

Maternal Worries about Child Underweight Mediate and Moderate the Relationship Between Child Feeding Disorders and Mother–Child Feeding Interactions

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Objective To examine the role of maternal worries about child underweight and undereating in mother–child feeding interactions with children having a feeding disorder (FD). **Method** Participants were 27 children diagnosed with nonorganic-based FD and 28 children without FD. Mothers were interviewed about their worries about child underweight and undereating. Mother–child interactions were videotaped during feeding. **Results** Maternal child weight-related worries acted as both a mediator and a moderator. The more negative mother–child interactions found in the FD group, compared to the control group, were explained by greater maternal worry regarding child underweight. Furthermore, mother–child interactions within the FD group were not at risk per se, but only when coupled with high maternal worries about children’s underweight. **Conclusion** Worry about child underweight partially explains the development of negative feeding interactions when having children with FD, signifying clinical implications for the treatment of FD.

Key words Eating and feeding disorders; failure to thrive; motherhood; parenting.

Introduction

Children’s feeding problems are one of the most common issues brought to the attention of pediatric health care professionals. Approximately 25% of normally developing children experience feeding problems (Chatoor & Macaoay, 2008; Linscheid, Budd, & Rasnake, 2009), with 1–2% suffering from severe feeding difficulties associated with poor weight gain (Chatoor & Macaoay, 2008). Acute feeding problems are associated with severe consequences, including susceptibility to chronic illness, growth failure, deficits in cognitive development, and later eating disorders (Chatoor & Macaoay, 2008). Child feeding disorders (FD) have been defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM IV; American Psychiatric Association, 1994) as “persistent failure to eat adequately with significant failure to gain weight

or significant loss of weight over at least one month,” without evidence of any other general medical conditions or mental disorders that may account for the feeding problem and onset before the age of 6 years (American Psychiatric Association, 1994, p. 98). Failure to thrive (FTT) is a term often used in the diagnoses of FD. FTT refers to children below the 5th growth percentile or children who exhibit weight loss of more than two major growth percentiles (Bauchner, 2007). The pediatric literature distinguishes between *Organic FTT*, marked by an underlying medical condition, and *Nonorganic FTT (NOFTT)* without any known medical condition explaining the growth deficiency (Bauchner, 2007). The current study focused on children who exhibit NOFTT, meaning children with severe growth deficiency, not explained by any underlying medical condition.

Feeding is a reciprocal process, involving complex interactions between the child and the parent. During the feeding process, optimal parent–child interactions depend on sensitive responsive parenting as well as the child’s ability to clearly communicate hunger cues. Therefore, feeding and growth problems are often characterized by difficulties in parent–child interactions around feeding (Satter, 1986). Research has shown that mothers of children with FD were more intrusive (Chatoor, Egan, Getson, Menvielle, & O’Donnell, 1988; Sanders, Patel, Le Grice, & Shepherd, 1993) and demonstrated greater conflict and struggle for control during feeding interactions with their children (Ammaniti, Ambrozzi, Lucarelli, Cimino, & D’Olimpio, 2004; Lindberg, Bohlin, Hagekull, & Palmerus, 1996) than mothers of children without FD. Furthermore, mothers of children with FD provided less structuring during feeding interactions (Ammaniti et al., 2004) and demonstrated less efficient problem-solving skills during mother–child interactions compared to mothers of healthy comparisons (Robinson, Drotar, & Boutry, 2001). Moreover, we have recently reported higher levels of intrusiveness and lower levels of structuring during feeding among mother–child dyads of children with FD compared to healthy comparison dyads (Atzaba-Poria et al., 2010). The present study was designed to expand our previous findings, by identifying the *process* associated with the development of dysfunctional mother–child feeding interactions when having children with FD. The importance of specific maternal worries about children’s weight and eating is discussed in the following focused review and mediation and moderation models are proposed.

Maternal Worry and Mother–Child Feeding Interactions

Chatoor and her colleagues (Chatoor, Hirsch, & Persinger, 1997) proposed that the conflictual interactions between mothers and children with FD are a result of particular child and mother characteristics. Specifically, when children refuse to eat, vulnerable mothers may become anxious and insecure and try to forcefully feed their children. The more they try, the more the food refusal becomes persistent and a vicious cycle is created (Chatoor et al., 1997). Thus, in order to understand the process by which dysfunctional parent–child interactions develop among children with FD, potential maternal vulnerability factors, such as maternal worry must be explored. Worry has been defined as: “. . . a chain of thoughts and images, negatively affect-laden and relatively uncontrollable; it represents an attempt to engage in mental problem solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes . . .” (Borkovec,

Robinson, Pruzinsky, & DePree, 1983, p. 10). Worry is considered a common human experience. However, excessive worry may become uncontrollable, distracting attention from tasks, and evoking negative affect (Borkovec et al., 1983). Excessive worry has also been associated with rigid maladaptive interpersonal relationships, often characterized by intrusive, overly nurturing behavior (Borkovec, Ray, & Stober, 1998). Costanzo and Woody (1985) proposed that the impact that parental worries have on children may be *domain specific*. They suggested a model describing relations between parental worries, parenting strategies, and child outcomes in the particular context of childhood obesity. Specifically, parents of children who may exhibit a tendency toward obesity are likely to become highly worried about their children’s weight. In turn, the heightened parental worry tends to affect parent–child interaction around feeding issues, exhibited by restrictive, controlling, high monitoring parenting around food (Costanzo & Woody, 1985). Research findings tend to be consistent with the presented model regarding childhood obesity. For example, maternal worry about children becoming overweight has been linked to parental feeding strategies, such as more restriction of child food intake (e.g., May et al., 2007). Moreover, maternal worry about child overweight mediated the link between child obesity and maternal feeding strategies (Webber, Hill, Cooke, Carnell, & Wardle, 2010). However, no attempts have been made to explore this model among children suffering from underweight. In line with the model presented above, we proposed that the negative feeding interactions seen between children with FD and their mothers can be explained by elevated maternal worries regarding children’s underweight and undereating.

Current Study

In the current study, we investigated differences between families having children with FD and a comparison group regarding maternal worries about children’s underweight and undereating as well as mother–child interactions during child feeding. Specifically, we hypothesized that mothers of children with FD would express more worries about their children’s underweight and undereating than mothers in the control group. Furthermore, higher levels of maternal intrusiveness and lower levels of maternal structuring would be observed among the mother–child dyads in the FD group in comparison to the control group. Also, maternal worries about child underweight and undereating would mediate the links between group belonging (FD vs. control) and negative mother–child interactions. Specifically, mothers of children having FD would report

elevated levels of maternal worry about child underweight and undereating in comparison to control group mothers. This, in turn, would be linked to elevated levels of maternal intrusiveness and lower levels of maternal structuring. Finally, maternal worries about child underweight and undereating would moderate the links between child FD and mother–child interactions. Specifically, mother–child relationship would be more negative in families having children with FD, only when coupled with high maternal worries about child underweight and undereating.

Methods

Sample

Fifty-five children (ages 1–3 years, mean age = 1.94 years, $SD = 0.80$) and their mothers participated in the study. Thirty-seven participants were girls and 18 were boys. All participating children were from two-parent Hebrew-speaking families living in the southern region of Israel. The FD group included 27 children (M age = 1.85 years, $SD = 0.85$) diagnosed with NOFTT. Children were eligible to participate if they did not suffer from any developmental delays. In addition, organic or medical conditions that may explain the children's failure to gain weight were ruled out. Families from the FD group were recruited from the Pediatric Day Care Unit as well as the Infant Psychiatric Unit at the largest medical center in the southern region of Israel. The Infant Psychiatric Unit is a community-based outpatient clinic, treating 0- to 6-year-old children with emotional or psychiatric problems. Children's weight and height were measured and documented during their visit in the hospital in a weight follow-up session proximal to the NOFTT diagnosis. Weight measures were available for 24 children and height measures were available for 16 children from the FD group. Children's weight ranged between 5.86 and 11.80 kg (M weight = 8.90 kg, $SD = 1.57$). All children were below the 5th percentile or had dropped two major growth chart percentile lines. Weight percentiles ranged between the 0th and 9th percentile (M weight percentile = 1.73, $SD = 2.35$). One child's weight was on the 20th percentile. Children's height ranged between 66 and 88 cm (M height = 77.32 cm, $SD = 6.50$) and height percentiles ranged between the 0th and 66th percentiles (M height percentile = 17.37, $SD = 20.23$). The control group included 28 children (M age = 2.03 years, $SD = 0.76$) with no evidence of FD or other developmental difficulties who were matched to the FD group for age, gender, birth order, and maternal education. Families from the control group were recruited from mainstream daycare centers in the southern region of Israel.

Children's gestational age at birth ranged between 36 and 43 weeks ($M = 39.23$, $SD = 1.66$). There were no between-group differences in gestational age. However, children from the FD group had significantly [$t(51) = -2.60$, $p < .05$] lower birth weights ($M = 2,889$ g, $SD = 484.49$) than children from the control group ($M = 3,228$ g, $SD = 463.75$).

The majority of the mothers (92.7%) were born in Israel. The mothers' ages ranged from 21 to 42 years ($M = 31.67$ years, $SD = 5.46$). All mothers were married to the children's biological fathers. The number of children in the family ranged between one and five with the birth order of most participating children being the 1st (35%) and 2nd (37%). Parental education level was varied, with most mothers and fathers possessing a high-school education. No differences were found in terms of parental education between the FD group and the comparison group. None of the parents suffered from eating disorders or any other mental disorder.

Sixty percent of the families that were offered to participate in the study agreed to participate. The main reasons reported for refusal to participate were time constraints and lack of willingness to be videotaped and expose the family.

Procedure

The study received Helsinki Review Board approval, and all parents signed informed consent forms. Two researchers paid home visits to recruited families during the afternoon. During each 2–3 hr home visit, researchers interviewed one parent. The other parent participated in two interactions: parent–child feeding and parent–child play. In the current article, we reported results regarding the mother–child feeding interactions. Data regarding mother–child play interactions and data on father–child interactions have been reported elsewhere (Atzaba-Poria et al., 2010). Feeding interactions were scheduled for times when children would normally eat. One parent fed the child during afternoon snack time, at the beginning of the home visit, while the other parent fed the child at the end of the visit, at dinner time. Parents were instructed to offer the type of food representative of typical meals in their household. An average feeding interaction lasted 12 min. Children were given a small gift for their participation. All feeding sessions were videotaped and coded.

Measures

Maternal Worries

Mothers were interviewed using the “concern about infant undereating” scale from the Infant Feeding Questionnaire (IFQ; Baughcum et al., 2001) including three items

($\alpha = .69$): (a) “Did you worry that your infant was not eating enough?”; (b) “Was it a struggle to get your infant to eat?”; (c) “If you did not encourage your infant to eat, then he/she would not eat enough”. Mothers were asked to rate the items on 5-point Likert-type scales ranging from “disagree a lot” (1) through “agree a lot” (5) or from “never” (1) through “always” (5). In addition, mothers were interviewed using the “concern about infant’s weight” scale from The Child Feeding Questionnaire (CFQ; Birch et al., 2001) including three items. This subscale originally assesses parental worry about the child’s risk of becoming overweight. However, for the purpose of the present research, we revised the items to indicate parental worry about the child’s risk of becoming underweight ($\alpha = .91$): (a) “How worried are you about your child becoming underweight?”; (b) “How worried are you about your child eating too less when you are not around him/her?”; (c) “How worried are you about your child having to diet to maintain a desirable weight?”. Mothers rated the items on 5-point Likert-type scales ranging from “not worried” (1) through “very worried” (5).

Parent–Child Feeding Interaction

Mother–child interactions were coded using the third edition of the Emotional Availability Scale (EAS; Biringen, Robinson, & Emde, 1998). This scale measures the parent’s emotional signaling to the child and vice versa, as well as the parent’s ability to understand the child’s emotional experience (Biringen, 2000). All EAS subscales are viewed as “relationship variables” because each takes the other partner’s behavior into account. Thus, the EAS assesses specific behaviors of individuals but, simultaneously, constitutes global ratings of dyads and emphasize joint interactional styles (Biringen, 2000). Two EAS subscales were used: structuring and nonintrusiveness. Each subscale is coded on a Likert scale. Parent structuring (5-point scale) refers to the degree to which the parent appropriately structures the activity and sets limits when necessary. Parent nonintrusiveness (5-point scale) refers to the parent’s ability to be available to the child without exercising excess direction, stimulation or interfering with the child’s autonomy.

Three trained research assistants who did not participate in the data collection and who were blinded regarding information about the families coded the videotapes. For coding purposes, 20% of the videotapes were randomly selected and rated by all three trained coders. Interclass coefficients were calculated for each of the EA dimensions. All scales showed excellent interrater reliability (ranging from .91 to .99).

Maternal nonintrusiveness and structuring were highly correlated ($r = .82, p < .001$). Therefore, we summed these scales to create mother–child interaction composite scores.

Statistical Analysis

Three main types of analyses were used in this study: group mean differences, bivariate correlations, and multiple regressions. A priori power calculations were conducted using the G*power program (Faul, Erdfelder, Buchner, & Lang, 2009) for these analyses. Large effect sizes were expected based on previous findings in pediatric clinical samples (e.g., Dufton, Dunn, & Compas, 2009; Huss, Derefinko, Milich, Farzam, & Baumann, 2009), indicating Cohen’s d effect sizes greater than .80. It was found that 42 participants were required in order to detect a large ($d = .80$) difference between two independent samples’ means (i.e., first and hypothesis) when $\alpha = .05$ and 80% power was desired. In addition, it was found that as a large effect size (.35) was desired, and regression analyses were planned to involve not more than three predictors (i.e., second and third hypotheses), the minimum number of participants required was 20.

All variables were tested for normality using the Shapiro–Wilk test. The variables maternal worries about child undereating and underweight, as well as maternal structuring and nonintrusiveness were found to be not normally distributed. Therefore, nonparametric tests were applied. In order to examine the first and second hypothesis addressing group differences between the study variables, Mann–Whitney U-tests were used. Furthermore, the mediation hypotheses were examined in two steps. First, bivariate correlations between the independent, the mediator and the dependent variables were examined using Spearman rank correlation. The Bonferroni correction was used to account for the multiple comparisons. Specifically, a new p -value cutoff was obtained by dividing the original cutoff by 4, the number of comparisons. Only if these three variables were all significantly correlated with one another was there a reason to continue and test for mediation (Baron & Kenny, 1986). In the second step, accordingly, mediation effects were tested using a set of three multiple regressions as follows: (a) the independent variable predicts the mediator (FD \rightarrow maternal worry); (b) the independent variable predicts the dependent variable (FD \rightarrow mother–child interaction); (c) both the independent variable and the mediator together predict the dependent variable (FD + maternal worry \rightarrow mother–child interaction). Mediation is deemed present if the independent variable significantly predicts the mediator in the first equation; the independent variable significantly predicts

the dependent variable in the second equation; and the mediator provides significant independent prediction of the dependent variable in the third equation. Finally, the effect of the independent variable on the dependent variable must decrease upon the addition of the mediator to the model, i.e., in the third equation compared with the second (Baron & Kenny, 1986). Finally, the moderation hypotheses were tested in two stages. First, the independent variable and the moderator were centered (i.e., deviation scores were formed, as outlined in Jaccard, Turrisi, & Wan, 1990), and an interaction variable consisting of the product of the centered scores was computed. Following that analysis, hierarchical regression was used in order to test for moderation effects: in the first step, FD and maternal worry were entered. In the second step, the interaction variable was entered. Moderation was evident in those cases for which the interaction variable provided significant independent prediction.

Results

Preliminary Analyses

Due to significant group differences found in birth weight (as reported above), we evaluated possible correlations between birth weight and the model variables: maternal worries about child underweight and undereating and parent-child interactions. None of these correlations were significant.

Group Differences in Maternal Worry and Mother-Child Interaction

Mann-Whitney U-tests were conducted to examine the first hypothesis proposing group differences in maternal worries and mother-child interactions. As demonstrated in Table I, mothers of children with FD reported more worries about child underweight ($U = 135.5$, $p < .001$) and undereating ($U = 44.5$, $p < .001$). Furthermore, mother-child interactions were more intrusive and less structured in the FD group compared to the control group ($U = 231.5$, $p < .05$).

The Mediation Role of Maternal Worry

In order to examine the second hypothesis proposing that maternal worries about child underweight and undereating would mediate the links between group belonging (FD vs. control) and negative mother-child interactions, Spearman rank correlations were first calculated between FD, mother-child interaction, and the two maternal worry variables. These calculations enabled determination of which variables met the prerequisite criteria for mediation. Correlations involving child FD are point-biserial

Table I. Means and Standard Deviations of Study Variables

| Study variable | FD group M (SD) | Comparison group M (SD) |
|-------------------------------|--------------------|----------------------------|
| Worry about child undereating | 3.65 (0.78)*** | 1.90 (0.71)*** |
| Worry about child underweight | 3.41 (1.53)*** | 1.71(0.96)*** |
| Mother-child interactions | 6.63 (1.72)* | 7.69 (1.31)* |

* $p < .05$, *** $p < .001$.

correlations, as appropriate for dichotomous variables. Significant associations were found between child FD and maternal worries about child undereating ($r = .76$, $p < .001$) and between child FD and maternal worries about child underweight ($r = .56$, $p < .001$), indicating that mothers from the FD group reported higher levels of worry about their children's underweight and undereating than mothers from the control group. Furthermore, significant correlations were revealed between mother-child interactions and maternal worry about child undereating ($r = -.26$, $p < .05$) and maternal worry about child underweight ($r = -.26$, $p < .05$). These correlations remained significant after applying the Bonferroni correction. As illustrated above, both potential mediating variables met all three terms for examining the mediation model. Thus, mediation model was tested using hierarchical regression analyses. As shown in Table II, analysis indicated that maternal worry about child underweight acted as a mediator in the links between child FD and mother-child interactions. Specifically, FD was linked to elevated levels of maternal worry about child underweight, which in turn, was linked to mother-child interactions. FD was also linked directly to mother-child interactions. However, after taking into account maternal worry about child underweight, the direct effect between FD and mother-child interactions was no longer statistically significant, indicating a mediation (Baron & Kenny, 1986). On the contrary, maternal worry about child undereating did not act as a mediator (Table II).

Maternal Worry as a Moderator

Hierarchical regression analyses were conducted to test the third hypothesis, investigating whether the links between FD and parent-child interactions differed by levels of maternal worry about child underweight and undereating. As demonstrated in Table III, the interaction term of maternal worry about child underweight \times child FD significantly predicted mother-child interaction. This finding indicates that maternal worry about child underweight acted as a moderator in the link between child FD and mother-child interaction (Table III). In order to further examine the nature of this interaction, the sample was first divided

Table II. Hierarchical Regression Analysis for Testing Maternal Worry about Child Underweight and Undereating as Mediators of the Link Between Child Feeding Disorders as the Independent Variable and Mother–Child Interactions as the Dependent Variable

| Steps | Outcome | Predictors | β | R^2 | F |
|---|---------------------------|-------------------------|---------|-------|----------|
| Regression 1: Worry about underweight as a mediator | | | | | |
| 1. | Worry about underweight | Feeding disorder | .56*** | .31 | 24.61*** |
| 2. | Mother–child interactions | Feeding disorder | –.33* | .11 | 6.43* |
| 3. | Mother–child interactions | Feeding disorder | –.14 | .18 | 5.58** |
| | | Worry about underweight | –.32* | | |
| Regression 2: Worry about undereating as a mediator | | | | | |
| 1. | Worry about undereating | Feeding disorder | .76*** | .59 | 76.38*** |
| 2. | Mother–child interactions | Feeding disorder | –.33* | .11 | 6.42* |
| 3. | Mother–child interactions | Feeding disorder | –.30 | .11 | 3.16* |
| | | Worry about undereating | –.03 | | |

* $p < .05$, ** $p < .01$, *** $p < .001$

Table III. Hierarchical Regression Analysis for Testing Maternal Worry about Child Underweight and Undereating as Moderators of the Link Between Child Feeding Disorders as the Independent Variable and Mother–Child Interactions as the Dependent Variable

| Steps | Outcome | Predictors | β | R^2 | F |
|--|---------------------------|---|---------|-------|---------|
| Regression 1: Worry about underweight as a moderator | | | | | |
| 1. | Mother–child interactions | Feeding disorder | –.14 | .18 | 5.58** |
| | | Worry about underweight | –.32* | | |
| 2. | Mother–child interactions | Feeding disorder | –.25 | .23 | 6.33*** |
| | | Worry about underweight | –.14 | | |
| | | Feeding disorder \times Worry about underweight | –.34* | | |
| Regression 2: Worry about undereating as a moderator | | | | | |
| 1. | Mother–child interactions | Feeding disorder | –.30 | .11 | 3.16* |
| | | Worry about undereating | –.03 | | |
| 2. | Mother–child interactions | Feeding disorder | –.31 | .11 | 2.21 |
| | | Worry about underweight | –.02 | | |
| | | Feeding disorder \times Worry about underweight | –.08 | | |

* $p < .05$, ** $p < .01$, *** $p < .001$

into “low worry about child underweight” and “high worry about child underweight” groups using a median split. Mean group differences were examined for the four groups (high and low maternal worry \times FD and control groups). The results pattern was clear: The lowest mother–child interaction scores appeared for dyads in the FD group only when coupled with mothers reporting high worries about child weight. When mothers reported low worries about child underweight, mother–child were not less positive than those in comparison families (Figure 1). Finally, the interaction term “child FD \times maternal worry about child undereating” was not significant, indicating no moderation effects.

Discussion

This study examined the role of maternal worries in the link between child FD and mother–child feeding interactions. Maternal worry about child underweight explained

part of the process by which negative feeding interactions develop among children with feeding disorders and their mothers. Results are discussed in light of previous research on childhood obesity and ecological perspectives emphasizing multiple environmental influences that may explain the significant role maternal worry about child weight has in the context of child FD.

Group Differences in Maternal Worries and Mother–Child Interactions

The first hypothesis regarding group differences in maternal worries and mother–child feeding interactions was confirmed. Mothers of children with FD were more intrusive and less structuring in feeding interactions with their children compared to mothers from the control group. These findings highlight how mother–child relationship difficulties may be nested in child feeding problems, as described in our previous report (Atzaba-Poria et al., 2010). Furthermore, mothers of children with FD reported more

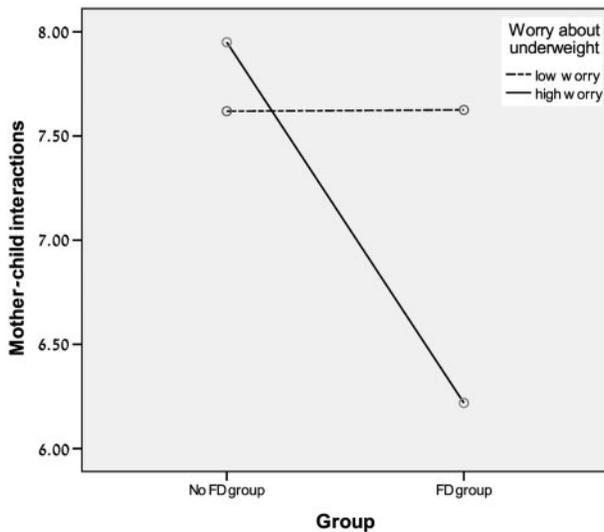


Figure 1. Mean levels of mother-child feeding interactions for low and high maternal worry about child underweight in children with FD and children without FD.

worries about their children's underweight and undereating compared to mothers from the control group. These findings are salient considering findings from past studies indicating that parental worry may commemorate children's problematic behavior. It was found that among children with health problems, parental worries about specific child health issues may evoke maladaptive parental behaviors around the child's problem. For example, among adolescents suffering from chronic pain, higher parental worries about their children's health were associated with parents' use of more pain promoting behaviors, such as permission to stay home from school, not complete homework or chores, or to receive extra attention from the parent (Guite, Logan, McCue, Sherry, & Rose, 2009). Furthermore, research focusing on childhood obesity indicated that maternal worry about the child becoming overweight was linked with more restriction of child food intake, especially of energy-dense snack foods (Francis, Hofer, & Birch, 2001; May et al., 2007; Webber et al., 2010), a feeding strategy that has been found to increase children's consumption of these restricted foods (Fisher & Birch, 1999). The current study focuses on mother-child interaction as a main component of FD and examines the links between maternal worries about children's underweight and undereating and mother-child feeding interactions.

Maternal Worries and Mother-Child Feeding Interactions

While previous studies focused on finding group differences in mother-child feeding interactions between

children with FD and healthy children (e.g., Chatoor et al., 1988; Sanders et al., 1993) or correlates between infant and maternal characteristics and mother-child feeding interactions among children with FD (e.g., Ammaniti et al., 2004), our investigation sought to reveal a possible process putting children with FD at high risk for negative mother-child feeding interactions. Our second hypothesis regarding the mediating role of maternal worry about child underweight was confirmed. It was found that mothers of children with FD expressed more worry about their children's underweight. In turn, the heightened maternal worries were linked to higher levels of maternal intrusiveness and lower levels of maternal structuring during feeding. These results support Costanzo and Woody's model (1985) and elaborate previous findings regarding childhood obesity (May et al., 2007; Webber et al., 2010) suggesting that the links between maternal worries about child weight and maternal behavior during child feeding are seen not only for children with overweight problems, but also for children with underweight problems. These findings imply that childhood overweight and underweight problems may be explained by similar processes. Our third hypothesis concerning the moderating role of maternal worry about child underweight was confirmed as well. We found that the combination between child FD and elevated maternal worries about child weight resulted in the most negative feeding interactions, while low worries about child weight may act as a buffer, protecting children having FD from difficulties in parent-child feeding interaction. The moderation process described above may be explained by Belsky's (1984) determinants of parenting model. According to this model, parenting is influenced by three domains: child characteristics, parent's psychological resources, and contextual sources of stress and support. The model presumes that when parts of these determinants are at risk, parental psychological resources are most effective in buffering negative influences on the parent-child relationship (Belsky, 1984). Our results confirm Belsky's model in the context of child FD. Having a child with FD puts the mother-child relationship at risk for more negative feeding interactions. However, when mothers manage to maintain their psychological resources, and are not overwhelmed by worries about their children's weight, the mother-child feeding relationship remains positive, and does not differ from dyads of healthy developed children.

It is noteworthy to point out that these mediation and moderation models were seen when considering worry about child underweight but not about undereating. One possible explanation is that child weight plays an immense role in Western cultures. Growth charts are used routinely to assess child health and development, and as a result,

parents attribute great importance to them (Wright & Weaver, 2007). A review of parental perceptions of infant size and growth indicated that infant weight may be viewed as a marker of parental competence, as reflected in maternal feelings of guilt in reaction to infant underweight (Lucas et al., 2007). Maternal perceptions and behavior regarding infants' weight may be viewed in light of Bronfenbrenner's (1979) ecological theory that considers how the immediate environment, as well as how aspects of the larger context influence the individual and his or her immediate setting. Issues concerning child weight are highly salient in all ecological levels surrounding mothers. For example, mothers are influenced by information about infant weight provided by close family (Baughcum, Burklow, Deeks, Powers, & Whitaker, 1998), pediatric health professionals (Black, 2009) mass media (Sherratt, Johnson, & Holmes, 1991), and online Internet sites (Plantin & Daneback, 2009). In addition, from a cultural point of view, insufficient growth in infancy has been historically associated with childhood morbidity and mortality, raising public and government awareness to the importance of growth surveillances in infancy (Wright & Weaver, 2007). These multilayered influences may explain the significant role child weight-related worries have in maternal feeding behaviors.

Study Limitations and Future Research

The study's findings should be considered in light of a few limitations. First, the current study employed a cross sectional research design. We presume that child FD led to heightened maternal worries about child underweight which in turn led to negative mother–child feeding interactions. Longitudinal designs are necessary in order to determine the direction of these links. Second, due to our focus on maternal worries, we did not interview fathers regarding their worries about child weight and underfeeding. The inclusion of paternal reports and examination of father–child feeding interactions may shed light on the role of fathers in child FD. In addition, growth parameters were available only for the FD group, and therefore such parameters were not included in the statistical analyses. In future research, including actual growth parameters will enable a more profound examination of the relationships between growth status, maternal worries and mother–child feeding interactions. Finally, our novel finding suggesting similar processes for children having under or over weight highlights the need for future research to systematically compare parent–child feeding interactions between children with FD and children with childhood obesity.

Clinical Implications

The present study focused on a clinical group of children suffering from severe feeding difficulties associated with poor weight gain. These children are at high risk for severe physical and mental consequences. Therefore, efficient early intervention programs are highly essential for these children. Findings from the current study draw attention to two main issues that should be addressed in clinical interventions programs for children with FD. First, clinicians should recognize maternal worries about their children's weight and health and assist mothers in relieving their emotional burden associated with their heightened worries. Second, after acknowledging maternal worries, intervention programs should shift the focus away from child weight surveillance to promoting mothers' sensitive, structured feeding interactions with their children.

Conflicts of interest: None declared.

References

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- Ammaniti, M., Ambrozzi, A. M., Lucarelli, L., Cimino, S., & D'Olimpio, F. (2004). Malnutrition and dysfunctional mother–child feeding interactions: Clinical assessment and research implications. *Journal of the American College of Nutrition*, 23(3), 259–271.
- Atzaba-Poria, N., Meiri, G., Millikovsky, M., Barkai, A., Dunaevsky-Idan, M., & Yerushalmi, B. (2010). Father–child and mother–child interaction in families with a child feeding disorder: The role of paternal involvement. *Infant Mental Health Journal*, 31(6), 682–698.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Bauchner, H. (2007). Failure to thrive. In R. M. Kliegman, R. E. Behrman, H. B. Jenson, & B. M. D. Stanton (Eds.), *Nelson textbook of pediatrics* (18th ed., pp. 184–187). Philadelphia: W.B Saunders.
- Baughcum, A. E., Burklow, K. A., Deeks, C. M., Powers, S. W., & Whitaker, R. C. (1998). Maternal feeding practices and childhood obesity: A focus group study of low-income mothers. *Archives of Pediatrics and Adolescent Medicine*, 152(10), 1010–1014.

- Baughcum, A. E., Powers, S. W., Bennett Johnson, S., Chamberlin, L. A., Deeks, C. M., Jain, A., & Whitaker, R. C. (2001). Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *Journal of Developmental & Behavioral Pediatrics*, 22(6), 391–408.
- Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, 55, 83–96.
- Birch, L. L., Fisher, J. O., Grimm-Thomas, K., Markey, C. N., Sawyer, R., & Johnson, S. L. (2001). Confirmatory factor analysis of the child feeding questionnaire: A measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*, 36(3), 201–210.
- Biringer, Z. (2000). Emotional availability: Conceptualization and research findings. *American Journal of Orthopsychiatry*, 70(1), 104–114.
- Biringer, Z., Robinson, J. L., & Emde, R. N. (1998). *The Emotional Availability Scales* (3rd ed.). Fort Collins: Department of Human Development and Family Studies, Colorado State University.
- Black, M. M. (2009). Failure to thrive. In M. C. Roberts, & R. G. Steele (Eds.), *Handbook of pediatric psychology* (4th ed., pp. 499–509). New York: Guilford Press.
- Borkovec, T. D., Ray, W. J., & Stober, J. (1998). Worry: A cognitive phenomenon intimately linked to affective, physiological, and interpersonal behavioral processes. *Cognitive Therapy and Research*, 22(6), 561–576.
- Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy*, 21(1), 9–16.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge: Harvard University Press.
- Chatoor, I., Egan, J., Getson, P., Menvielle, E., & O'Donnell, R. (1988). Mother–infant interactions in infantile anorexia nervosa. *Journal of American Academy of Child & Adolescent Psychiatry*, 27(5), 535–540.
- Chatoor, I., Hirsch, R., & Persinger, M. (1997). Facilitating internal regulation of eating: A treatment model for infantile anorexia. *Infants & Young Children*, 9(4), 12–22.
- Chatoor, I., & Macaoay, M. (2008). Feeding development and disorders. In M. M. Haith, & J. B. Benson (Eds.), *Encyclopedia of infant and early childhood development* (pp. 524–533). New York: Academic Press.
- Costanzo, P. R., & Woody, E. Z. (1985). Domain-specific parenting styles and their impact on the child's development of particular deviance: The example of obesity proneness. *Journal of Social & Clinical Psychology*, 3(4), 425–445.
- Dufton, L. M., Dunn, M. J., & Compas, B. E. (2009). Anxiety and somatic complaints in children with recurrent abdominal pain and anxiety disorders. *Journal of Pediatric Psychology*, 34(2), 176–186.
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149–1160.
- Fisher, J. O., & Birch, L. L. (1999). Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *American Journal of Clinical Nutrition*, 69, 1264–1272.
- Francis, L. A., Hofer, S. M., & Birch, L. L. (2001). Predictors of maternal child-feeding style: Maternal and child characteristics. *Appetite*, 37(3), 231–243.
- Guite, J. W., Logan, D. E., McCue, R., Sherry, D. D., & Rose, J. B. (2009). Parental beliefs and worries regarding adolescent chronic pain. *The Clinical Journal of Pain*, 25(3), 223–232.
- Huss, D., Derefinko, K., Milich, R., Farzam, F., & Baumann, R. (2009). Examining the stress response and recovery among children with migraine. *Journal of Pediatric Psychology*, 34(7), 707–715.
- Jaccard, J., Turrisi, R., & Wan, C. K. (1990). *Interaction effects in multiple regression*. Newbury Park: Sage Publications.
- Lindberg, L., Bohlin, G., Hagekull, B., & Palmerus, K. (1996). Interactions between mothers and infants showing food refusal. *Infant Mental Health Journal*, 17(4), 334–347.
- Linscheid, T. R., Budd, K. S., & Rasnake, L. K. (2009). Pediatric feeding problems. In M. C. Roberts, & R. G. Steele (Eds.), *Handbook of pediatric psychology* (4th ed., pp. 481–498). New York: Guilford Press.
- Lucas, P., Arai, L., Baird, J., Kleijnen, J., Law, C., & Roberts, H. (2007). A systematic review of lay views about infant size and growth. *Archives of Disease in Childhood*, 92, 120–127.
- May, A. L., Donohue, M., Scanlon, K. S., Sherry, B., Dalenius, K., Faulkner, P., & Birch, L. L. (2007). Child-feeding strategies are associated with maternal concern about children becoming overweight, but not children's weight status. *Journal of the American Dietetic Association*, 107(7), 1167–1175.
- Plantin, L., & Daneback, K. (2009). Parenthood, information and support on the internet. A literature review

- of research on parents and professionals online. *BMC Family Practice*, *10*, 34–46.
- Robinson, J. R., Drotar, D., & Boutry, M. (2001). Problem-solving abilities among mothers of infants with failure to thrive. *Journal of Pediatric Psychology*, *26*(1), 21–32.
- Sanders, M. R., Patel, R. K., Le Grice, B., & Shepherd, R. W. (1993). Children with persistent feeding difficulties: An observational analysis of the feeding interactions of problem and nonproblem eaters. *Health Psychology*, *12*, 64.
- Satter, E. (1986). The feeding relationship. *Journal of the American Dietetic Association*, *86*, 352–356.
- Sherratt, F., Johnson, A., & Holmes, S. (1991). Responding to parental concerns at the six-month stage. *Health Visitor*, *64*(3), 84–86.
- Webber, L., Hill, C., Cooke, L., Carnell, S., & Wardle, J. (2010). Associations between child weight and maternal feeding styles are mediated by maternal perceptions and concerns. *European Journal of Clinical Nutrition*, *64*, 259–265.
- Wright, C. M., & Weaver, L. T. (2007). Image or reality: Why do infant size and growth matter to parents? *Archives of Disease in Childhood*, *92*(2), 98–100.