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Pediatric Food Allergies and Psychosocial Functioning: Examining the Potential Moderating Roles of Maternal Distress and Overprotection

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Abstract

Objectives Identify factors associated with maternal perceptions of health-related quality of life (QoL) among youth with food allergies (FA), and identify maternal factors that may moderate relationships between FA-related challenges and child QoL. **Methods** In all, 533 mothers of children with FA completed measures assessing characteristics of their child's FA, maternal perceptions of child QoL, maternal psychological distress, and maternal overprotection. **Results** FA severity, maternal psychological distress, and overprotection were significantly associated with maternal reports of poorer child functioning and/or poorer QoL among youth with FA. Hierarchical linear regression analyses showed an FA severity by maternal distress interaction in the prediction of child FA-related anxiety; children of higher stress mothers showed a stronger link between auto-injector use and anxiety than children of lower stress mothers. **Conclusions** When identifying youth with FA who are at risk for low QoL, it is important to assess history of FA-related challenges, parental psychological distress, and overprotection.

Key words: food allergies; pediatric; psychosocial functioning; quality of life.

Roughly 8% of US children have food allergies (FA), and approximately 40% have a history of severe reactions (Gupta et al., 2011). In recent years, rates of documented FA have sharply risen (Branum & Lukacs, 2008; Gupta et al., 2011; Ring, Kramer, Schafer, & Behrendt, 2001), and emergency department visits for allergic reactions have also increased substantially (Rudders, Banerji, Vassallo, Clark, & Camargo, 2010). In addition to the physical concerns associated with pediatric FA, emerging evidence reveals a concerning psychosocial portrait for many affected youth. For example, FA in childhood is associated with impairments in social, academic, psychological, and family functioning and is linked with overall reduced quality of life (QoL; Cummings, Knibb, King, & Lucas, 2010; Marklund, Wilde-Larsson, Ahlstedt, & Nordstrom, 2007; Teufel et al., 2007). Anxiety and stress observed in youth with FA are higher than in the general population (Lyons & Forde, 2004), and children with FA exhibit more worry about dangers in their environment and about being away from home than do healthy children (Avery, King, Knight, & Hourihane, 2003).

Despite these concerning findings, the majority of youth with FA nonetheless function psychologically within normal limits, with symptoms of anxiety, depression, and social stress falling within nonclinical ranges (LeBovidge, 2009). Given the heterogeneity in psychosocial functioning across youth with FA, it is critical to investigate the circumstances under which FA confers a negative impact on child QoL. Research is needed to move beyond simple predictors and main effects examinations of FA on functioning, and toward identifying moderators of the links between FA and QoL that can clarify which youth are at greatest risk.

Parents of children with FA report significant emotional stress and limitation on family activities (Sicherer, Noone, & Munoz-Furlong, 2001). Even after consulting with health care professionals, parents affected by pediatric FA report feeling that they lack sufficient knowledge about their child's condition and feeling inadequately trained to manage risky situations, use an auto-injector, or navigate allergen avoidance (Hu, Grbich, & Kemp, 2007). Parents of youth with FA report experiencing social isolation, frustration in their attempts to access needed resources for management of their child's symptoms, and financial burdens associated with their child's FA (McBride, McBride-Henry, & van Wissen, 2010). As is the case for many pediatric populations, parental distress can be associated with poorer psychological outcomes in youth. For example, maternal anxiety has been shown to predict child distress among FA-affected families (LeBovidge, 2009).

Parenting behaviors, independent of chronic health conditions, have also been linked to psychological distress in children. For example, overprotective, nonautonomy granting parenting practices have been shown to be a risk factor for child anxiety (Cooper-Vince, Pincus, & Comer, 2014; Wood, McLeod, Sigman, Hwang, & Chu, 2003). Such parenting practices can convey messages to children about the potential danger of various situations through vicarious means—such as modeling of anxious behavior or restricting children's ability to explore situations autonomously—or through more direct means such as verbal information provided to the child (Fisak & Grills-Taquechel, 2007). These messages can, in turn, promote anxiety and avoidance in children. In youth with FA, however, a certain amount of anxiety and vigilance may be critical for successful coping and appropriate avoidance of allergens (Mandell, Curtis, Gold, & Hardie, 2005). As such, simple linear main effects models of the impact of overprotective parenting on child distress among youth with FA may be misguided.

Moreover, although research has shown that adolescents and young adults are most at risk for FA-related fatalities, youth with FA of all ages are susceptible. Many FA reactions occur in the first 3 years of life, affecting 6–8% of infants (Akeson et al., 2007; Bock, 1987; Bock, Munoz-Furlong, & Sampson, 2001, 2007). However, there has been little attention paid to the examination of psychosocial functioning in younger children with FA and their parents.

The present study aimed to: (1) identify FA and maternal factors associated with mother perceptions of QoL among children of all ages with FA, and (2) identify key factors that moderate relationships between FA-related challenges and mother perceptions of child QoL. Specifically, it was hypothesized that (a) *FA severity* (i.e., episodes of anaphylaxis, history of auto-injector use, number of FAs, history of FA-related hospitalizations, and number of symptoms exhibited during an allergic reaction), *maternal psychological distress* (i.e., depression, anxiety, and stress), and *maternal overprotection* would all be associated with poorer maternal perceptions of child QoL, and (b) maternal psychological distress and overprotection would moderate relationships between FA severity variables and maternal perceptions of child QoL—such that the presence of FA-related challenges would have more pronounced negative relationships with maternal perceptions of child QoL among children whose mothers have higher, relative to lower, levels of psychological distress and overprotective parenting practices. Exploratory analyses were also conducted to examine the extent to which child age moderated interaction effects.

Method

Participants

Participants included 533 mothers of children (ages 0–17 years) with FA who completed a one-time survey. Mothers were recruited through several organizations, including regional branches of the Asthma and Allergy Foundation of America, the Food Allergy and Anaphylaxis Network, the Food Allergy and Intolerance Foundation, and the Kids with Food Allergies Foundation, as well as through social media sites (i.e., Facebook, Twitter, and Craigslist), university message boards, pediatricians, allergy specialists, and paper flyers. Participants were predominantly White (89.5%) and between the ages of 26 and 40 years (58.4%). Median annual household income range for the sample was $100,000–$150,000. Mothers reported age ranges of their children with FA as follows: <2 years (7.8%), 2–4 years (23.7%), 5–7 years (28%), 8–12 years (30.6%), and 13–17 years (9.8%). In all, 40% of the youth with FA were reported to be female. Type of FAs reported included nut (42.1%), egg (26.4%), milk (22.2%), sesame (14.3%), shellfish (11.2%), soy (9.8%), fruits (7.2%),

fish (7.0%), wheat (6.8%), and vegetable (5.0%). The average number of FAs reported for each child was 3.17 ($SD = 2.33$; Modal number of FA = 2), with number of allergies ranging from 1 to 11. Mean age at FA diagnosis was 2.64 years ($SD = 2.02$). Most youth (93%) had been reportedly prescribed an auto-injector. Fifty-nine percent had experienced at least one anaphylactic reaction. Thirty-three percent of youth had been hospitalized at least once owing to FA.

Procedures

Study procedures were approved by the Boston University Charles River Campus institutional review board. A secure web-link to online questionnaires was provided in both electronic and paper recruitment materials for the study. Interested participants were directed to contact study staff or visit a study web site for further details. To take part in the study, mothers were required to indicate that they were >18 years of age and did not have any children with a diagnosed developmental disability or other major nonallergic chronic illness. Eligible mothers provided informed consent, and completed questionnaires via a data-encrypted Internet-based survey program requiring server authentication. This ensured data were secure and only available to authorized persons. On completion, participating mothers were given the option to provide their email address and be entered into a raffle to receive a gift card.

Measures

Demographics and FA Clinical Characteristics

Participants completed a brief measure assessing demographic characteristics. Age ranges, rather than precise dates of birth, were collected for mothers and children in the context of the present de-identified survey, and the background questionnaire also assessed FA-specific items about the nature and severity of FA, including type of diagnosed FA, number of foods the child has to avoid owing to his/her allergy, number of anaphylactic reactions experienced, number of FA-related hospitalizations, symptoms experienced during an allergic reaction, and frequency of medical intervention (e.g., administration of epinephrine) for minor to severe FA reactions.

Maternal Report of Child QoL

The Food Allergy Quality of Life Questionnaire—Parent Form (FAQL-PF; DunnGalvin, de BlokFlokstra, Burks, Dubois, & Hourihane, 2008) measures the parent's perspective of the impact of FA on a child's QoL. Although originally developed for parents of children between the ages of 0 and 12 years, the FAQL-PF has also been used successfully with adolescents (Knibb et al., 2013), with varying item sets for three different age-groups (i.e., 0–3, 4–6, 7–17). The FAQL-PF yields three subscale scores: Emotional Impact, Food Anxiety, and Social and Dietary Limitations. Items are scored on a 7-point Likert-style scale ranging from 0 ("*No impact on health-related quality of life*") to 6 ("*Extreme impact on health-related quality of life*"). Subscale scores range from 0 to 6 ("0" indicates *no effect on FA-related QoL* and "6" indicates *an extreme adverse effect on FA-related QoL*). Higher scores indicate poorer life quality in these various domains. The FAQL-PF has demonstrated robust psychometric properties including excellent reliability and validity (DunnGalvin et al., 2008; $\alpha = .97$ in the present sample).

The Pediatric Quality of Life Inventory Generic Core Scales (PedsQL; Varni, Seid, & Kurtin, 2001) is a measure that assesses *generic* child QoL (i.e., not specific to FA) across four domains: physical functioning, emotional functioning, social functioning, and school functioning. The parent proxy report of this measure was used for the current study. Participants rate items on a 5-point Likert-style scale (0 = "*Never a problem*"; 4 = "*Almost always a problem*"), with varying sets of items depending on the age of the child for whom the measure is being completed. Items are reverse scored and linearly transformed to a 0–100 scale such that higher scores indicate better functioning. A psychosocial health summary score (composed of the mean of the items in the Emotional, Social, and School functioning subscales) and a physical health summary score (composed of the mean of the items in the Physical Functioning subscale), as well as a Total Score (i.e., mean of all of the items on the measure) are calculated to provide a summary of the child or adolescent's generic QoL. The PedsQL has demonstrated good reliability and validity and utility in evaluating pediatric QoL (Varni et al., 2001; $\alpha = .92$ in the present sample).

Maternal Distress

Mothers completed the Depression Anxiety and Stress Scales, Short Version (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998), a brief version of the DASS, which measures symptoms of adult depression, anxiety, and stress, as well as total distress. Participants rate the extent to which each symptom item has been present in the past week on 4-point severity and frequency scales. Higher scores indicate greater distress. Strong psychometric properties have been demonstrated for the DASS/DASS-21, with high internal consistency and concurrent validity for both versions of the instrument. Adequate convergent and discriminant validity in clinical samples have been demonstrated when correlated with other measures of depression, anxiety, and negative affect (Brown, Chorpita,

Korotitsch, & Barlow, 1997; $\alpha = .92$ in the present sample).

Maternal Overprotection

The Vulnerable Child/Overprotecting Parent Scale (VCOPS; Wright, Mullen, West, & Wyatt, 1993) is a 28-item measure assessing parental overprotection versus optimal developmental stimulation behaviors in parents of physically vulnerable children. Higher scores on the VCOPS indicate parental overprotection tendencies. This instrument has exhibited high internal consistency and test–retest reliability and has been used successfully with parents of children presenting with a variety of physical vulnerabilities (e.g., Suskauer, Cintas, Marini, & Gerber, 2003; $\alpha = .75$ in the present sample).

Data Analysis

Bivariate correlations were computed to examine our first hypothesis that higher levels of FA severity, maternal psychological distress, and maternal overprotection would be associated with maternal perceptions of poorer child QoL. Hierarchical linear regression analyses were performed to evaluate our second hypothesis that maternal psychological distress and overprotection would moderate the effects of FA severity on maternal perceptions of child QoL. To evaluate formal moderation, each hierarchical model consisted of two steps: (1) main effects were entered into Step 1, and (2) main effects and the interaction term were entered into Step 2 (see Baron & Kenny, 1986). Significant interactions were followed up with post hoc probing analyses to clarify the nature of the interaction (see Holmbeck, 2002).

Specifically, to examine maternal psychological distress variables (i.e., maternal depression, anxiety, and stress) as moderators of relationships between child FA severity and maternal perceptions of child QoL, predictors were entered as follows: Step 1: FA severity variable (i.e., history of anaphylactic reactions, history of auto-injector use, number of foods that need to be avoided owing to FA, history of hospitalizations owing to FA, or number of symptoms experienced during an allergic reaction), and maternal psychological distress variable (i.e., stress, anxiety, or depression; variable centered); Step 2: FA severity variable, maternal psychological distress variable, and the product of the FA severity variable and maternal psychological distress variable.

Parallel analyses were completed for maternal overprotection, where overprotection was entered into the model in the place of maternal psychological distress variables. Significant interactions were followed up with post hoc probing to determine the direction and nature of the interaction (Holmbeck, 2002). Specifically, conditional moderator variables for maternal depression, anxiety, stress, and overprotection were computed by grouping cases into three groups for each: Those whose scores on the moderator fell below 1 SD of the overall sample mean ("low"), those whose scores were beyond 1 SD above the overall sample mean ("high"), and those whose respective scores fell within 1 SD of the overall sample mean ("middle"). Simple slopes evaluating the association between the relevant FA severity variable and the relevant child QoL outcome variable were computed separately for "high" and "low" groups on each significant moderator and then compared descriptively to clarify the direction of the interaction effects.

Exploratory analyses were conducted to examine the extent to which child age (grouped into four age

Table I. Means, Standard Deviations, and Bivariate Correlations for FA Severity Variables and Child Psychosocial Functioning Variables

Variable	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Anaphylaxis episodes	2.15	1.34	–								
2. Auto-injector use	1.63	1.08	.68*	–							
3. Foods to avoid	2.49	1.15	.14*	.05	–						
4. Hospitalizations	1.57	1.02	.43*	.42*	.13*	–					
5. Symptom count	10.61	5.84	.47*	.31*	.22*	.32*	–				
6. PedsQL-Total[a]	88.10	12.08	−.15*	−.10	−.05	−.09	−.22*	–			
7. PedsQL-Ps[b]	87.00	13.76	−.15*	−.10	−.06	−.09	−.22*	.96*	–		
8. FAQL-FA[c]	2.50	1.85	.20*	.13*	.10	.18*	.38*	−.34*	−.35*	–	
9. FAQL-SD[d]	3.19	1.70	.24*	.15*	.16*	.14*	.37*	−.32*	−.33*	.69*	–
10. FAQL-EI[e]	2.28	1.61	.26*	.17*	.11	.17*	.41*	−.44*	−.45*	.84*	.80*

Note. Higher scores on the PedsQL indicate *better* quality of life, whereas higher scores on the FAQL indicate *poorer* quality of life. Inverse correlations between the two measures, therefore, indicate consistent reporting of quality of life on both measures.

[a]Pediatric Quality of Life Inventory – Total Score.

[b]Pediatric Quality of Life Inventory – Psychosocial Health subscale.

[c]Food Allergy Quality of Life Questionnaire – Food Allergy-Related Anxiety subscale.

[d]Food Allergy Quality of Life Questionnaire – Social and Dietary Limitations subscale.

[e]Food Allergy Quality of Life Questionnaire – Emotional Impact subscale.

*$p < .01$.

Table II. Means, Standard Deviations, and Bivariate Correlations for Maternal Psychological Distress and Child Functioning Variables

Variable	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Depression (DASS)	2.34	3.45	–								
2. Anxiety (DASS)	1.84	2.91	.58**	–							
3. Stress (DASS)	5.08	4.37	.66**	.61**	–						
4. Total distress (DASS)	9.25	9.29	.86**	.82**	.90**	–					
5. Overprotection (VCOPS)	−.48	.84	−.00	.05	.02	.02	–				
6. PedsQL-Total[a]	88.10	12.08	−.44**	−.36**	−.44**	−.48**	−.14**	–			
7. PedsQL-Ps[b]	87.00	13.76	−.42**	−.38**	−.44**	−.48**	−.13**	.96**	–		
8. FAQL-FA[c]	2.50	1.85	.12**	.18**	.13**	.16**	.10	−.34**	−.35**	–	
9. FAQL-SD[d]	3.19	1.70	.18**	.24**	.21**	.24**	.13**	−.32**	−.33**	.69**	–
10. FAQL-EI[e]	2.28	1.61	.21**	.27**	.23**	.27**	.12	-.44**	−.45**	.84**	.80

Note. Higher scores on the PedsQL indicate *better* quality of life, whereas higher scores on the FAQL indicate *poorer* quality of life. Inverse correlations between the two measures, therefore, indicate consistent reporting of quality of life on both measures.

[a]Pediatric Quality of Life Inventory – Total Score.

[b]Pediatric Quality of Life Inventory – Psychosocial Health subscale.

[c]Food Allergy Quality of Life Questionnaire – Food Allergy-Related Anxiety subscale.

[d]Food Allergy Quality of Life Questionnaire – Social and Dietary Limitations subscale.

[e]Food Allergy Quality of Life Questionnaire – Emotional Impact subscale.

*$p < .01$.

ranges: 0–4 years old, 5–7 years old, 8–12 years old, and 13–17 years old) moderated significant interaction effects. Age categories were selected for consistency with age groupings in existing literature examining patterns of parental accommodation and overprotection and child functioning (e.g., Hudson, Comer, & Kendall, 2008; Mullins et al., 2007; Skriner et al., 2015). To examine child age as a moderator of any observed significant interactions between maternal psychological distress and mother-reported child FA severity in the prediction of child outcomes, predictors were entered as follows: Step 1: child age, FA severity variable, and maternal psychological distress variable; Step 2: child age, FA severity variable, maternal psychological distress variable, and the product of child age and the FA severity variable; Step 3: child age, FA severity variable, maternal psychological distress variable, the product of child age and the FA severity variable, and the product of child age, the FA severity variable, and the maternal psychological distress variable. Significant interactions were followed up with post hoc probing to determine the direction and nature of the interaction. To control for error associated with multiple tests, a Holm–Bonferroni correction was applied for all analyses.

Results

Direct Associations

Means and standard deviations for all study variables are presented in Tables I and II. Episodes of anaphylaxis, auto-injector use, number of FA-related hospitalizations, and number of symptoms experienced during an allergic reaction were each significantly and positively associated with food-related anxiety, social and dietary limitations, and emotional impact of FA. Additionally, history of anaphylaxis and number of symptoms exhibited during an allergic reaction were significantly and negatively associated with maternal perceptions of child QoL (PedsQL Total Score) and psychosocial health (see Table I). Maternal depression, anxiety, and stress were each significantly and positively associated with children's food-related anxiety, social and dietary limitations, and emotional impact of FA. Maternal distress variables were significantly and negatively associated with maternal perceptions of child QoL and psychosocial health (see Table II). Maternal overprotection was significantly and negatively associated with maternal perceptions of child QoL and psychosocial health; the greater the overprotection, the lower the perceptions of the child's functioning. Maternal overprotection was significantly and positively associated with social and dietary limitations (see Table II).

Child age was positively associated with reported anaphylactic history ($r = .17$, $p < .001$), reported auto-injector use ($r = .17$, $p < .001$), and allergy symptom count ($r = .11$, $p < .05$) but not significantly associated with number of foods the child avoids or history of FA-related hospitalizations ($ps > .05$). Child age was negatively associated with maternal perceptions of child psychosocial health ($r = -.09$, $p < .05$) and positively associated with maternal perceptions of child food-related anxiety ($r = .36$, $p < .001$), social and dietary limitations ($r = .14$, $p < .01$), and emotional impact ($r = .35$, $p < .001$). No significant associations were found between child age and maternal perceptions of generic child health-related QoL or physical health ($ps > .05$). Child age was negatively associated with maternal depression ($r = -.11$, $p < .05$), maternal anxiety ($r = -.14$, $p < .01$), and maternal stress ($r = -.19$, $p < .001$). Child age was not significantly associated with maternal overprotection.

Moderated Effects

Hierarchical linear regression analyses found a significant FA severity by maternal distress interaction in the prediction of child FA-related anxiety, such that the effect of history of auto-injector use on FA-related anxiety was moderated by maternal stress (i.e., when adding the interaction term in Step 2 to the main effects in the prediction of FA-related anxiety, F_{change} (1, 491) = 7.53, $p < .01$). Post hoc probing revealed significant associations between history of auto-injector use and greater FA-related anxiety among the high maternal stress group (defined as 1 SD above the sample mean on the DASS Stress subscale) ($B = .80$, $SE = .23$, $\beta = .36$, $p = .001$). In contrast, no such association was detected among the low maternal stress group (defined as 1 SD below the sample mean on the DASS Stress subscale) ($B = -.04$, $SE = .18$, $\beta = -.03$, $p > .05$). Associations between all other indicators of FA severity (i.e., episodes of anaphylaxis, number of foods to be avoided, history of FA-related hospitalizations, number of symptoms exhibited during an allergic reaction) and maternal perceptions of child QoL were not significantly moderated by maternal psychological distress variables. Similarly, interactions between FA severity and maternal overprotection did not predict maternal perceptions of child QoL or psychosocial health.

Exploratory analyses further probing the significant interaction of maternal stress and history of auto-injector use in the prediction of FA-related anxiety found that child age significantly moderated this interaction ($\beta = .27$) (see Table III). Specifically, among 5- to 7-year-olds with mothers in the low maternal stress group, there was only a small effect of auto-injector use on FA-related anxiety ($\beta = .15$) whereas among 5- to 7-year-olds with mothers in the high maternal stress group, there was a medium-sized effect of auto-injector use on FA-related anxiety ($\beta = .28$). In contrast, there was no significant interactive effect of maternal stress and history of auto-injector use in the prediction of FA-related anxiety among youth in any of the other age groups.

Table III. Details of Hierarchical Regression Examining Moderating Role of Child Age on the Interaction Between Auto-Injector Use and Maternal Stress in Predicting Child Food Allergy-Related Anxiety

Variable entered	*B*	*SE(B)*	*B*	*t*	R^2
Step 1					.17
Child age	.70	.08	.38	8.95*	
History of auto-injector use	.14	.07	.08	1.92	
Maternal stress	.09	.02	.21	5.08*	
Step 2					.18
Child age	1.02	.14	.55	7.56*	
History of auto-injector use	.21	.08	.12	2.76	
Maternal stress	.09	.02	.21	4.96*	
Child age × auto-injector use	−.19	.07	−.21	−2.85**	
Step 3					.20
Child age	.98	.14	.53	7.28*	
History of auto-injector use	.23	.08	.13	3.02**	
Maternal stress	.09	.02	.21	5.13*	
Child age × auto-injector use	−.15	.07	−.17	−2.13	
Child age × auto-injector use × maternal stress	.02	.01	.11	2.49**	

Note. *$p < .001$, **$p < .01$.

Step 1: $F(3, 491) = 30.75$, $p < .001$; Step 2: $F(4, 490) = 27.71$, $p < .001$; Step 3: $F(5, 489) = 23.64$, $p < .001$; Step 2 F_{change} (1, 490) = 8.13, $p < .01$, $\Delta R^2 = .01$; *Step 3* F_{change} (1, 489) = 6.18, $p = .01$, $\Delta R^2 = .02$.

Discussion

The present findings help to clarify maternal perceptions of child QoL across youth with FA, and identify affected youth who are most vulnerable for FA-related distress and reduced health-related QoL. Previous literature has shown that youth with FA can present with psychological challenges (Cummings et al., 2010; Manassis, 2012), and the present findings add to this growing literature by identifying FA and parent factors that may indicate a higher level of risk for these challenges. Although most youth with FA in this sample were, by maternal report, exhibiting relatively adaptive functioning and positive health-related QoL, we found youth with higher maternal-reported incidents of anaphylaxis, auto-injector use, number of FAs, FA-related hospitalizations, and number of symptoms experienced during an allergic reaction exhibited significantly poorer outcomes across FA-specific domains of QoL (food-related anxiety, social and dietary limitations, and emotional impact of FA). We also found that mother-reported anaphylaxis episodes and number of symptoms experienced during an allergic reaction in particular, are significantly associated with poorer maternal perceptions of generic child health-related QoL (i.e., social and emotional well-being as it relates to a child's FA) and psychosocial health (i.e., general social, emotional, and school functioning).

Together, these results indicate that specific experiences with FA-related challenges and limitations (and not merely the simple presence of FA itself) are associated with maternal perceptions of poorer child functioning. Further, previous work has found parents of youth with FA to have unmet informational needs and to experience emotional and practical challenges related to their child's FA (e.g., Hu et al., 2007; Sicherer et al., 2001). The present findings document that the severity of maternal depression, anxiety, and stress are all, in turn, significantly linked with child psychological functioning and health-related QoL. Moreover, many youth with FA do endure remarkably well (LeBovidge, Strauch, Kalish, & Schneider, 2009)—even those with very severe FA. The present study found that links between FA severity (particularly mother-reported history of auto-injector use) and

maternal perceptions of children's FA-related anxiety are only significant among youth with mothers reporting high stress. Frequency of auto-injector use as reported by mothers was not significantly linked with FA-related anxiety among children whose mothers reported relatively low stress. Children between 5 and 7 years seem to be particularly vulnerable with regard to the interaction between maternal stress and auto-injector in predicting child FA-related anxiety. Importantly, these children are beginning to navigate other significant life transitions (e.g., school entry, increased independence from parents, development of peer relationships), and thus maternal stress and history of negative FA-related events may have an even greater effect on FA-related anxiety during this developmental period than for younger or older children.

Importantly, maternal stress moderated the relationship between mother-reported history of auto-injector use and FA-related anxiety, whereas maternal depression and anxiety did not. This may be due, in part, to the fact that maternal stress, as measured by the DASS-21, encompasses behaviors that may more easily affect individuals in a mother's immediate environment (e.g., over-reacting to situations, feeling touchy, finding it difficult to wind down), whereas the DASS-21 depression and anxiety subscales are comprised primarily of more internalized symptoms that may not be as readily apparent to others (e.g., dryness in mouth, feeling blue). Children may be more influenced by outward expressions of maternal stress than by internalized symptoms of anxiety and low mood. Our findings therefore suggest that high maternal stress may be the most concerning component of maternal distress when considering the impact of FA severity on affected youth. Medical teams working with youth with FA may do well to assess maternal stress as part of routine screening and evaluation efforts to help identify children at greatest risk for psychological distress. Curiously, while an interactive effect was found for mother-reported history of auto-injector use and FA-related anxiety, a similar effect was not found for mother-reported episodes of anaphylaxis. This discrepancy may be explained by the fact that auto-injector use is an objective, clear-cut event, whereas there may be some confusion for parents around what constitutes an episode of anaphylaxis. Further replication is warranted to determine the extent to which the absence of an interactive effect between maternal stress and anaphylaxis in predicting child outcomes may have simply reflected unclear definitions of FA-related events (see Limitations section below).

Overprotective, nonautonomy granting parenting practices have been shown to be a risk factor for anxiety in healthy youth (Cooper-Vince, Pincus, & Comer, 2014; Wood et al., 2003), and most treatments for child anxiety directly work to reduce overprotective parenting to reduce child anxiety (e.g., Comer et al., 2012; Kendall, Hudson, Gosch, Flannery-Schroeder, & Suveg, 2008). However, there are life-threatening risks associated with poor FA management, complicating concerns about the psychological impacts of parental "overprotection" within the pediatric FA population. Indeed, we found that maternal overprotection was significantly and negatively associated with maternal perceptions of child health-related QoL and psychosocial health and positively associated with social and dietary limitations; the greater the overprotection, the lower the child's functioning. Importantly, there were no moderating effects between maternal overprotection and FA severity in predicting child outcomes—i.e., links between FA severity and child outcomes were uniform across levels of maternal overprotection. The extent to which professionals should accordingly advise parents of youth with FA to reduce overprotective parenting practices in an effort to optimize children's mental health must always be considered on balance with the medical realities of each child's FA. Parents with relatively higher degrees of overprotective parenting who have children with a known history of relatively less severe FA symptoms (e.g., mild dermatological sequelae) may do well to encourage their children to be more autonomous and independent, whereas parents of children with FA with a known history of relatively more severe and potentially life-threatening FA symptoms (e.g., respiratory disturbance) may nonetheless need to maintain a relatively greater degree of parental control despite some of the associated psychological correlates—particularly for younger and less independent youth. For such parents, a particular challenge will be to find key ways to promote child autonomy and independent functioning while simultaneously ensuring the child's physical safety, especially when there is uncertainty around how a child's FA reaction may manifest itself physically. Family-based interventions for this population may therefore do well to include parent guidance around how to distinguish medically necessary protection to ensure a child's safety from overprotection in the context of less-threatening situations.

Limitations

Replication of this study is needed to confirm the present findings, which should be interpreted with several considerations in mind. First, this study used survey methodology and relied solely on mother reports of child functioning, FA characteristics, maternal symptomatology, and parenting behaviors, and thus results may not be generalizable to the larger population of youth with FA. Future work incorporating reports from additional informants (i.e., fathers, other caregivers, medical professionals, and youth themselves) are needed to more comprehensively evaluate patterns and correlates of relationships between child FA and

QoL. For example, previous work has identified parent–child reporting discrepancies in the assessment of FA severity and threat, with parent reports indicating greater child disturbance in daily living for youth with FA, as compared with child self-report (Akeson et al., 2007). Parent–child reporting discrepancies have also been observed in the assessment of child anxiety and psychological adjustment (e.g., Comer & Kendall, 2004), with parents often reporting more problems than their children.

Second, in the context of this large national survey, child diagnosis of FA and history of anaphylaxis was reported by mothers and not validated by medical professionals or formal allergy tests. With regard to anaphylaxis, future work in this area might do well to provide mothers with a definition of anaphylaxis to address concerns about mothers' understanding of anaphylaxis. Researchers have noted that there can be a discrepancy between symptoms of true, diagnosed FA and reports of FA symptoms by nonmedical professionals (Jansen et al., 1994). Symptoms reported by nonmedical professionals can indicate the presence of conditions unrelated to FA. Although initial screening questions attempted to exclude mothers who may have self-diagnosed their child's FA in the absence of medical confirmation, some participants in the sample may nonetheless have children who do not have formal FA diagnosis. Future work with more regionally restricted samples would do well to incorporate formal allergy tests and to provide participants with a specific definition of anaphylaxis to avoid overreporting. Additionally, although an effort was made to exclude mothers whose child had other current, chronic, nonallergic illnesses, the extent to which asthma may have been successfully excluded is unclear. Given that asthma can contribute to one's susceptibility to respiratory symptoms and anaphylaxis, future work should make clearer delineations between youth with FA who present with or without a comorbid asthma condition.

Third, causal inferences can not be made in the context of the present cross-sectional design. Although we identified a relationship between maternal psychological distress, maternal overprotection, and maternal perceptions of QoL in children with FA, the direction of these relationships cannot be determined. It is also plausible that mothers who are more distressed may be reporting with a more negative bias with regard to their child's functioning. Additionally, the DASS measures distress experienced over a 1-week period and may not capture longer-term parental distress. Future work using a prospective, longitudinal study design with measures that examine parental distress over longer periods of time is needed to better inform the directionality of relationships among variables in affected youth.

Finally, although we recruited mothers from across the United States, the degree to which this sample is truly representative of the full population of mothers of youth with FA cannot be assured. The majority of the sample was White, highly educated, and reported household income significantly higher than that of the median household income in the United States. The present design used online recruitment and data collection, which limited participation to individuals with access to a computer and to Internet service. Mothers frequenting online forums for pediatric FAs may represent a more severe population of both youth with FA and of mothers who are under significant distress as a result of their child's FA. This may be evidenced in part by the fact that the proportion of youth with a mother-reported history of anaphylaxis in this sample was higher than what has previously been reported in the general population (59% vs. 40%). Future work using population-based sampling and incorporating paper and pencil options for study participation is needed to examine the extent to which the present findings are generalizable to the full population of families affected by pediatric FA.

Clinical Implications

Although youth with FA and their mothers may, on average, show healthy psychological functioning, it is important that caregivers and health care professionals are well-equipped to identify particularly vulnerable children and address some of the challenges that FA can pose to a meaningful subset of affected children and their families. Pediatricians are well-placed to identify and refer children and families who may be struggling with the psychosocial and physical sequelae of FA, though it has been shown that most parents do not discuss behavioral or emotional issues with their child's pediatrician (Briggs-Gowan, Horwitz, Schwab-Stone, Leventhal, & Leaf, 2000). Better methods for screening and referring families of youth with FA who may be encountering difficulties are needed. The present findings suggest that mental health screening may be valuable for children with more extensive histories of FA-related challenges (i.e., history of auto-injector use). Assessing maternal stress may be further useful for identifying youth at greatest risk, given that maternal stress can moderate links between FA severity and child QoL.

Additional attention should be paid to the unique challenges and stresses associated with parenting a child with FA. Based on our findings, maternal distress is an identified risk factor for psychosocial difficulties in youth with FA, and restrictive parenting practices can lead to poorer health-related QoL in this population. Focus groups conducted with parents of youth with FA reveal that parents could benefit significantly from additional knowledge about how to successfully manage this chronic health condition (Vargas et al.,

2011). Psychosocial interventions for youth with FA and their families are essential to ensuring optimal functioning in this population; however, available treatments are scarce. LeBovidge and colleagues (2008) established preliminary support for the effectiveness and feasibility of a group intervention for children with FA and their parents. Research efforts should continue to evaluate ways to increase parent perceived competence in caring for a child with FA and improve the overall QoL for affected youth and their families.

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