challenging. For instance in one study, only 7% of caregivers of children with food allergy were able to correctly identify food labels containing milk, 22% were able to correctly identify labels with soy, and 54% were able to correctly identify labels with peanuts (Joshi, Mofidi, & Sicherer, 2002). A better understanding of how caregivers' food allergy knowledge influences their appraisals of safe and unsafe food choices for their child may help to inform food allergy psychoeducational interventions, as well as medical provider recommendations for families caring for a child with food allergy.

Strict adherence to an allergy-free diet is essential to avoid reactions. Upon ingesting an allergen, a child may experience immediate reactions, such as mouth itching, abdominal pain, hives, vomiting, or more severe, life-threatening reactions, such as anaphylaxis (American College of Allergy, Asthma & Immunology, 2015a; Food Allergy Research & Education, 2016a; Mayo Clinic, 2014). Anaphylaxis can lead to death, and in some cases, even minute amounts of exposure to food allergen can result in these severe reactions (American College of Allergy,

Asthma & Immunology, 2015a; Mayo Clinic, 2014). Given the risk of reaction, many caregivers of children with food allergy report feelings of persistent fear and uncertainty, including anxiety and fear of their child dying (Gillespie, Woodgate, Chalmers, & Watson, 2007; Gupta et al., 2011; Williams, Parra, & Elkin, 2009). Although this literature is in its infancy, caregiver fear of an adverse reaction may lead to heightened worry and anxiety about their child accidentally ingesting a food allergen and greater restriction of their child's diet to prevent a reaction (Teufel et al., 2007). Even after a successful food challenge, where patients are given incrementally larger doses of the allergenic food under close observation until a full serving is tolerated, as many as 25% of some caregivers may be too worried about an adverse reaction to reintroduce the food into the child's diet despite the physician's recommendation to do so (Eigenmann et al., 2006). This worry may contribute to continued and unnecessary food avoidance and in fact, may lead to re-sensitization to the food allergen (van der Valk, et al., 2016; van Erp et al., 2014). Additional reasons for not introducing a food include child refusal, concerns about allergies to other foods, and parental report of not receiving adequate advice on food reintroduction (van Erp et al., 2014; van der Valk et al., 2016), indicating that both child factors and medical advice also play a role in parental decisions regarding feeding their child with food allergies.

There is some evidence that anxiety in the child is also related to unnecessary food avoidance. In a sample of children who had experienced an adverse food reaction, Le and colleagues (2013) found that children who avoided eating foods that were actually safe to eat had higher state anxiety related to adverse food reactions than children who did not avoid safe foods. However, in this study, maternal anxiety was not related to unnecessary food avoidance. Given these mixed findings and limited literature, there is a need to better elucidate the impact of caregiver anxiety and other characteristics on unnecessary avoidance of safe foods for children

with food allergy.

Managing children's food allergies (e.g., reading product labels, understanding cross-contamination) requires some level of food allergy knowledge. However, it is not yet clear to what extent food allergy knowledge and other caregiver characteristics specifically impact perceptions of safe versus unsafe food choices. The present study examined parents' general knowledge of food allergy (as measured by the Food Allergy Knowledge Test (FAKT; Hahn, Dahlquist, Hoehn, & Bollinger, 2017) in relation to parent's appraisals of whether or not certain foods were safe for their child to eat or should be avoided. Parents were given a list of foods and asked whether their child should avoid each food item. Based on the child's food allergies, the number of foods correctly identified as safe or correctly identified as needing to be avoided were examined. In addition, two types of *food avoidance appraisal errors* were examined: *false negative* errors (i.e., assuming a food does not need to be avoided when it should be avoided), which could be considered "lack of appropriate avoidance;" and *false positive* errors (i.e., assuming a food should be avoided when it is actually safe to eat), which could be considered "unnecessary avoidance."

It was predicted that caregivers with higher educational attainment and greater general food allergy knowledge, and caregivers who had more experience managing their child's food allergy (estimated by illness duration), would make more accurate appraisals (i.e., fewer false negative and false positive errors) about foods that should be avoided. It was also hypothesized that caregivers who reported more worry about their child's food allergy would make more false positive appraisals (i.e., "unnecessary avoidance").

Method

Participants

Caregivers were recruited from food allergy clinics in a large metropolitan area serving ethnically and financially diverse patients as part of a larger study aimed at developing and evaluating a measure of caregiver food allergy knowledge (the FAKT) (Hahn et al., 2011, 2017).

Of the 100 caregivers approached, 79 consented to participate. Reasons for not participating included time constraints and lack of interest in the study topic. Seven caregivers were subsequently eliminated from data analyses because of significant amounts of missing data, resulting in a final sample of 72 caregivers. The children were confirmed to have IgE-mediated food allergy by a board-certified pediatric allergist.

The sample consisted primarily of female caregivers; mean age was 36.65 years ($SD = 7.88$). All caregivers had at least a high school degree. Their children ranged in age from 1 to 17 years ($M = 6.80$; $SD = 3.72$). Approximately 39% of children were male. Approximately 58% of children were identified as Caucasian, 44% as Black, 4% as Asian, 1% as Native American, and 1% as “other”. See Table 1 for additional demographic information. Means and standard deviations for the independent and dependent variables are present in Table 2. Frequencies of Foods to Avoid Test false positive and false negative scores are presented in Table 3.

Procedure

Study procedures were approved by the hospital and university IRBs. Participants were recruited during regularly scheduled visits at a tertiary care academic pediatric food allergy specialty clinic. Medical providers offered participation in the study to caregivers and upon agreement a research team member obtained informed consent. Upon completion of all measures, participants were provided the correct answers to the items testing food allergy knowledge, \$5 compensation, and the opportunity to enter a raffle to win a \$100 gift card.

Measures

Family demographics. Caregivers provided the following information about themselves: their age, relation to child, highest level of educational attainment, food allergy status of each individual residing in their household, the child's age, date of food allergy diagnosis, gender, race, ethnicity, and any co-morbid medical conditions.

Anaphylaxis history. Caregivers reported whether or not their child had a history of food allergy reactions, the number of times their child had a severe food allergy reaction, epinephrine use, and emergency department visits.

Food allergy perceived severity and associated caregiver worry. Caregivers reported each of their child's food allergies and rated the severity of each on a 7-point Likert scale, anchored 1 = very mild to 7 = very severe. The perceived *food allergy severity* score was defined as the highest severity score for any of the reported food allergens. Caregivers also reported their level of worry about each applicable food allergy on a 7-point Likert scale, anchored 1 = not worried to 7 = very worried. The *food allergy worry* score was defined as the highest worry score for any of the reported food allergens. Similar Likert ratings of health condition severity and parental illness-related worry have been used successfully in the pediatric health literature (e.g., Anthony, Gil, & Schanberg, 2003; Graumlich et al., 2001; Guite, Logan, McCue, Sherry, & Rose, 2009; Streisand, Swift, Wickmark, Chen, & Holmes, 2005).

Food allergy knowledge. The FAKT (Food Allergy Knowledge Test; Hahn et al., 2011, 2017) is a 39-item test of caregivers' food allergy knowledge. It includes both true/false and multiple-choice items and assesses both factual and application-based information based on the following content areas: avoiding exposure, general clinical food allergy knowledge, epinephrine auto-injector, anaphylaxis, and symptoms. Scores range from 0-57, with higher scores being indicative of greater food allergy knowledge. Examples of questions include: *It is safe to assume*

that labels are identical on a large and small box of cereal (True/False) and When administering epinephrine, it is very important to do which of the following? (multiple choice).

The FAKT has been found to be highly reliable ($\alpha = .86$) and validity analyses have indicated positive correlations between a caregivers' FAKT score and their age, education, insurance status, access to food allergy information, and auto-injector use ($r = .23- .57$).

Foods to Avoid Test. A pediatric allergist and two pediatric psychologists generated a list of 40 food items (e.g., cashews, scallops, butter, custard) that could be challenging for parents to identify as safe versus unsafe for their child to eat based on an available food allergy guide developed by Food Allergy Research & Education (FARE), a nationally-recognized food allergy education organization, and clinical expertise (see FARE, 2020 for most recent guide). Each of the items included at least one of the eight most common food allergens (supplemental Table 1). One item was removed (plain breadcrumbs) because of the highly variable potential for cross-contamination during manufacturing, resulting in a 39-item test.

Caregivers were asked "Should your child avoid eating this item?" and were instructed to circle "yes" if their child should avoid the food item or circle "no" if their child did not need to avoid the item. A "don't know" choice was provided if caregivers were not sure if their child should avoid a particular food.

The Foods to Avoid test yields three separate scores (see Figure 1). The *total correct* score represents the number of items correctly identified as a food the child should avoid, based on his/her allergies, plus the number of items correctly identified as not necessary to avoid, based on the child's food allergies. "Don't know" responses were scored as incorrect. For example, a child allergic to dairy should avoid butter, nougat, milk, casein, hand-dipped ice cream, whey, cheese and custard, but does not need to avoid the remaining items on the Foods to Avoid test.

Possible total correct scores ranged from 0 to 39.

A *total false negatives* score also was calculated. A false negative response occurred when a caregiver reported that their child did not need to avoid a certain food item when, in reality, that food item would not be safe to eat given their child's allergy. Thus, false negative scores suggest the risk of potentially dangerous exposure to food allergens. Possible total false negative scores ranged from 0 to 39.

A *total false positives* score also was generated. A false positive response occurred when a caregiver reported that their child should avoid a certain food item even though that food item does not contain any food allergens for that child. In other words, false positive scores indicate unnecessary avoidance. See Figure 1 for a diagram illustrating the scoring of the Foods to Avoid Test. Possible total false positive scores ranged from 0 to 39.

Data Analytic Plan

Distributions of all variables were assessed for normality. Based on guidelines by Tabachnick and Fidell (2007), all variables had a normal distribution except for the Foods to Avoid Test total false positives and total false negatives scores. Due to substantial positive skew, the total false positive and total false negative scores were transformed by adding a constant (1) to the original value and applying the log₁₀ transformation. No significant outliers were identified. Alpha was set to .05. Correlational and hierarchical regression analyses were conducted to evaluate the study hypotheses.

Results

Accuracy of food avoidance appraisals on the Foods to Avoid Test

As predicted, caregivers who obtained higher total correct scores on the Foods to Avoid Test were better educated ($r = .38, p = .001$), demonstrated greater food allergy general

knowledge on the FAKT ($r = .63, p < .001$), and had children with longer illness duration ($r = .24, p = .052$). Food allergy general knowledge predicted Foods to Avoid total correct scores even after controlling for parental education and illness duration (See Table 4).

Findings were similar for false negative scores (i.e., food not correctly identified as potential food allergen). Caregivers who made more false negative errors were less educated ($r = -.35, p = .002$) and demonstrated lower levels of general food allergy knowledge on the FAKT ($r = -.35, p = .003$). Caregivers made the greatest number of false negative errors in their ratings of the following foods: marzipan, nougat, pesto, pasta, peanut oil, mayonnaise and hand-dipped ice cream.

In contrast, total false positives scores (i.e., food that is not a potential allergen) were not significantly related to caregiver educational attainment ($r = .03, p = .78$), level of general food allergy knowledge (FAKT scores) ($r = .10, p = .41$), or illness duration ($r = -.04, p = .78$). Instead, false positive errors evidenced a small to medium size correlation with ratings of parental worry about food allergy ($r = .24, p = .055$). Caregivers made the greatest number of false positive errors in their ratings of the following foods: marzipan, nougat, hand-dipped ice cream, pasta, eggnog, cashews, almonds, pistachios, and macadamia nuts.

Achieved Power

Child illness duration had a small effect ($f^2 = .06$) on caregivers' Foods to Avoid score. Given this small effect, 72 participants, and three predictor variables, the regression was underpowered (.37). Caregiver education had a medium effect on caregivers' Foods to Avoid score ($f^2 = .24$) and caregivers' food allergy knowledge (FAKT score) had a large effect on caregivers' Foods to Avoid score ($f^2 = .89$). Given medium-large effect sizes, 72 participants, and three predictor variables, post-hoc achieved power was adequate and ranged from .93-.99.

Discussion

The current study examined the accuracy of caregivers' appraisals of foods that their children with allergy should avoid eating. As predicted, caregivers with higher educational attainment made fewer errors in their assessments of whether or not different foods were safe to eat or should be avoided. This finding is consistent with studies of other health conditions and parental health literacy in general. More educated parents tend to be more knowledgeable about their children's health condition (Silva & Barros, 2013).

However, parental educational attainment accounted for only about 14% of the variance in total scores on the Foods to Avoid Test. General food allergy knowledge accounted for a substantial additional proportion (i.e., 27.7%) of the variance. Caregivers who had greater general food allergy knowledge were better able to accurately identify the foods that their child with food allergy should avoid, regardless of their educational attainment or the duration of the child's food allergy. This finding suggests that even relatively well-educated caregivers who have had some time to adapt to their child's food allergy diagnosis still need food allergy avoidance training in order to make safe food selection choices for their children.

Examination of the false negative scores revealed that a concerning number of caregivers (69 percent of the sample) indicated that their child did not need to avoid at least one item that the child actually should avoid. Even more alarming, approximately 39 percent of caregivers misidentified 2 or more unsafe foods as safe to eat, 24% misidentified 3 or more unsafe foods as safe, and 15 % misidentified 4 or more unsafe foods as safe. Children of caregivers who mistakenly appraise foods as safe to eat when they should be avoided are likely to be at greater risk for accidental exposure to food allergens and the associated potentially life-threatening consequences.

Therefore, it is important for medical providers to screen for food allergy knowledge as a potential predictor of accidental exposure. Caregivers who obtain low scores on the FAKT could be provided additional training in how to identify key words on food labels specific to their child's allergy in order to help them make safer food choices and prevent reactions.

Caregivers made considerably more false positive errors (i.e., indicating their child should avoid a food that is actually safe) than false negative errors (indicating it is okay to eat an unsafe food). In some ways, this is an encouraging finding. If faced with a food item the caregiver is not certain is safe for the child to eat, avoiding that item would be less risky than allowing the child to eat it. Such a "better safe than sorry" approach seems especially sound in the face of unfamiliar food items and is usually recommended by healthcare providers.

False positive (unnecessary avoidance) errors were not related to caregiver educational attainment or general food allergy knowledge; instead, false positives were most strongly related to parental reported worry about the child's food allergy. Past research has demonstrated that some caregivers overly restrict their child's diet due to fears of a reaction (Eigenmann et al., 2006; Gillespie et al., 2007; Gupta et al., 2011; Teufel et al., 2007; Williams et al., 2009). While it is adaptive for caregivers to be cautious of serving their children food if they are uncertain of the ingredients, excessive avoidance or restriction may lead to unintended negative outcomes. Greater food restriction among children with food allergy has been associated with lower quality of life (particularly social quality of life) and anorexia nervosa (Avery, King, Knight, & Hourihane, 2003; Shanahan, Zucker, Copeland, Costello, & Angold, 2014).

In this study, caregivers found marzipan, ovalbumin, and nougat were the most challenging to evaluate for safety. Because marzipan, ovalbumin, and nougat are not very common, compared to food items such as bread, it may be the case that caregivers had not come

across such foods and had not needed to evaluate them for safety. However, caregivers appraised many common, familiar items (e.g., pasta, almonds, custard) as foods their child should avoid, in addition to items that might have been less unfamiliar (e.g., marzipan), which suggests that factors other than unfamiliarity also play a role in overly cautious appraisals of foods the child should avoid.

Limitations

The study findings should be considered in light of its limitations. Although the study sample was diverse with respect to the child's race/ethnicity, the sample size was relatively small, which limited the power to detect less robust patterns of relation.

Additionally, it should be noted that caregiver worry was the only caregiver psychological variable assessed and involved a simple Likert rating of each of the child's food allergies. Thus, there is a need for more formal assessment of caregiver worry as well as related constructs, such as anxiety and intolerance of uncertainty (Steiner, Dahlquist, Power, & Bollinger, 2019), and the role these variables play in appraisals of food safety for those caring for children with food allergy.

Future Directions

The results of this study support the utility of the FAKT as a predictor of important aspects of caregiver decision-making regarding food safety. To help ensure caregivers are supporting their children in appropriately avoiding unsafe foods as well as allowing their children to eat safe foods, medical providers should assess caregiver knowledge of food allergy with the FAKT. Because the present study was a pilot study, further research will include opportunities for additional validation of this measure. Longitudinal studies are needed to determine whether screening with the FAKT can identify gaps in caregivers' knowledge about

food allergy, and potentially help prevent accidental exposures by identifying caregivers at risk for falsely assuming unsafe foods do not need to be avoided. In addition, future studies are needed to examine the utility of using the Foods to Avoid test in conjunction with psychological screening to identify caregivers at risk for overly cautious food avoidance.

Implications for Practice

It may be useful for medical providers to systematically assess caregivers' food allergy knowledge (e.g., using the FAKT) at key timepoints including post-diagnosis and following food challenges. Additionally, providers may benefit from assessing caregiver worry and anxiety to identify caregivers that may benefit from additional education on food allergy or psychological intervention to support effective food allergy management.

Such screening is particularly warranted because many caregivers of children with food allergy report feeling that they do not receive adequate information about managing their child's food allergy from their medical providers (Abdurrahman et al., 2013; Gupta et al., 2008) and desire more information on how to read food labels, understand cross-contamination of foods, and how to use epinephrine injectors (Stear, Potter, & Labadarios, 2011; Vargas et al., 2011). Caregivers may also benefit from information about free online resources (e.g., www.kidswithfoodallergies.org; www.foodallergy.org; www.myallergykingdom.com) at initial diagnosis, food challenges, follow-up appointments, and after a reaction.

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Figure 1. Foods to Avoid Test scoring

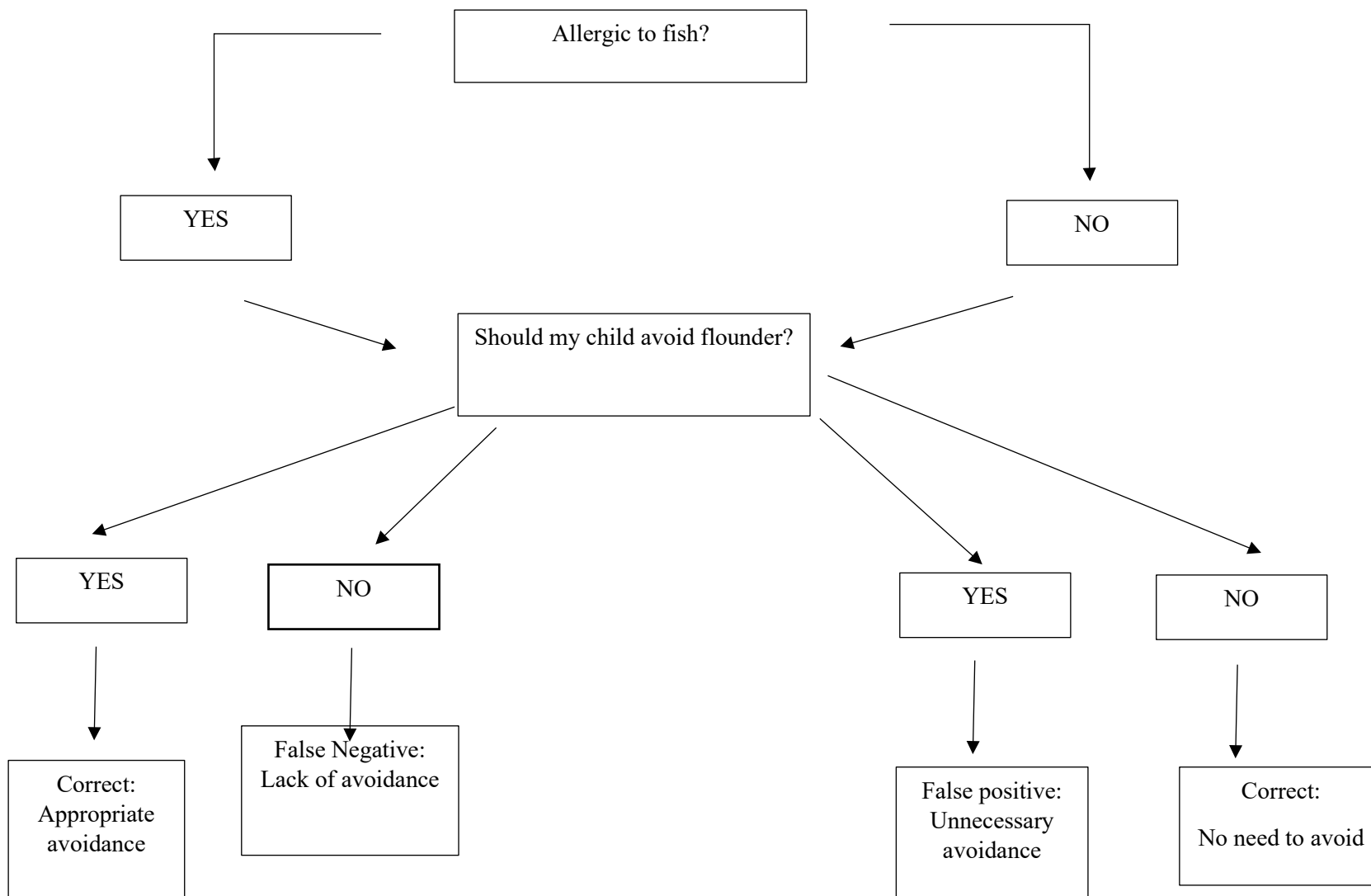


Table 1. Sample Characteristics ($n = 72$)

Variable	<i>n</i>	%
Caregiver relation to child		
Mother/female caregiver	62	86.1
Father/male caregiver	7	9.7
Other (e.g., grandparent)	3	4.2
Caregiver years of education		
12	8	11.1
13	17	23.6
14	15	20.8
16	16	22.2
17	3	4.2
18	11	15.3
20	2	2.8
Child gender		
Female	43	59.7
Male	28	38.9
Missing	1	1.4
Child race (check all that apply)		
Native American	1	1.4
Asian	3	4.2
Black	32	44.4
Caucasian	42	58.3
Other	1	1.4
Other medical diagnoses		
Asthma	51	70.8
Eczema	58	80.6
# of epinephrine administrations		
0	59	81.9
1	9	12.5
2	4	5.6
# of ED visits because of food allergy		
0	49	68.1
1	14	19.4
2	6	8.3
>2	2	2.8
Missing	1	1.4

Table 2. *Descriptive statistics for independent and dependent variables*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Range</i>
FAKT score	72	43.11	8.01	14-56
Total correct score	72	27.27	7.04	2-38
Total false positives (raw)	72	3.25	2.68	0-15
Total false positives (transformed)	72	.54	0.30	0-1.20
Total false negatives (raw)	72	1.79	2.59	0-18
Total false negatives (transformed)	72	.34	0.28	0-1.28
Caregiver education (years)	72	14.89	2.16	12-20
Illness Duration (months)	69	63.01	38.79	10-188
Parental worry about food allergy	67	5.82	1.55	1-7.00

Final *ns* vary due to missing data.

Table 3. Frequencies of False Negative and False Positive Errors on the Foods to Avoid Test

<u>False negatives</u>			<u>False Positives</u>		
Score	Frequency	Percent	Score	Frequency	Percent
0	22	30.6	0	11	15.3
1	22	30.6	1	9	12.5
2	11	15.3	2	10	13.9
3	6	8.3	3	14	19.4
4	6	8.3	4	6	8.3
5	2	2.8	5	12	16.7
6	1	1.4	6	4	5.6
9	1	1.4	7	3	4.2
18	1	1.4	8	1	1.4
			11	1	1.4
			15	1	1.4

Table 4. *Hierarchical Regression Analysis Predicting Foods to Avoid Total Correct Scores*

Variables in model	<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>R Square Change</i>	<i>F Change</i>	<i>Df</i>	<i>Sig. F change</i>
1. Illness Duration	.235	.055	.041	.055	3.917	1,67	.052
2. Caregiver education	.439	.193	.168	.138	11.252	1,66	.001
3. FAKT score	.686	.470	.446	.277	34.000	1,65	<.001

Supplemental Table 1. *Foods to Avoid Test Items and Allergens Contained in Each Item*

Item	Fish	Shellfish	Tree nuts	Peanuts	Soy	Egg	Dairy	Wheat
1. Flounder	Y	N	N	N	N	N	N	N
2. Bulgar	N	N	N	N	N	N	N	Y
3. Prawns	N	Y	N	N	N	N	N	N
4. Marzipan	N	N	Y	Y	N	Y	N	N
5. Cashews	N	N	Y	N	N	N	N	N
6. Edamame	N	N	N	N	Y	N	N	N
7. Grouper	Y	N	N	N	N	N	N	N
8. Peanut butter	N	N	N	Y	N	N	N	N
9. Scallops	N	Y	N	N	N	N	N	N
10. Ovalbumin	N	N	N	N	N	Y	N	N
11. Fresh pasta noodles	N	N	N	N	N	Y	N	Y
12. Pesto	N	N	Y	N	N	N	N	N
13. Butter	N	N	N	N	N	N	Y	N
14. Mayonnaise	N	N	N	N	N	Y	N	N
15. Salmon	Y	N	N	N	N	N	N	N
16. Almonds	N	N	Y	N	N	N	N	N
17. Tofu	N	N	N	N	Y	N	N	N
18. Lobster	N	Y	N	N	N	N	N	N
19. Nougat	N	N	Y	Y	N	Y	Y	N
20. Cold pressed peanut oil	N	N	N	Y	N	N	N	N
21. Spelt	N	N	N	N	N	N	N	Y
22. Milk	N	N	N	N	N	N	Y	N
23. Tuna	Y	N	N	N	N	N	N	N
24. Crawfish	N	Y	N	N	N	N	N	N
25. Pistachios	N	N	Y	N	N	N	N	N

26. Casein	N	N	N	N	N	N	Y	N
27. Macadamia nuts	N	N	Y	N	N	N	N	N
28. Hand-dipped ice cream	N	N	Y	Y	N	Y	Y	Y
29. Crab	N	Y	N	N	N	N	N	N
30. Flour	N	N	N	N	N	N	N	Y
31. Whey	N	N	N	N	N	N	Y	N
32. Meringue	N	N	N	N	N	Y	N	N
33. Cheese	N	N	N	N	N	N	Y	N
34. Soy sauce	N	N	N	N	Y	N	N	Y
35. Eggnog	N	N	N	N	N	Y	N	N
36. Mixed nuts	N	N	Y	Y	N	N	N	N
37. Bran	N	N	N	N	N	N	N	Y
38. Custard	N	N	N	N	N	Y	N	N
39. Liquid egg whites (egg beaters)	N	N	N	N	N	Y	N	N

Below you will find a list of food allergens and the foods that should be avoided (based on the list you were provided on the test).

Fish	Shellfish	Tree nuts	Peanuts
Flounder Grouper Salmon Tuna	Prawns Scallops Lobster Crawfish Crab	Marzipan Cashews Pesto Almonds Nougat Pistachios Macadamia nuts Mixed nuts Hand-dipped ice cream ¹ (due to possible cross-contamination from scooper touching other ice creams)	Peanut butter Cold pressed peanut oil Mixed nuts Hand-dipped ice cream ² (due to possible cross-contamination from scooper touching other ice creams) Marzipan ² Nougat ²

Soy	Egg	Dairy	Wheat
Edamame Tofu Soy Sauce	Ovalbumin Fresh pasta noodles Mayonnaise Meringue Eggnog Liquid egg whites Custard Hand-dipped ice cream ³ (due to possible cross-contamination from scooper touching other ice creams) Marzipan ³ Nougat ³	Butter Nougat Milk Casein Hand-dipped ice cream Whey Cheese	Bran Bulgar Spelt Fresh pasta noodles Flour Soy Sauce ⁴ Hand-dipped ice cream ⁴ (if scooper touches cone)

¹ May contain tree nut protein

² May contain peanut protein

³ May contain egg protein

⁴ May contain wheat protein

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