# SELF-ESTEEM AND MOOD IN OBESE CHILDREN AND THEIR MOTHERS: A PILOT STUDY

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## Abstract

*Objective*: A test-retest pilot study was conducted to examine the relationship between overweight/obesity, self-esteem and mood in a group of school-age children, and the degree to which they changed after a tailored psycho-educational intervention. Before and after administering the psycho-educational training, the following aspects were assessed: the child's weight (BMI); the child's and mother's levels of self-esteem and mood; the mother's perception of their child; and the child's general quality of life.

*Method*: Subject to their prior informed consent, 12 overweight/obese children aged between 8 and 13 years, and their mothers were involved in a psycho-educational intervention, which consisted in four meetings with both the children and their mothers. The study consisted in measuring anthropometric parameters and administering specific psychological tests (the CDI, TMA, BDI, B-SE, and CBCL) to both the children and their mothers before and after the psycho-educational intervention.

*Results*: The results showed that a high BMI was associated with depressive symptoms (anhedonia, negative mood) and low self-esteem (family life, body experience). Low levels of self-esteem were also found in 50% of the mothers, with no correlations between the mother's and child's self-esteem. On analyzing the mothers' clinically significant depressive symptoms (cognitive-affective sphere), it emerged that they included the perception of more problems in their child. After the psycho-educational intervention, there were improvements in: the children's BMI; the children's depressive symptoms and self-esteem; the mothers' depressive symptoms and self-esteem; and the mothers' perceptions of their child's problems.

*Conclusions*: Our case series confirmed the association between overweight/obesity and psychological issues. Overweight/obese children need to be also addressed regarding the psychological fallout of their physical condition. Any intervention must also include the parents, to make them more aware, more committed, and better able to help their child change.

**Key words**: childhood, overweight, obesity, depression, self-esteem, psycho-educational intervention

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## Introduction

Overweight (OW) and obesity in school-aged children have been on the rise in the last decade. The estimated prevalence of these conditions in children and adolescents is about 20% in the World Health Organization (WHO) European Region, with major differences across countries and socio-economic groups (Manios 2011). A recent study by Ahrens et al. (2014) assessed the European distribution of weight status in the European population: the highest prevalence of OW and obesity was seen in Italy (42.4%), Cyprus (23.4%), and Spain (21.2%), the lowest in Belgium (9.4%), and Sweden (11.0%). This study observed a slightly higher prevalence of OW and obesity in girls (21.1%) than in boys (18.6%).

In Italy, a sizable proportion (24.9% in 2014-2015) of children and adolescents are overweight and obese, with a peak among 6- to 10-year-olds (34.2%), after which the levels decline with older age, reaching the lowest percentage among 14- to 17-year-olds (Istituto Superiore di Sanità 2016). Socio-economic, socio-cultural and lifestyle aspects have important implications in this setting. Higher proportions of overweight children live in the central-southern regions of Italy (Nardone et al. 2016, Grassi et al. 2016, Zani et al. 2016), where occupational and educational levels are generally lower than in the north, and several protective factors and services (sports facilities, good-quality food, dieting and health-promoting centers, schools with good educational programs, etc. [Devaux and Sassi 2013]) are less readily available. Gender differences matter too: Italy's higher prevalence of obesity among females means that there are more women at risk of having children who will in turn be more likely to be overweight or obese, and to have few chances of moving up the social ladder, thus reinforcing the link between obesity and socio-economic disadvantage (Devaux and Sassi 2013).

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Several major studies have shed light on the psychological aspects related to the phenomena of overweight and obesity in children. Depressive symptoms seem to be among the most common (Kalarchian and Marcus 2012, Luppino et al. 2010). In a thorough literature review, Liem et al. (2008) found a positive association between depressive symptoms at age 6 to 19 years and overweight in later life (from 1 to 15 years later). Some authors focused on the association between self-perception and weight problems, finding vague perceptions of a stable and safe self-boundary in overweight children (Bruno 2001), and a high BMI associated with a low self-esteem in both boys and girls (Williams et al. 2012). Jansen et al. (2007) noted that overweight children had significantly lower levels of perceived competence in the domain of global self-esteem than their normal-weight peers. Gunnarsson et al. (2010) reported that overweight children often perceive their body as being out of proportion, and attribute their excessive weight to a specific part of the body - the stomach. Gibson et al. (2008) concluded that OW and obesity in children and adolescents cause depressive states, a perception of poor social skills, and a generally worse quality of life, with psychosocial problems that usually begin in pre-school age.

Another body of research aimed to assess the extent to which parents select environments that promote their children's OW (Birch and Davison 2001). Studies on the behavioral mediators in familial patterns of OW indicate that parents' own eating behavior and their parenting practices influence how their children's eating behavior develops, mediating familial OW patterns. Especially in early and mid-childhood, family environments are the key element in the development of food preferences, food intake patterns, eating styles, and preferences for activities that shape weight status in developmental age. Children's weight status is also influenced by parents' emotional status, and recent studies in this direction suggest that it is important to consider the mother's emotional responsiveness to understand the interpersonal context in which a child's eating behavior, and resulting weight develop. Distress responses may serve as a risk factor for children's weight gain (Saltzman et al. 2016).

Based on the above, the present study aimed to investigate some of the aspects closely linked to the issue of OW, i.e. self-esteem and mood, in a developmental stage of life when an individual's body, and relationship with the self become fundamental. It is hardly surprising that many problems occurring in developmental age relate to mood disorders, emotional dysregulation and lack of control, the focus of their expression is the body, and they often emerge during puberty, at a time of major changes in the body's shape and functioning (Gatta et al. 2014, Kravvariti and Gonidakis 2016, Danielsson et al. 2016, Gatta et al. 2016). The phenomenon of OW in childhood and adolescence (which has become increasingly prevalent in recent years all over the world) conceals a profound suffering that can be alleviated within a good intervention, that should be not only educational, formative and prescriptive, but also warm and therapeutic.

## Participants and study design

The target population for the present pilot study was a group of children aged between 8 and 13 years, with a BMI coinciding with a condition of OW or obesity (based on international anthropometric values), and their mothers. They were recruited at two pediatric outpatients services in Padua, one managed by a nutritionist and the other by a dietician, who agreed to take part in this pilot study. The inclusion criteria were: a BMI indicative of OW or obesity; and age between 6 and 14 years. The only exclusion criterion was intellectual disability.

The managers at the two outpatient units invited all eligible parents and children coming to their unit for a consultation between January and June 2015 to take part in the pilot study. The proposed psycho-educational intervention lasted two months (with four fortnightly meetings). It consisted of discussions regarding health and nutrition to help the children recognize and improve their self-awareness and self-esteem, and the dietician drew up individual meal plans, taking each child's food preferences into account. The children were enrolled after the aims of the study had been explained, and after receiving the informed consent of children and their parents (the latter also in writing). 12 children (4 girls and 8 boys) with mean age of 10.52 years (DS=1.39) accept to participate with their mothers. All the children had a high BMI compared with the international cut-off values by gender and age.

Several tests were administered to the children and their parents at the baseline to investigate the following domains: self-esteem, mood, and psycho-behavioral profile. Two months later, after completing the psycho-educational intervention, a follow-up (test-retest) assessment was conducted to investigate the same previously-mentioned aspects related to childhood obesity and the early outcomes of the psycho-educational intervention. Prompt retesting was chosen to identify any early improvements with a view to adjusting the intervention and suggesting other treatments. The precise goals of this pilot study were:

a. to measure the level of self-esteem (TMA), and identify any depressive symptoms (CDI) or psycho-behavioral problems (CBCL 6-18) in the sample of overweight children;
b. to measure the level of self-esteem (Basic SE), and assess the mood (BDI-II), of the children's mothers, and to ascertain any correlations; and
c. to identify any changes after the psycho-educational intervention (at retest), in terms of body weight, level of self-esteem, and mood, in the children and their mothers.

## Tools and methods

The intervention consisted of the following steps:

- anthropometric measurements (weight and height), and calculation of the children's BMI to ascertain the presence and severity of OW (based on the international reference values; **table 1**) before and after the psycho-educational intervention;
- investigating each child's eating habits using semi-structured interviews to collect specific details on: daily routines and meal times; types of food consumed on a regular basis; number of meals prepared and consumed with the family; and eating arrangements (e.g. being together and talking to each other, eating separately, watching television). A meal plan appropriate for the child's energy requirements was subsequently drawn up and customized on the grounds of the findings emerging during the interview (also taking food preferences into account);
- four psycho-educational meetings co-conducted by a pediatrician and a psychologist, and dealing with the following topics: 1- food as nourishment (explanation of the specific function of each macro-nutrient

contained in the food we eat); awareness about food providing comfort in situations when we are unable to cope with strong emotions; 2-alternative solutions that make us feel good and have fun; 3- how to manage strong emotions that are difficult to "digest"; 4- the vital importance of self-esteem in everyday life and of being assertive when making decisions.

The following questionnaires were administered to the children and their mothers before and after the psycho-educational intervention:

- CDI; the Child Depression Inventory (Kovacs 1988) was administered to the children individually in a calm and well-lit environment. The examiner was always present to provide assistance and solve any doubts respondents had while answering the questions. This tool was used to identify any altered mood states and difficulties in terms of emotional and relational well-being. It was also used to check the consistency between the data obtained with this CDI and with the TMA (particularly for the items in the Emotional Scale), and to seek correlations between the child's and the mother's mood states (the mothers' mood was investigated with the BDI-II);
- TMA (*Test Multidimensionale dell'Autostima*); this is the Italian version of Bracken's Multidimensional Self-Concept Test (Bracken 1993), a questionnaire for examining many areas of self-esteem in children and adolescents. The test consists of 150 items divided into six scales concerning: interpersonal relationships, scholastic success, family life, body image experience, perceived competence in controlling the environment, and emotionality. The questionnaire was administered individually in a comfortable setting conducive to maintaining the levels of concentration needed to complete the test;
- BDI-II; the Beck Depression Inventory - II (Beck et al. 1996) is a self-assessment tool comprising 21 items designed to recognize and measure the severity of depression in adults and adolescents aged 13 or more. It was used to identify any depression in the mothers of the children in our sample. After reviewing the relevant literature, we became curious to see whether a correlation existed between any depressive states in children and their mothers (the people they rely on most, especially at this stage in their lives), and whether any depression in mothers might relate to their level of self-esteem. All the mothers were asked to complete the questionnaire, choosing the answers that best represented their mood in the previous two weeks, including the day when they answered the questions;
- B-SE; the Basic Self-Esteem Scale (Forsman and Johnson 2003) is used to estimate self-esteem in the adult population. The test includes 22 items and answers are given on a scale of 1-5. The test was administered to the mothers of the children in our sample to seek any correlations between the mothers' and their children's levels of self-esteem (the latter's measured with the TMA), and between the mothers' level of self-esteem and mood. The test was completed by all the mothers involved in the study in a calm and well-lit environment appropriate for maintaining the concentration needed to answer the questions without being distracted;
- CBCL; the Child Behavior Checklist (Achenbach 2001) is one of the most commonly used scales for rating juvenile behavior, adopted internationally in both clinical and research settings. The questionnaire (report form) to be completed by parents has been translated into Italian and validated (Frigerio et al. 2004, Ivanova et al. 2007). It provides a profile of a child's behavioral and emotional problems on 8 specific syndrome scales: anxiety/depression, withdrawal, somatization, social problems, thought-related problems, attention problems, aggressive behavior, and rule-breaking behavior. These scales are grouped into: 'internalizing problems' (anxiety/depression, withdrawal, somatization); 'externalizing problems' (aggressive behavior, rule-breaking behavior); and 'other problems' (social problems, thought-related problems, attention problems). There is also a scale based on DSM-oriented diagnostic categories: affective problems; anxiety problems; somatic problems; attention-deficit/hyperactivity problems; oppositional/defiant problems; and behavioral problems. The scores obtained on each scale and subscale are classified using specific cut-offs that place the child's responses on one of three levels: normal, borderline or clinical.

Non-parametric statistical analyses were performed

**Table 1.** *Reference values, international anthropometric curves and 12 subjects' BMI values before (T0) and after (retest) the psycho-educational intervention*

| Reference values international anthropometric curves | BMI at T0 | BMI at retest |
|---|---|---|
| OVERWEIGHT | 33.67 | 33.67 |
| [1]Cut-offs BMI IOTF (International Obesity Task Force) limit | 22.30 | 21.90 |
| | 26.90 | 26.68 |
| OBESITY | 23.06 | 22.95 |
| [1]Cut-offs BMI ≥ IOTF (International Obesity Task Force) limit | 23.07 | 22.35 |
| | 21.95 | 21.07 |
| | 23.98 | 23.84 |
| SEVERE AND/OR COMPLEX OBESITY | 23.95 | 22.68 |
| [2]BMI > 99$^{th}$ perc. of S.I.E.D.P. (Società Italiana di Endocrinologia e Diabetologia) | 24.08 | 23.38 |
| | 26.60 | 28.20 |
| | 21.74 | 22.21 |
| | 23.82 | 22.70 |
| | M= 24.59 | M= 24.30 |

[1] Extended International (IOFT) body mass index cut-offs for thinness, overweight and obesity T.J.Cole1 and T Lobstein2 1MRC Centre of Epidemiology for Child Health, UCL Institute of Child Health, London, UK; [2] International Association for the Study of Obesity, London, Pediatric Obesity © 2012 International Association for the Study of Obesity. Pediatric Obesity 7,

with IBM SPSS software; p values ≤ 0.05 were considered significant.

## Results

The children's weight ranged from 41 kg to 83 kg, with a mean weight of 54.72 kg (σ=11.42). Their height ranged from 131 cm to 165 cm, with a mean height of 148.83 cm (σ=11.02). Their BMI ranged from 22 to 34. Most of the children were above the 95$^{th}$ percentile, two were between the 90$^{th}$ and 95$^{th}$ percentiles, and one was in the 90$^{th}$ percentile (**table 1**).

In our sample, 58.3% of the children were attending primary school, and 41.7% were at lower secondary school. One in three (33.3%) were only children, while the other 66.7% had siblings. As for their parents, 41.7% of their mothers and 33.3% of their fathers were overweight or obese.

We first ran a Wilcoxon test on the scores obtained before (at T0) and after administering the psycho-educational intervention (retest). At T0, we found high scores on the subscales for anhedonia (1.81; cut-off = .58, SD=1), and negative mood (3.09; cut-off = 1.17, SD=1.32); and these two scores did not decrease significantly at retest. After the intervention, the average total BMI value slight decreased (Average BMI value test phase = 24.59; average BMI value retest phase = 24.30 ).

The children's depressive symptoms decreased after the intervention, particularly in terms of the CDI total score (from 6.64 to 4.17; Z=-2.05; p=.04), and the measure of "low self-esteem" (from 1.17 to .67; Z=-2.45; p=.01).

The mean BMI also dropped slightly after the intervention (from 24.59 at T0 to 24.30 at retest).

The CBCL scores indicated that: 70% of the children had a full-blown psychopathology; 72.7% had internalizing symptoms; and 63.6% had attention problems. When gender was considered, the presence of psychopathological symptoms was higher in the male children (36.29% according to the Total Problems scale) than in the females (25.33%). After the intervention (at retest), the CBCL scores indicated a significant improvement in the children's social problems (z = -1.98; p = .05).

As for the TMA, the children's scores on the Family Life Scale was M=71.45 (SD=3.11), and for the Body Image Experience Scale M= 62.22 (SD=3.42) (**table 2**). There was an improvement in the children's level of self-esteem with a particularly significant increase in the scores obtained on the Scholastic Success Scale (**table 2**).

Turning now to the mothers' level of self-esteem and mood, their BDI score was 7.90 (SD=6.91) at T0, but dropped to 5.42 (SD=6.04) after the intervention. Concerning their level of self-esteem, the mean score on the BSE was 82.67 (SD =18.99); 50% of the mothers had a low self-esteem, while it was normal in the remainder of the sample. No relationship emerged between the mothers' depressive symptoms and their levels of self-esteem, or between a mother's and her child's levels of self-esteem.

As regards the mothers' depressive symptoms, there was a drop in the Cognitive Factor of the BDI score from 4.60 (SD= 5.50) at T0 to 3.58 (SD=4.60) after the intervention.

The mothers' B-SE scores improved significantly after the psycho-educational intervention, revealing a higher general level of perceived self-esteem. Only one of the 12 mothers still had a score indicative of a low level of self-esteem.

**Table 2.** *Children's level self-esteem (TMA) before and after the intervention*

| | Test | | Retest | | Wilcoxon | |
|---|---|---|---|---|---|---|
| | **Average** | **SD** | **Average** | **SD** | **Z** | **p** |
| TMA | 445.80 | 41.22 | 473.00 | 39.94 | -1.83 | .06 |
| Competence | 77.78 | 15.66 | 81.2727 | 16.82 | -1.61 | .11 |
| Emotionality | 76.36 | 13.62 | 79.50 | 17.74 | -.14 | .87 |
| Scholastic success | 78.45 | 9.92 | 84.08 | 8.98 | -2.64 | .01 |
| Interpersonal relationships | 77.25 | 10.35 | 77.42 | 12.29 | -1.69 | .09 |
| Family life | 71.45 | 3.11 | 69.89 | 6.23 | -2.97 | .77 |
| Body image perception | 62.22 | 3.42 | 64.45 | 6.70 | -.42 | .67 |

p=<.05

**Table 3.** *Spearman's correlations between CDI and CBCL scores, and between CDI and TMA scores*

| | CBCL Somatic problems | CBCL Social problems | CBCL Attention problems | CBCL Self-regulation | TMA Competence | TMA Emotions | TMA Scholastic success |
|---|---|---|---|---|---|---|---|
| Suicidal index CDI | -.630* | -.025 | .030 | .232 | -.522 | -.350 | -.361 |
| Sig. (2-tailed) | .028 | .939 | .930 | .468 | .150 | .291 | .275 |
| Anhedonia CDI | .308 | .692* | .339 | .327 | -.817* | -589 | -510 |
| Sig. (2-tailed) | .356 | .018 | .338 | .327 | .013 | .073 | .132 |
| Interpersonal problems CDI | .074 | .350 | .668* | .655* | -.726* | -.403 | -253 |
| Sig. (2-tailed) | .818 | .265 | .025 | .021 | .027 | .219 | .453 |
| Low self-esteem CDI | -.097 | .192 | .101 | -.032 | -.713* | -.757* | -649* |
| Sig. (2-tailed) | .763 | .549 | .768 | .925 | .031 | .007 | .031 |
| Negative mood CDI | -.240 | .384 | .323 | .288 | -.707 | -.794* | -.482 |
| Sig. (2-tailed) | .477 | .243 | .362 | .390 | .050 | .006 | .159 |
| Total CDI | -.073 | .550 | .337 | .259 | -.957* | -.931* | -.820** |
| Sig. (2-tailed) | .831 | .080 | .340 | .442 | .000 | .000 | .004 |

*p=<.05; **p=<.01

**Table 3** shows the positive Spearman's correlations between the CBCL and CDI scores, and between the CDI and TMA scores.

Spearman's correlations between the BDI and CBCL scores are presented in **table 4**. CDI Anhedonia score correlates with Total BDI (rs=.79) and Somatic factor BDI (rs=.60)

**Table 4.** *Spearman's correlations between BDI and CBCL scores*

| | CBCL Somatic problems | CBCL Social problems | CBCL Thought problems | CBCL Attention problems | CBCL Aggressive behavior | CBCL Externalizing problems | CBCL Total problems |
|---|---|---|---|---|---|---|---|
| Total BDI | .644* | .638* | .754* | .667* | .862** | .790** | .711* |
| Sig. (2-tailed) | .044 | .047 | .012 | .035 | .001 | .007 | .021 |
| Cognitive-affective factor BDI | .523 | .620 | .778** | .748* | .857** | .824** | .759* |
| Sig. (2-tailed) | .121 | .056 | .008 | .013 | .002 | .003 | .011 |
| Somatic factor BDI | .448 | .205 | .487 | .151 | .465 | .369 | .334 |
| Sig. (2-tailed) | .167 | .545 | .154 | .657 | .150 | .264 | .346 |

*p=<.05; **p=<.01

On analyzing the scores obtained in the questionnaires at retest, no correlations emerged between: the BDI and the TMA; the B-SE and the TMA; the BDI and the CDI; or the B-SE and the CDI.

## Discussion

In this pilot study, we examined the psychological well-being and self-esteem in obese children and adolescents, and their mothers, before and after a brief psycho-educational intervention program.

First, we checked whether our findings were consistent with the previously-reviewed existing scientific literature; then we considered the outcomes of our intervention in terms of any physical and psychological improvements in the sample of children.

Although the children's mood at T0 was not low enough to warrant a diagnosis of depressive disorder, they showed significant levels of anhedonia and negative mood. The children's psycho-behavioral profiles (based on questionnaires answered by their mothers) revealed pathological features in 70% of cases, particularly for internalizing disorders (anxiety, depression, somatic complaints; 72.7%); and attention problems (63.6%). Such problems were generally more common among the male children. Zeller et al. (2008) had observed that mothers of children with OW or obesity perceived their children's temperament and behavior as more difficult than those of their peers, especially in terms of flexibility, mood, relationships and perseverance.

Contrary to our expectations, our OW and obese children's global levels of self-esteem, and perceived competence did not differ from the normative values for their age group. On the other hand, we found significant difficulties experienced in family life and problems associated with body image (on the Family Life Scale and the Body Image Experience Scale of the TMA). These data confirm the particular importance of the family environment in the life of an overweight child, and how essential it is to work on aspects related to body image and self-perception when dealing with obesity in pediatric age. This latter aspect brings to mind the issue of self-boundaries, which - as Bruno (2001) demonstrated - are not perceived as safe and secure by obese children.

Higher levels of perceived competence were associated with better mood states, lower levels of anhedonia, higher levels of self-esteem, and a weaker perception of personal problems. A better self-perception and management of emotions was associated with a better mood, a lower perception of negative mood, and a higher level of self-esteem. Finally, a better self-perception, in terms of scholastic success, was associated with a better mood, a higher global level of self-esteem, and a lower sense of ineffectiveness.

These associations again underscore the importance of working to improve the level of perceived competence, emotional control and self-esteem, as well as nutritional aspects, when starting a therapeutic intervention for an overweight child. Looking back at the aims and methods of our pilot study, it is precisely these aspects that were addressed by our psycho-educational meetings.

Turning now to the mothers' depressive symptoms, we found a significant role for the cognitive-affective factor of depressed mood, which involves aspects relating to rumination and thoughts, rather than to problems associated with the somatic domain. It is important to note that more severe depressive symptoms in the mothers suggest a stronger perception of specific problems in their children (somatic, social, thought and attention problems, aggressive behavior, and externalizing problems on the CBCL), and a generally stronger perception of their difficulties (total problems scale on the CBCL). Higher values for the cognitive-affective factor were associated with mothers' more acute perception of their children's thought and attention problems, aggressive behavior, and total problems (with significant associations between the BDI and CBCL scores). Maternal depressive traits could give rise to a more or less explicitly reluctant attitude to the child care. It would be useful in future studies to shed more light on this issue. Vandewalle et al. (2013) demonstrated, for instance, that maternal rejection is positively correlated with a child's adoption of unhealthy strategies, including overeating, as a means of controlling strong emotions.

Low levels of general self-esteem were detected in 50% of the mothers, but no associations emerged with the levels of their children's self-esteem.

Our findings support the conviction that the etiological basis for eating disorders and obesity usually lies in a combination of psychosocial, environmental, and genetic or biological factors. Children with psychological problems may have more difficulty controlling their food consumption, and food can be used as a coping mechanism by individuals with weight problems, especially when they are sad, anxious, stressed, lonely, or frustrated. The result may be a vicious circle of emotional dysregulation, overeating, and weight gain. This pattern is seen not only in the case of a genetic predisposition to obesity, but also in "toxic" environments where a child feels rejected, abandoned, or unwelcome, pressured into being what they are not, blamed, etc..

Given the importance of mood and emotional regulation, and the psychological features associated with overweight children, it may be worth integrating treatment for obesity with certain types of activity (Natale et al. 2016, Farris et al. 2011). Art or drama can release feelings, improve the ability to express and manage emotions, and facilitate the development of socialization skills. Such forms of therapy are known to be effective for other emotional-behavioral problems (Gatta et al. 2010, Gatta et al. 2014, D'Amato and Dean 2006, Hamamci 2006). Family-based interventions have reportedly been successful if applied using a multidisciplinary approach (Kelishadi and Azizi-Soleiman 2014). In particular, behavioral therapies have had positive consequences on weight and BMI, and on dietary (Ford et al. 2009, Tsiros et al. 2011).

As expected, the results obtained after administering our psycho-educational intervention revealed a drop in the children's BMI, and a significant improvement in their depressive symptoms and self-esteem. The mothers also perceived an improvement in their children's problems, particularly as regards the social sphere. The significant improvement in the children's the general level of self-esteem was associated with a substantial improvement in terms of their perceived scholastic success.

As expected, the mothers themselves experienced some improvements too, relating to the cognitive-affective factor, and in terms of their perceived level self-esteem. Only one mother (as opposed to 6 at the baseline) continued to report a low level of self-esteem after the intervention.

It is worth noting that an association emerged at retest between a mother's depressed mood and her child's "body image perception" dimension of self-esteem. For example, the correlation between BDI (retest) and TMA (retest) was positive for the BDI total score, and for problems relating to body image perception (TMA).

Based on our findings, we surmise that the intervention offered to the children and mothers in our sample was effective from both a physical and a psychological standpoint. The limitations of this pilot study are naturally the small number of subjects involved and the lack of a longer follow-up.

## Conclusions

Albeit with the above-mentioned limitations, this study confirms that OW and obesity in school-aged children is not just about weight. Physical and psychological aspects are closely linked in children, and our psycho-educational intervention showed that change induced in one individual can significantly contribute to change in people around them, too. Diagnostic and therapeutic interventions for overweight children therefore need to consider them globally and in their family environments. Building a positive working alliance with parents should be one of the first goals, both to reinforce the child's compliance and to improve the parents' caregiving experience (Gatta et al. 2009). Treatments should be planned by a multidisciplinary team that can work with the child and parents on all the issues involved. Parents should be given appropriate tools so that they can take an active part in the process of change in their child.

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