Associations Among the Perceived Parent–Child Relationship, Eating Behavior, and Body Weight in Preadolescents: Results from a Community-based Sample

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Objective Data on associations between the parent–child relationship, eating behavior, and body weight in a community-based sample of preadolescent children are presented. The aim of our study was to replicate the finding from clinical samples that families of overweight children demonstrate adverse characteristics of the parent–child relationship. **Methods** A community-based sample of 373 fourth-grade students was given self-report questionnaires on the perceived parent–child relationship and on eating behavior, and each child's height and weight was measured. **Results** No meaningful associations between children's body weight and the parent–child relationship were apparent. Deviant eating behavior was strongly linked to an adverse parent–child relationship irrespective of children's body weight. **Conclusions** It is suggested that previous findings from clinical samples of overweight children cannot simply be generalized to the population of overweight children and that deviant eating behavior, not overweight itself, is linked to an adverse parent–child relationship in preadolescent children.

Key words childhood obesity; eating behaviour; overweight; parent–child relationship; rearing behaviour.

Childhood overweight is a major public health concern. To date, there is still only modest empirical evidence on etiological factors to base effective treatments on (US Preventive Services Task Force, 2005; Whitlock, Williams, Gold, Smith, & Shipman, 2005). The long-term effectiveness of existing treatments is rather discouraging (Summerbell et al., 2003), whereas the prevalence rates of overweight are still increasing (e.g., Ogden et al., 2006 for the US; Kromeyer-Hauschild & Zellner, 2007 for German data).

Body mass index [BMI = weight (kg)/height $(m)^2$] is the simplest and most common assessment tool for categorizing overweight, but the appropriate cut-off points for designation of overweight in childhood are critical. A BMI at or above the 95th percentile of age- and gender-specific national reference data is recommended [e.g., by the American Academy of Pediatrics (AAP)] for the use in the US, whereas for German children, the European Childhood Obesity Group and the national German Taskforce on Childhood Obesity recommend a BMI at or above the 90th percentile for age and gender.

Since overweight is not considered an eating disorder, mainly biological and psychosocial factors like socio-economic status (SES), other sociodemographic data, or parental weight status are discussed in the context of its multifactorial etiology, while psychological factors like the parent–child relationship are considered less frequently. The family itself is seen as crucial factor in the development of childhood overweight because parents provide both the eating and activity environments for their children. Existing findings on psychological characteristics of families with overweight children are

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rarely thoroughly discussed. For example, the AAP briefly states ''Environmental risk factors for overweight and obesity, including family and parental dynamics, are numerous and complicated.'' (AAP, 2003).

As a result of prospective research, neglect in childhood was strongly linked to overweight in early adulthood (Johnson, Cohen, Kasen, & Brook, 2002; Lissau & Sørensen, 1994). Cross-sectional studies suggest less cohesion in families with overweight children compared to families with normal weight children (Banis, Varni, Wallander, & Korsch, 1988; Beck & Terry, 1985; Mendelson, White, & Schliecker, 1995). Further, a lack of care and emotionally warm relationships with the overweight child (Hammar et al., 1972; Kinston, Loader, Miller, & Rein, 1988; Turner, Rose, & Cooper, 2005) and a markedly increased rate of insecure attachment styles among mothers of overweight children have been reported (Trombini et al., 2003). Tension, conflicts, marital dissatisfaction, hostility, and loud arguments are reported to be more prevalent (Banis et al., 1988; Beck & Terry, 1985; Hammar et al., 1972; Johnson et al., 2002; Kinston et al., 1988). Furthermore, a higher level of parental control (interpreted as rigidity) and dominance is described (Banis et al., 1988; Wilkins, Kendrick, Stitt, Stinett, & Hammarlund, 1998; Mendelson et al., 1995; Moens, Braet, & Soetens, 2007; Valtolina & Ragazzoni, 1995). The presence of harsh maternal punishment was prospectively associated with the development of overweight in girls (Johnson et al., 2002). Using rather undifferentiated scores from measures of family functioning (i.e., total scores derived from summing different subscale scores), families with overweight children did not (Klesges et al., 1992; Wilkins et al., 1998) or only in part differ from families with normal weight children (Kinston, Loader, & Miller, 1987).

There is growing evidence that treatment for pediatric overweight is enhanced by parent involvement (Beech et al., 2003; Jelalian & Saelens, 1999). Family-based treatments mainly involve parents in attempts to change children's weight-related behavior, while only few target general parental skills and family functioning (Kitzmann & Beech, 2006). However, Golan and Crow (2004) suggested that the effectiveness of behavioral child management strategies taught to parents is likely to vary depending on the broader family context of parental relationships with the overweight child. This statement is supported by Stein, Epstein, Raynor, Kilanowski, and Paluch (2005) who reported that the change in paternal acceptance versus rejection during treatment was strongly associated with the effectiveness of a behavioral family-based pediatric overweight treatment (even though these results do not allow for causal interpretation of effects).

Except for Mendelson et al. (1995), the summarized findings are limited to clinical samples of overweight children seeking for treatment. Further research on community-based samples of overweight children is lacking. As indicated by extensive reviews of the literature, overweight children seeking for treatment might represent a selective subgroup of overweight children with e.g., increased psychiatric comorbidity and lower self-esteem (Zametkin, Zoon, Klein, & Munson, 2004). Thus, clinical- and community-based samples of overweight children may differ in their representativeness. The increased generalizability of findings from community-based samples is an important advantage over clinical samples.

Therefore, the aim of our study was to replicate the summarized findings from clinical samples in a community-based sample of overweight children. Because childhood overweight is a complex multicausal phenomenon, we assumed that the hypothesized unfavorable family characteristics would not be present in all families of overweight children but in a certain subgroup only. Own previous research suggested that differentiation of subgroups of overweight children based on psychological eating behavior patterns might be a promising approach to account for the heterogeneity of possible pathways leading to overweight in children (Schacht, Richter-Appelt, Schulte-Markwort, Hebebrand, & Schimmelmann, 2006). In the literature, there is consensus on three established general psychological dimensions of eating behavior: *emotional eating* (i.e., eating as a form of coping with emotional distress), *external eating* (describing eating in response to external stimuli), and *dietary restraint* (Stunkard & Messik, 1985; Van Strien, Frijters, Bergers & Defares, 1986). Previous research on these eating behaviors in children resulted in no consistent empirical evidence of differences in eating patterns between overweight and normal weight children. This might be explainable by the lack of age appropriate measures with some researchers using adult questionnaires with children (Breat & Van Strien, 1997) or parent-rated versions of questionnaires on children's eating behavior instead (de Lauzon et al., 2004). In contrast, the use of the Eating Pattern Inventory for Children, a new age appropriate self-report questionnaire on psychological dimensions of eating behavior in preadolescent children, allowed for differentiation of deviant eating behavior in overweight children (Schacht et al., 2006) and for generation of the following hypothesis.

The hypothesis of the present study was that children's body weight would not be predictable by

knowing the perceived parent–child relationship only, but that there would be a significant interaction effect between the perceived parent–child relationship and the presence of deviant eating behavior on body weight. We expected that an adverse parent–child relationship might only affect the body weight of children with deviant eating behavior.

Method

The sample consists of children in grade 4 from a representative sample of 12 randomly selected public elementary schools in Hamburg, Germany. Participants were recruited from November 2004 to January 2005. Written information about the study was sent home to parents and written informed consent was requested, which had to be presented on the respective day of testing. The children completed the questionnaires in the classroom during regular school lessons. Afterwards, all children were measured and weighed. The instructions for filling out the questionnaires were given carefully, emphasizing confidentiality and that there were no right or wrong answers. The children were encouraged to ask questions related to any item they did not understand. During the completion of the questionnaires, the children were stopped from talking to each other but they could at any time ask the investigator questions. The investigator was present all the time and closely monitored the children. In each school class, the children got excited or even uncomfortable during the weighing procedure and actively compared weights afterwards. Anticipating these reactions, the weighing was precautionary not done until the children entirely finished answering the questionnaires and the children were weighed one by one in a separate room to ensure privacy and confidentiality. The respective weight and height data were strictly given to the individual child only. An immediate feedback regarding the corresponding age and gender-specific BMI percentile of the individual body weight was offered. For the parents, the investigator's contact address and the offer to give feedback regarding the children's body weight were provided along with the written information sent home before. The study was approved by the local board of education and the local ethics committee.

Measures

Perceived Parent–Child Relationship

The Parent–Child Relationship Inventory for Children (PI-C; Schacht, Richter-Appelt, & Schimmelmann, 2007, see journal website and Appendix) was used. This age appropriate 22-item self-report questionnaire assesses the dimensions *care* (e.g., ''My family likes to spend time with me''), *control* (e.g., ''In my family, there are clear rules how I have to behave''), *lack of limitations* (e.g., ''My family allows me everything that I want''), *confidence* (e.g., ''My family trusts me to do certain things without their help''), and *conflict/rejection* (e.g., ''My family often complains about me''). The PI-C is a theoretically derived instrument with satisfactory psychometric properties (Schacht et al., 2007), which had been developed for the use in this study. Item and factor analysis were based on the same sample as used in this study. The original factor analysis was performed by means of principal component method of extraction followed by oblique rotation (using direct oblimin method). The eigenvalue-criterion (eigenvalues >1) as well as the Scree-test suggested a 5-factor solution to best fit the data. Only items with factor loadings of at least .60 on the assigned factor, factor loadings not exceeding .32 on factors not assigned to (according to 10% overlap of variance), item discrimination indices of at least .40 (computed as corrected item-total correlations), and item difficulties ranging between .05 and .95 were selected from the original item pool of 66 items. The five factors explained 53.8% of the total item variance. Internal consistencies as computed by means of Cronbach's α (using part-whole correction) were .76 for *care*, .77 for *control*, .76 for *lack of limitations*, .70 for *confidence*, and .58 for *conflict/rejection*, respectively. At present, the PI-C is the only German self-report measure available, which assesses how preadolescent children perceive the relationship with their parents but is still practicable in research settings.

Weight and Height

Each child's height was measured (without shoes, using a portable measuring scale accurate to 0.5 cm) and weight recorded (using a Soehnle digital scale accurate to 100 g).

Eating Behavior

The Eating Pattern Inventory for Children (EPI-C; Schacht et al., 2006) was used to assess psychological dimensions of eating behavior in children. The EPI-C is an age appropriate psychometrically sound 20-item self-report questionnaire with the dimensions dietary restraint (e.g., ''It is always on my mind that I weigh too much''), external eating, i.e., eating in response to food-related stimuli regardless of internal states of hunger and satiety (e.g., ''When I see someone eat, I also get hungry''), parental pressure to eat (e.g., ''At home I must eat whatever is put on the table''), and emotional eating, i.e., eating as a form of coping with emotional distress (e.g., ''Eating helps me when I am disappointed''). The EPI-C had also been developed for the

use in this study. A German inventory for adolescents that translates to the Eating Behavior and Weight Problems Inventory for Children (EWI-C; Diehl, 1999) was used as a basis for the development of an appropriate version for younger children. Item and factor analysis were based on the same sample as used in this study. The original factor analysis was performed by means of principal component method of extraction followed by oblique rotation (using direct oblimin method). The eigenvalue-criterion (eigenvalues >1) as well as the Scree-test suggested a 4-factor solution to best fit the data. Criteria for item selection from the original item pool of 39 items correspond to the criteria that were used for the development of the PI-C (see above). Internal consistencies as computed by means of Cronbach's α (using part-whole correction) were .93 for *dietary restraint*, .74 for *external eating*, .72 for *parental pressure to eat*, and .80 for *emotional eating*, respectively. These factors explained 62.0% of the total item variance. This measure is, at present, the only German self-report questionnaire on psychological dimensions of eating behavior in preadolescent children.

Sociodemographic Data

The children answered questions about age, gender, and their family composition (i.e., presence of a father or substitute father, presence of a mother or substitute mother, number of siblings, and number of additional family members). Substitute parents included not only stepfathers and stepmothers, but any father and mother figures permanently living with the child. SES was estimated for each school according to the official classification of the districts' SES (a complex index based on numerous social indicators, e.g., mean income, unemployment rates, mean educational level). SES was classified as lower (representing the lower 25% of the index distribution), medium (26–74%), or upper (75–100%) status.

Data Analysis

The overall percentage of missing values was very low (<0.01%), two cases with >5% missing values were deleted. The remaining missing values were replaced by median item scores. Three cases were identified as multivariate outliers and were also deleted. All analyses are based on the same remaining sample size.

Based on weight and height, body mass indices were calculated [BMI = weight (kg)/height $(m)^2$]. In accordance with guidelines recommended by the European Childhood Obesity Group and the national German Taskforce on Childhood Obesity, overweight was defined as BMI above the 90th percentile of the age- and gender-specific recent national reference data (Kromeyer-Hauschild et al., 2001). As BMI in children is known to be skewed toward higher values, standard deviation scores (BMI-*SD*s, $M = 0$, $SD = 1$) for nonnormally distributed variables were calculated following the LMS-method provided by Cole (1990).

The EPI-C is a continuous measure of eating behavior. In addition, a categorical cut-off score was sought to separate normal from deviant eating behavior. The sample size and representativeness of our sample were satisfactory (see below) and allowed for calculation of standardized norm values. We used percentile scores, since the raw subscale scores differed slightly but significantly from a normal distribution. Accordingly, the 85th percentile was used as a cut-off for deviant eating behavior for each of the subscales *dietary restraint* (85th percentile: 2.75), *external eating* (2.60), and *emotional eating* (2.00). Thus, the upper 15% of the empirical distribution of raw scores in the norm sample were classified as deviant. In a final step, the children's eating behavior was categorized as deviant if at least one of those three EPI-C subscales scores corresponded to or exceeded the 85th percentile of the whole sample. Thus, deviant eating behavior means deviance from the mean of the norm sample and is not indicative of clinical eating disorders.

Effect sizes (*d*) were computed as mean differences divided by pooled standard deviations. EPI-C- and PI-C-subscale scores were computed as mean item score for each scale as the number of items varied. Numerical data are given as means (*SD*).

Linear associations between body weight and (a) the parent–child relationship and (b) eating behavior were analyzed by means of two separate linear regression analyses with continuous body weight in BMI-*SD*s as the dependent variable. Independent variables consisted of the PI-C and EPI-C subscale scores, respectively.

A cluster analysis was performed to allow for analyses of nonlinear associations between body weight and the parent–child relationship. Relationship clusters were extracted by means of Ward's method of hierarchical cluster analysis using squared Euclidean distance measure. Variables entered were *z*-transformed PI-C subscale scores. The optimal number of clusters was evaluated by inspection of distance coefficients of consecutively joined clusters (with the stage before a sudden jump in distance values indicating the optimal stopping point for merging clusters, a procedure analogous to the Scree-test for factor extraction in factor analysis; Lathorp & Williams, 1990). The cluster membership was then used as independent variable in one-way analysis of variance with continuous BMI-*SD*s as the dependent variable. In order to control

for confounding variables, 2-factor analyses of variance were performed with gender and the (categorized) presence of deviant eating behavior as independent variables, respectively.

Results

Sample Characteristics

Altogether, 373 children participated in the study. The data of five cases were deleted (see above), leaving a remaining sample size of $N = 368$. The percentage of children for whom written informed consent was available, who were present on the day of testing and willing to participate in the study was 58.6% of all eligible children. About one-third of families (36.5%) denied consent, another 18 children for whom written informed consent was available were either absent on the day of testing (4.0%) or denied participation (0.8%). Sample characteristics are displayed in Table I.

The mean BMI of all children was 17.9 (2.8) kg/m^2 (range 12.8–29.5 kg/m^2). The distribution of the respective percentile scores ranged from 0.7 to 99.7 and the mean BMI corresponds to the 55th percentile of the German reference group. Using recommended criteria, 57 children (15.5%) were classified as overweight (Table I).

Table I. Sample Characteristics ($N = 368$)

	N	%
Gender		
Boys	164	44.6
Girls	204	55.4
Age		
8-years old	2	0.5
9-years old	196	53.3
10-years old	156	42.4
11-years old	14	3.8
Socio-economic status		
Upper SES	108	29.3
Medium SES	148	40.2
Lower SES	112	30.4
Family composition		
Living with both biological parents	279	75.8
Living with single mother	70	19.0
Living with single father	3	0.8
Living with parent and new partner	14	3.8
Living with siblings	278	75.5
Living with additional family members	35	9.5
Body weight[a]		
Underweight	32	8.7
Normal weight	279	75.8
Overweight	57	15.5

[a]<15th percentile, underweight; 15th–90th percentile, normal weight; >90th percentile, overweight; percentiles based on age- and gender-specific recent national reference data (Kromeyer-Hauschild et al., 2001).

Body Weight and the Parent–Child Relationship

No meaningful group differences in the Parent–Child Relationship Inventory subscale scores were apparent between overweight and nonoverweight children except for the confidence subscale with overweight children reporting slightly less perceived confidence (Table II).

A linear regression was performed between continuous body weight in BMI-*SD*s as the dependent variable and the PI-C subscale scores as independent variables. Altogether, a small proportion of 3.1% (1.7% adjusted) of the variance in body weight was predicted by the PI-C subscale scores (though statistically significant, with $F(5, 362) = 2.30$, $p = .05$). Cluster analysis of the children based on their PI-C subscale scores resulted in a 6-cluster solution. The characteristics of the *disregarded* children ($n = 120$), children reporting a *contradictory* parent–child relationship ($n = 60$), children reporting an *optimal* parent–child relationship ($n = 59$), children reporting the relationship with their parents as *affectionless control* ($n = 48$; the term refers to Parker, Tupling, & Brown, 1979), children who seem to be *idealized* by their parents ($n = 58$), and children who feel *rejected* by their parents ($n = 23$) are displayed in Fig. 1.

These relationship subgroups were neither significantly associated with the frequency of overweight in children nor did children's BMI-*SD*s significantly differ between the subgroups in one-way analysis of variance. This lack of associations could not be explained by possibly diverging effects of children's gender, which was analyzed by means of a 2-factor analysis of variance.

Table II. Group Differences in the Parent–Child Relationship Inventory Subscale Scores Between Overweight and Nonoverweight Children

	Weight groups[a]			
PI-C subscales	Overweight children $n = 57$	Nonoverweight children $n = 311$	p[b]	*d*
Care	3.19 (0.34)	3.18 (0.32)	.80	0.03
Control	2.77 (0.88)	2.62 (0.76)	.22	0.19
Lack of limitations	2.10 (0.63)	2.11 (0.57)	.90	0.02
Confidence	3.14 (0.56)	3.27 (0.44)	.05	0.28
Conflict/Rejection	1.88 (0.56)	1.75 (0.57)	.11	0.23

[a]Body weight > 90th percentile, overweight; body weight < 90th percentile, nonoverweight. Percentiles are based on age- and gender-specific recent national reference data (Kromeyer-Hauschild et al., 2001).
[b]*p*-values are derived from *t*-tests for independent samples.

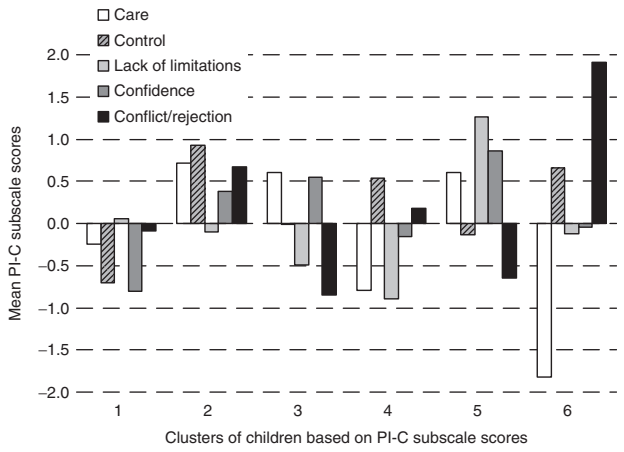

Figure 1. Clusters of children based on the self-reported perceived parent–child relationship. Note: Clusters are based on *z*-transformed mean Parent–Child Relationship Inventory for Children (PI-C) subscale scores ($M = 0$, $SD = 1$). 1, disregarded children; 2, contradictory parent–child relationship; 3, optimal parent–child relationship; 4, affectionless control; 5, idealized children; 6, rejected children.

Differentiation of Subgroups Based on Eating Behavior

According to predefined criteria (see above), deviant eating behavior was present in 158 (42.9%) children and was strongly linked to overweight with 68.4% of all overweight children versus 38.3% of all nonoverweight children demonstrating deviant eating behavior ($\chi^2(1) = 17.88$, $p < .001$). A 2-factor analysis of variance was performed using the relationship subgroup membership and presence of deviant eating behavior as independent variables and continuous BMI-*SD*s as dependent variable. The analysis revealed a significant main effect for the presence of deviant eating behavior, $F(1, 356) = 12.41$, $p = .01$, explaining 6.4% of the variance in BMI-*SD*s, but neither a significant main effect for the relationship subgroups, $F(5, 356) = 0.42$, $p = .82$ nor significant interactions between both factors, $F(5, 356) = 1.14$, $p = .34$.

The association between eating behavior and children's body weight was even stronger when continuous eating behavior subscale scores were used in linear regression analysis predicting BMI-*SD*s as dependant variable. Overall, 40.0% of variance in BMI-*SD*s was explained by the EPI-C subscale scores, $F(4, 363) = 61.2$, $p < .001$.

Irrespective of children's body weight, eating behavior was linked to the perceived parent–child relationship. Overall, children with deviant eating behavior reported higher perceived parental *control* [2.82 (0.79) vs. 2.52 (0.74)] than children with normal eating behavior, $t = -3.81$, $\mathrm{df} = 366$, $p < .001$, $d = .39$, slightly less perceived *confidence* [3.18 (0.51) vs. 3.31 (0.43)], $t = 2.52$, $\mathrm{df} = 366$, $p = .012$, $d = .27$, and higher *conflict/rejection* [1.99 (0.61) vs. 1.60 (0.49)], $t = -6.80$, $\mathrm{df} = 366$, $p < .001$, $d = .68$, while no group differences were apparent for the *care* and *lack of limitations* subscales. The rates of deviant eating behavior differed across the subgroups of the parent–child relationship [$\chi^2(5) = 28.40$, $p < .001$] as displayed in Table III.

Table III. Distribution of Deviant vs. Normal Eating Behavior for Each Parent–Child Relationship Subgroup[a]

	n	Normal eating behavior ($n = 210$) %	Deviant eating behavior ($n = 158$) %
Disregarded children	120	56.7	43.3
Contradictory parent–child relationship	60	35.0	65.0
Optimal parent–child relationship	59	74.6	25.4
Affectionless control	48	58.3	41.7
Idealized children	58	70.7	29.3
Rejected children	23	34.8	65.2

[a]The rates of normal vs. deviant eating behavior differed significantly across the subgroups of the parent–child relationship, $\chi^2(5) = 28.40$, $p < .001$.

With 65.2%, deviant eating behavior was most present in children feeling rejected by their parents, followed by 65.0% of all children reporting a contradictory parent–child relationship, whereas the lowest rate of deviant eating behavior (25.4%) was observed in children reporting an optimal parent–child relationship. In order to reveal more specific associations between eating behavior and the parent–child relationship, eating behavior subgroups derived from hierarchical cluster analysis were used (Schacht et al., 2006). The frequencies of those eating behavior subgroups significantly differed across the subgroups of the parent–child relationship [$\chi^2(25) = 70.79$, $p < .001$] as displayed in Table IV.

The highest frequency of emotional eaters was observed among disregarded children (30.0%), while children classified as emotional and external eaters were most prevalent among rejected children (30.4%), and restrained eaters were most prevalent among rejected children (26.1%) and children reporting a contradictory parent–child relationship (20.0%).

Associations with SES

While the percentage of children classified as overweight differed across their SES [lower: 15.2%, middle: 20.3%, and upper status: 9.3%; $\chi^2(2) = 5.80$, $p = .06$], post hoc analyses of group differences in BMI-*SD*s revealed that

Table IV. Distribution of Eating Behavior Subgroups for Each Parent–Child Relationship Subgroup

	n	Normal eaters ($n = 104$) %	Emotional eaters ($n = 65$) %	External eaters ($n = 49$) %	Restrained eaters ($n = 48$) %	Emotional and external eaters ($n = 25$) %	Indifferent eaters ($n = 77$) %
Disregarded children	120	30.0	24.2	15.8	10.8	3.3	15.8
Contradictory parent–child relationship	60	23.3	21.7	15.0	20.0	8.3	11.7
Optimal parent–child relationship	59	30.5	8.5	8.5	13.6	3.4	35.6
Affectionless control	48	39.6	8.3	20.8	6.3	10.4	14.6
Idealized children	58	24.1	17.2	8.6	10.3	3.4	36.2
Rejected children	23	13.0	17.4	4.3	26.1	30.4	8.7

only the differences between upper and middle SES were significant (using Games–Howell correction for multiple testing, $p = .30$). There were no significant associations between SES and neither PI-C nor EPI-C subscale scores and no differences in the associations between the perceived parent–child relationship and body weight across the SES subgroups.

Discussion

The aim of this study was to analyse associations among body weight, eating behavior, and the perceived parent–child relationship in a large, representative community-based sample of preadolescent children. As a result, no meaningful associations between body weight and the perceived parent–child relationship were apparent except for slightly less perceived parental confidence in overweight children compared to normal weight children. The presence of deviant eating behavior was strongly linked to both an adverse parent–child relationship and overweight in children. Contrary to our expectations, the associations between deviant eating behavior and the parent–child relationship were independent of children's body weight. Thus, we did not find the hypothesized interaction effect between parent–child relationship and eating behavior on children's body weight.

The lack of associations between body weight and the perceived parent–child relationship is in contrast to most previous findings. Our study differs in the assessment of family factors and in the sample source, which might explain the divergent findings. Only Mendelson et al. (1995) and Turner et al. (2005) used similar self-report questionnaires of the parent–child relationship but studied a different age group (i.e., adolescents), while most other studies relied on parents' reports or observational measures of family factors. In addition, while most previous research was based on small clinical samples of overweight children seeking for treatment, our findings were derived from a community-based sample of chidren. Only Mendelson et al. (1995) similarly used a community-based sample of children and also reported no differences in family relationships between the weight groups in the entire sample.

Due to the heterogeneity of possible pathways leading to overweight in children, we assumed that the hypothesized unfavorable family characteristics might be present in a subgroup of overweight children with deviant eating behavior only. Instead, they were present in the whole group of children reporting deviant eating behavior irrespective of their body weight. Cluster-analyzing the children based on their perceived parent–child relationship revealed that adverse relationship subgroups, especially contradictory parental behavior and parental rejection, were strongly linked to deviant eating behavior, which is in line with the literature on associations between clinically disordered eating behavior and deviant relationships with the parents (O'Kearny, 1996; Ward, Ramsay, & Treasure, 2000). Eating behavior had not been considered in previous research on the parent–child relationship in clinical samples of overweight children. Because the rates of deviant eating behavior might be much higher in clinical samples of overweight children, previously reported associations between overweight and the parent–child relationship might in fact be explainable by associations between deviant eating behavior and the parent–child relationship. This hypothesis clearly warrants future research.

In our sample, SES disparities in overweight are not in line with other German data linking lower SES to higher prevalence rates of overweight in younger children (Danielzik, Czerwinski-Mast, Langnaese, Dilba, & Mueller, 2004; Lamerz et al., 2005). While recent research suggest that there might be an overall trend towards a weakened assocation between SES and overweight (Wang & Zhang, 2006), our results might also be confounded by the fact that SES was not estimated individually for each child but for each school according

to the official classification of the districts' SES. Thus, our SES data should be interpreted with caution.

As described earlier, the children became excited or even distressed during the weighing procedure and actively compared weights afterwards. Precautionary, the weighing was not done until the children entirely finished answering the questionnaires, the children were weighed one by one in a separate room and feedback regarding individual body weight was offered. All these efforts proved to be not only appropriate but also necessary. Future research should similarly take reasonable precautions when both, questionnaire and weight data are assessed.

Since our study is based on cross-sectional data only, the results do not allow for causal interpretation of effects. Alternative interpretations of the findings are possible. A higher level of parental control might also be a reaction to children's deviant eating behavior and conflicts may be a consequence of parent–child struggle over eating behaviors. In addition, irrespective of any causal impact, specific family characteristics may serve as barriers to successful intervention efforts. Prospective research is strongly needed to allow for causal interpretation of effects.

We used a large pool of randomly selected public schools stratified by SES, but since only ~60% of all eligible children participated in the study, selection bias can not be excluded. Overweight children (and/or their parents) might have been less willingly to participate in the study since the investigation of overweight is potentially embarassing to both the affected children and their families. In contrast to this hypothesis, variance in children's BMI and the prevalence rate of overweight were both satisfactory in our sample. Because demographic data were obtained from participating children only, differences between participants versus nonparticipants could not be analyzed and thus cannot be excluded.

The assessment of the perceived parent–child relationship was based on children's self-reports only. Several precautions were taken to avoid possibly negative influences on the validity of children's self-reports (e.g., instructions were given carefully; the investigator closely monitored the children). However, inherent to self-reports, it has to be kept in mind that the children's subjective experiences of the parent–child relationship do not automatically correspond to objective (e.g., observational) data. As a potential advantage though, children's perceptions of the relationship may have the most impact on their behavior.

Both instruments used, the PI-C and the EPI-C, had been developed for the use in this study. As indicated by factor analyses, item characteristics and internal consistencies, the psychometric properties of both instruments are satisfactory. All subscales and the associations among them were theoretically derived and were confirmed by factor analyses which indicates their factorial validity. The results of this study provide initial evidence of their construct validity. The EPI-C scores were strongly associated with children's body weight and the marked associations between deviant eating behavior and the PI-C scores are in line with the literature on eating disorders. However, the use of two new instruments remains a limitation of this study and it can not be excluded that the lack of associations between body weight and the parent–child relationship might indicate a lack of construct validity of our measure. Further research is strongly needed to support and extend our findings concerning the psychometric properties of our instruments.

Our operational definition of deviant eating behavior was based on standardized norm values classifying the upper 15% of the empirical distribution of raw scores in the norm sample as deviant. Even though this is a common and recommended procedure when continuous measures are used for diagnostic purposes, the adequacy and validity of this criterion clearly needs to be supported by future research.

Our results demonstrate that findings derived from clinical samples cannot simply be generalized to the population of overweight children. To our knowledge, this study was the first to present data on associations between the parent–child relationship, eating behavior, and body weight in a large community-based sample of preadolescent children. Future research is needed to support and extent our findings that deviant eating behavior, not overweight itself, is linked to an adverse parent–child relationship in preadolescent children. Prospective research is needed to analyse the impact of eating behavior and the parent–child relationship on treatment outcome in overweight children. In clinical care, the focus on differential, need-adapted treatments is strongly recommended. Overweight children with deviant eating behavior and an adverse parent–child relationship might, for example, benefit much better from family-based therapeutic interventions focusing on emotional needs but might benefit less from behavioral therapeutic interventions focusing on modifications of weight related behavior. In contrast, there might be children whose overweight is associated with predominantly biological or environmental factors and for whom behavioral interventions might be the best treatment option.

The differentiation of subgroups of overweight children seems to be necessary to account for the heterogeneity of possible pathways leading to overweight in children and is suggested as a promising approach for treatment indications.

Conflicts of interest: None declared.

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Appendix: The Parent–Child Relationship Inventory for Children (PI-C)

List of items:

1. My family helps me when I am in trouble.
2. My family is proud of me.
3. In my family, I can do everything that I want.
4. My family lets me do certain things on my own.
5. In my family, I have to stick to certain rules.
6. My family trusts me to do certain things without their help.
7. My family controls strictly that I stick to all rules.
8. My family often complains about me.
9. My family never gets angry at me.
10. My family likes to spend time with me.
11. My family is friendly and loving to me most of the time.
12. My family likes it when I do things on my own.
13. When I need someone, my family is always there for me.
14. My family never tells me off.
15. In my family, I can decide many things on my own.
16. My family always wants me to change.
17. My family trusts me to do certain things all by myself.
18. There are disagreements in my family about me.
19. My family never stops me from doing anything.
20. My family allows me everything that I want.
21. In my family, there are clear rules how I have to behave.
22. My family accepts that I am different from them in some ways.

Response choices are 1, ''not at all''; 2, ''little''; 3, ''mostly''; 4, ''totally''. Subscales scores are computed as mean item scores of the following items: *care* (items 10, 13, 11, 2, 1), *control* (items 21, 5, 7), *lack of limitations* (items 20, 14, 9, 19, 3), *confidence* (items 6, 4, 17, 15, 22, 12), and *conflict/rejection* (items 8, 16, 18).

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