CHILDHOOD OBESITY AND MOTOR/SENSORY DEVELOPMENT

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Abstract

Childhood obesity can be defined as a pathological condition characterized by an excess of adipose tissue due to an over-intake of calories chronically or positive respect to consumption. Because this phenomenon is so widespread in developed countries, activities and multi-disciplinary research aimed at understanding this disorder were promoted. First of all, we will refer to a study of a behavioural disorder food, which shows a correlation between anorexia nervosa and delay sense-perception, assuming that the results obtained are also attributable to obese subjects. The interest of this aspect of research could provide further knowledge on possible brain deficits in subjects with obesity in pediatric age with a focus on family history, risk factors, prevention activities and intervention to reduce the incidence and prevalence.

Keywords: Childhood obesity, motor/sensory development, eating disorders, prevention, physical activity.

Introduction

The eating disorders affect, in particular children, adolescents and young adults, with ever-increasing frequency both in Western countries than in the rest of the world. According to the world's most accepted classification (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision DSM-IV-TR), are: eating disorders (DCA), anorexia nervosa (AN), bulimia nervosa (BN) and Eating disorders not otherwise specified (NOS), non-homogeneous category that can include many disorders (atypical partial, subliminal) that do not meet the criteria for any other specific eating disorder.

To generate an eating disorder contributing causes of multifactorial, scilicet complex interactions between biological, psychological, individual and family (psychic structure of the family, the presence of traumatic events such as physical and sexual abuse), cultural (myths beauty / thinness, culture of competition and success). Factors or specific events - such as separation, loss, stress life events, poor eating habits - may precipitate the situation and unbalance in the sense psychopathology.
Anorexia nervosa

The term derives from the Greek ἀνορεξία anorexia, 'no appetite', a term that indicates a lack of desire for food. The use of the term in eating disorders, however, does not coincide with the ordinary meaning. In anorexia nervosa, in fact, do not miss the appetite but there is a vigorous fight against hunger to lose weight, because the self-esteem of the subject depends only on thinness. Anorexia nervosa is diagnosed according to the criteria of the DSM-IV-TR based on the following elements: the refusal to maintain body weight at or above the minimum normal for age and height (in childhood or before adolescence with inability to achieve the expected weight from medical charts for that age group), the fear of gaining weight, changes in body image as regards shape and size, amenorrhea in women in post-pubertal for at least three consecutive months. It stands out a restrictive form, where it is present only food restriction, and a form with binge eating and purging behaviour: misuse of laxatives, diuretics, or enemas and/or self-induced vomiting. A deeper level of the thrust to weight loss comes from a non-acceptance of self and from the difficulty of recognizing, and thus manage, their emotional dimension. In the minds of those who suffer from anorexia there is the constant worry of what can or cannot eat and the calories that must then be burned. The organization of everyday life often revolves around the moments of the meal and eating habits, resulting in very heavy constraints in the conduct of their own lives and the lives of family members. The organic anorexia can cause wear and tear with physical damage and serious complications in charge of all internal organs arriving, in extreme cases, cause death.

Bulimia nervosa

Bulimia nervosa is characterized by intense and overwhelming desire to feed themselves with huge amounts of food, often linked to a feeling of excessive hunger. Bulimia nervosa is, according to the criteria of the DSM-IV-TR, characterized by recurrent binge eating (episodes of rapid ingestion of large amounts of food), with loss of control and compensation hoses (vomiting, use of laxatives and diuretics, exercise) that occur at least twice a week for three months. Bulimia, unlike anorexia, usually does not manifest itself through a significant body modification: people who suffer from this disorder are often normal weight or slightly overweight or underweight. The bulimic, anorexic like that, pay attention to the control of the body and the ideal of thinness, but fails to counteract the "crisis bulimic" through which we can manage strong feelings of inner emptiness, loss and even also inability to feel your body. The functioning bulimic is almost always associated with mood instability and a vulnerability to depression. The bulimic symptom sometimes is structured in the life of a person without the knowledge of the whole family context, which can also ignore it for years. The consequences of the disorder are, however, such as anorexia, just as serious in organic and dramatic for the life of the subject, and therefore in need of medical treatment within the individualized treatment plan.

Disturbed Body Image

Although the poor picture of the body is one of the major components of diagnostic disorders, there is no single definition about his relationship with obesity (Collins et al., 1987). Some have used the image disturbed body to describe a defect in the perception of the size or in inaccurate assessment of body parts (Valtolina, 1998). Others have referred to it as a stress disproportionate to the bodily sizes (Pingitore et al., 1997) or regarding the characteristics of the body (Snyder, 1997). Studies on the perception of body image in obese subjects before and after weight loss have evaluated the disturbed body image as a result of three aspects: distortion, discrepancy and dissatisfaction. The distortion, is defined as the difference between the consultant's
evaluation of body size and that of the participants, the discrepancy, as the difference between the participants’ evaluation of the current and ideal body size; dissatisfaction, as the degree of dissatisfaction with current body size on a scale of 1 to 9 (extremely dissatisfied / very satisfied) (Sorbara et al., 2001). One of the objectives of the studies was to examine the interrelationship of the three aspects with the poor picture. The poor picture was more related to the distortion, then the discrepancy and ultimately dissatisfaction. The low correlation with dissatisfaction supports the view that the dissatisfaction is not synonymous with a disturbed image (Thompson, 1995). Different, compared to obesity, is the relationship that exists between anorexia, bulimia nervosa and the poor picture of the body. The obsessive search of the thinness of the body, in these types of disorders, it appears to be based on a dissatisfaction of psycho-social nature that causes an altered body image, so much so that, as said previously, this is used as a major components diagnosis of eating disorders.

Tactile perception in anorexia nervosa before and after the acquisition of weight

The tactile perception of patients with anorexia nervosa was analyzed in a longitudinal study (Grunwald et al., 2001). The investigations on touch were to palpate a structure of 12 surveys collected in sequence with both hands and eyes closed. After each scan, the structure was reproduced on a piece of paper. The group with Anorexia Nervosa consisted of ten female patients with anorexia nervosa, diagnosed according to ICD-10 (International Classification of Diseases, tenth edition) (Dilling et al., 1993), mean age = 16:34 years (SD = 1.30). The evaluation data obtained before (T₀) and after (T₁) the hospital stay, the end of which the studied subjects reported a slight increase in weight (for more details, see table 1 in Grunwald’s study, 2001). The control group consisted of ten healthy women mean age 17.30 years (SD=1.25), un suffered of neurological or psychological. The task consisted of tactile exploration of 12 surveys received (13cm x 13cm) which were presented to the participants in random order (Figure 1).

Figure 1: Twelve engravings tactile plastic, of different degrees of complexity. The incision is 7 mm wide and 3 mm deep (Grunwald et al., 2001).
The time of exploration of the stimulus was not limited. Consequently the tactile explorations, all participants were asked to draw with their eyes open on a piece of paper the structure of the stimuli, the more closely as possible. Within the group of healthy control subjects, the quality of the reproductions differed only marginally. The quality of the reproductions of the study group at T \(_0\) and T \(_1\) was significantly different from that of control subjects, while the comparison of reproduction among subjects with anorexia nervosa at the time T \(_0\) and T \(_1\), showed no significant differences. The comparison between the times of exploration of the group with anorexia nervosa and the control group, revealed significant differences. Based on the results of the test, patients who suffer from anorexia nervosa needed tactile tasks in less time compared to healthy control subjects. After the purchase of weight (T \(_1\)) the time of exploration of patients with anorexia nervosa, were even shorter that during the first test, although they not observed a statistically significant difference. The lower-quality reproductions of complex stimuli presented by patients with anorexia nervosa, show an impaired ability in perceptual processes and integrations somatosensory (Fox, 1981; Gordon et al., 1984; Laesslé et al., 1992; Ploog et al. 1987; Szmukler et al., 1992). The results showed that patients with anorexia nervosa possess the biggest problems with complex tactile information compared to healthy control subjects. Based on the studies in the field of Gestalt psychology, the simple geometric shapes are identified on the basis of certain characteristics without any operations including cognitive-perceptual (Appelle, 1991). However, with increasing complexity of the action requires a greater ability to integrate somatosensory processes of short-term memory and selective attention (Gibson et al., 1984: Grunwald et al., 1999, 2001; Klatzky et al. 1985). It can therefore be concluded that, in patients with anorexia nervosa are unable to forge complex relationships of the individual elements of the stimuli, in a general concept. We know from neuropsychological studies that these types of tasks are organized in the parietal cortex (Kolb et al., 1993; Reed et al., 1996). Lesions of the parietal cortex, may be disturbed in tactile perception (tactile agnosia, aphasia tactile). It is possible, that the reduced ability of reproduction shown by patients with anorexia nervosa, emerge from a functional disorder of the right parietal lobe. This hypothesis was supported by several studies (Casper et al., 1991; Rover et al., 1988). Bradley et al. (1997) argue that anorexia nervosa affects cognitive abilities that are related to the primary functions of the right parietal lobe. Kinsbourne and Bemporad (1984) suggested that the rear hemisphere dysfunction, mainly involving the right parietal lobe, is specific to anorexia nervosa and is responsible for the negligence towards the hunger experienced by anorexic body both before and during. The data obtained from the study in question, have shown that the poorer quality of reproduction tactile in patients with anorexia nervosa continues to exist even after the acquisition of weight.

We can assume that somatosensory deficits could probably be a risk factor for the development of the disease. The results therefore support the notion that patients with anorexia nervosa, both during the acute phase of the disease and after the purchase of weight, have obviously making processes tactile information compromised. This could be due to a disorder of the visual-spatial processes in the parietal-occipital regions (Bradley et al., 1997; Kolb et al., 1993). The observation of a poorer performance in the perceptual task tactile acquisition of weight during medical treatment, it could be an indication of a general integrative processes somatosensory deficits in some patients with anorexia nervosa. Based on the analysis of the times of exploration, patients with anorexia nervosa
nervosa employ on average less time in completing the task of tactile exploration compared to healthy control subjects.

**Childhood obesity**

Childhood obesity is a dramatic problem that now affects a growing number of children around the world. Childhood obesity could be due to a polygenic disorder that is a different susceptibility determined by genetic components, but also to the presence of factors that determine indelibly an increase in body weight, like environmental risk factors, particularly sedentary lifestyle and poor eating habits. Some studies claim a correlation between childhood obesity and hormonal disorders such as hypothyroidism or adrenal dysfunction. The surveillance system in childhood "Okkio alla Salute" of the Italian Ministry of Health estimates that in our country in 2010, children between 6 and 11 years with problems of excess weight were 1 million one hundred thousand. 12% of the children are obese, while 24% are overweight. While for adults it is easier to find evidences ponder structural measures that will allow us to identify the classes of membership according to body mass index [BMI = weight (kg) / height (m2)] in children, because the continuous susceptibility to change due to the development, gender, age, it is more difficult to find precise cut-off to identify a class of membership according to body mass index (BMI). It is appropriate to take as reference, rather than an absolute value, tables of percentiles. The international community employs the tables on percentiles proposed by Kuczmarski et al.:

- Underweight Less than the 5th percentile,
- Normal From 5° to 85°,
- Percentile at risk of overweight from 85° to 95°,
- Overweight rank higher than the 95° percentile

We will report three tables (Table 2 and 3) proposed by the "Centers for Disease Control and Prevention" in Atlanta, that show the use of percentile calculation to classify subjects aged 2 to 18 years, according to the classes of membership their BMI.

![Table 2: BMI and childhood obesity in children (Kuczmarski, 2000).](image)

![Table 3: BMI and childhood obesity in girls (Kuczmarski, 2000).](image)
The regulation of body weight
The maintenance of an adequate body weight has a positive impact on overall health status. To maintain a constant body weight is necessary a balance between the energy intake and the energy expenditure. It is clear that unbalances lead to variations in the content of fatty tissue. This adipostatic theory has recently been corroborated by the discoveries of the Ob gene and its product peptide, leptin (Friedman, 1994) secreted almost exclusively in adipose tissue, which constitutes a hormonal signal for the central nervous system, which acts on the state of energy reserves of the organism.

Adiposity rebound and early adiposity rebound: early indicator of the risk of childhood obesity
At cellular level, pediatric obesity is the result of an increase in volume (hypertrophy) and number (hyperplasia) of the adipocytes. The volume increase, resulting in a positive energy balance chronically that causes excessive lipogenesis potentially reversible with weight loss (through increased lipolysis). In contrast, the number of adipocytes remains substantially irreversible until adulthood, even in the case of weight loss, facilitating the individual tendency to relapse of overweight. Two periods have been proven sensitive to postnatal physiological development of adipose tissue, corresponding to the 1st year of life and from 6 to 10 years, characterized by increase in BMI curve and high replicative activity and differentiation of pre-adipocytes in new mature fat cells (Wabitsch et al, 2002). Exposure to environmental factors that promote the development of obesity during critical periods of intense activity replicative cell results an increased risk of persistent obesity.

• 0-1 year (1st period increase): at the birth, the percentage of body fat corresponds to 12-15% of the total body mass and then increases greatly during the 1st year of life with a peak of 25% at 6 months of life (first slope of the curve of BMI). This phase, characterized by an increase in the number of adipocytes, is a first sensitive period for the risk of obesity.

• 1-6 years (1st period decrease): after 1 year there is a continuous and progressive reduction in body fat percentage (with concomitant increase of lean body mass) to a minimum value (10% in males and 15% in females) achieved at around 5-6 years of age (downhill curve of BMI).

• 6-10 years (2nd period increase): at about 6 years starts a second phase of physiological progressive increase in body fat percentage (second ascent of the curve of BMI). This is defined Adiposity Rebound which continues until the first puberty, when it reaches values of 15% in males and 18-20% in females. Even at this stage, high cell proliferative activity is particularly critical for the risk of obesity.

Rolland Cachera showed first that the adiposity rebound, if it starts early, at the age of 2-5 years, rather than at the age of 5-7 years, is an important factor in susceptibility to the later development of obesity until young adult (Rolland Cachera, 1984). This phenomenon is defined Early adiposity rebound.

Figure 2: Change in physiological BMI during growth (Rolland Cachera, 1984).
Risk factors in childhood obesity: family history, physical inactivity and nutrition

Three are the main risk factors that are central in increasing the chance of childhood obesity or otherwise induce a state of overweight in children. **Familiarity:** only in 1% of children obesity is dependent on the genetic syndrome. In 99% of cases, childhood obesity is primary or essential. Those unfamiliar type are influenced by environmental factors, family members, often linked to the presence of parental obesity. The data reported in literature, provide strong evidence on the role of "family obese", about the nutritional habits that influence the supply of food within the family (Klesges et al, 1991). According to these studies, the etiology of childhood obesity, psycho-affective is to be found in absence of parents, in wrong food choices, maternal anxiety that causes overeating in obesity of the child and also parenteral obesity itself. The presence of one or more parents with excess weight, represents a greater risk of obesity in children (Whitaker et al, 1997). The percentage of obese children rises to 34% if both parents are obese, while around 25%, if only one parent is obese. The value stood at 18%, if neither parent has excess weight. The analysis of food preferences of the obese child showing a tendency to take an excessive amount of lipids, proportional to its percentage of adipose tissue and that found in the mother (Maffeis et al, 1996). The close link between child and mother, begins during foetal life. The formation of the hypothalamic centres responsible for the regulation of hunger and satiety, begins in foetus between 1st and 2nd trimester of pregnancy. In the 3rd quarter, the number of adipocytes increases. The embryonic development is therefore significantly affected by endocrine-metabolic and nutritional status of the mother (factors associated with the onset of obesity in children). Correction of maternal errors during pregnancy, is the first step quote of childhood obesity (Di Tullio, 2003). **Sedentary lifestyle:** collected data in 2010 from survey conducted by monitoring system in childhood "Okkio alla Salute" from Italian Ministry of Health (Table 4), shows that many Italian children lead a sedentary life, do not perform regular exercise and move little during the day long. In addition, almost one on two children, makes a disproportionate use of TV and video games: a behaviour encouraged by the fact that half of children have a television in their own room. Exercise is important for the growing child, as, in addition to make him lose weight, makes it more active, helping to redistribute the proportions between lean body mass and fat mass. It is enough to practice aerobic activity without too much strain on the body, like a bike ride or a walk, in which the muscles at a moderate but steady effort which allows the preferential use of fat as fuel. **Nutrition:** nutrition surveys conducted in various European countries, have confirmed that the age of 1 year, the children assume, unlike in the past, a number of proteins which is 3-4 times higher than the average needs, with a percentage higher than 16% of total calories, while caloric intake from fat is low, about 28% of total calories (Cachera et al, 2002; Scaglioni et al 2004). This is due to an excessive consumption of animal protein, while there is a low consumption of olive oil and other foods of vegetal origin. This food style, frequent in industrialized countries, is heavily unbalanced with regard to the indications of RDAs, an acronym designating the "Levels of Recommended daily intake of energy and nutrients" for the Italian population. The Italian Society of Human Nutrition (SINU) suggests 10-12% of protein, 50% of lipids in year 1st and ~ 40-45% of total daily calories in year 2nd, compared to the composition of breast milk; to which is recognized a protective effect dose-dependent and duration-dependent against obesity. Breast milk infant is low in protein (7% of total calories) and high in fat (50% of total calories).
Excess protein
An excessive intake of animal protein (especially cow's milk) in the first few years of life, seems to induce an increase in the production of growth factors such as IGF-1 (Insulin Like Growth Factor) (Cachera et al., 2006; Cachera et al., 2002). The increased levels of IGF1, upstimulate protein synthesis and cell proliferation in all tissues, also determine an increase differentiation of pre-adipocytes (which are provided with receptors for IGF1) in adipocytes (hyperplasia). This phenomenon could operate in the pathogenesis of early adiposity rebound. However, high protein intake also promotes the deposition of fat in the visceral (android distribution), probably mediated by a decrease in GH secretion, often seen in obese children (Cachera et al., 2006). The basis of the accumulation of adipose tissue and weight gain is on junk food, typical of fast-food restaurants, high fat. In summary, childhood obesity has a multifactorial origin being the result of different causes to be found in lifestyle of child and, in general, from the family environment in which he lives.

Implications of Childhood Obesity
Some clinical trials on obese children, have suggested a number of medical conditions for which obese children are at greatest risk. As shown in Table 5, there are actually a few organs that are not involved in complications from obesity in childhood and adolescence (Freedman et al., 1999).

| Pulmonary       | Sleep apnea          |
|                | Asthma               |
|                | Hypoventilation syndrome |
| Orthopedic     | Epiphyseolysis       |
|                | Blount's disease     |
|                | Shank Twist          |
|                | flatfoot             |
|                | Ankle sprains        |
|                | Increased risk of fracture |
| Neurological   | Idiopathic intracranial hypertension |
| Gastroenterological | Cholelithiasis     |
|                | Hepatic steatosis (fatty liver) |
|                | Gastroesophageal reflux |
| Endocrine      | Insulin resistance/tolerance to sugars had |
|                | Type 2 Diabetes      |
|                | Menstrual Disorders  |
|                | Polycystic Ovary Syndrome |
|                | Hypercortisolism     |
| Cardiovascular | Hypertension         |
|                | Dyslipidemia         |
|                | Left ventricular hypertrophy |

Table 5. Physical consequences of obesity in childhood and adolescence (Freedman et al., 1999).
Disease by accumulation of fat in the liver
It’s a problem that is observed more frequently in the obese child. It can start with an infiltration of fat in the liver (steatosis) and an inflammation due to excess fat (steatohepatitis) which can lead liver fibrosis, cirrhosis and finally, liver failure. Currently the studies estimate the incidence of steatosis around 3% in healthy children and 23-53% in the obese; among them up to 70% has actually already steatohepatitis. Hepatic steatosis in childhood is often a silent disease that occurs randomly through blood sample merging by an altered value of transaminases. Severe obesity and the presence of diabetes, are predictors of more severe steatosis: children in this condition have a fatty liver, steatohepatitis and cirrhosis (Lobstein et al., 2004).

Early menarche and menstrual problems
Early menarche and menstrual abnormalities are a part of the endocrine response to excess body weight in girls. Some studies have shown the association between obesity and low fertility; the impact of obesity on menstrual disorders, however, is unknown. Polycystic ovary syndrome is characterized by oligo-amenorrhea (rare or no menstruation), obesity, glucose intolerance, hirsutism, acne and acanthosis nigricans. The presence of an early menarche is also associated with the presence of overweight; early menarche is a risk factor for breast cancer and has also been associated with other types of cancers of the female reproductive system and an increased incidence spontaneous abortions in adulthood.

Type 2 Diabetes
Type 2 diabetes is an alarming consequence of obesity in children. The early beginnings of this metabolic problem, is a serious risk of complications fin adult life with diabetes (cardiovascular disease, kidney failure, visual defects). 45% of diabetes in childhood is of type 2 and 90% are linked to obesity (Lobstein et al., 2004).

Economic impact of childhood obesity
Overweight and obesity have a significant economic impact on the healthcare system. The costs attributable to obesity are both direct and indirect. Those heading include the prevention, diagnosis and treatment of obesity. Indirect costs are more related to morbidity and mortality (decreased productivity, absenteeism). In America in 1998, the estimated costs attributable to overweight and obesity represent 9.1% of health spending (78.5 billion dollars) in 2002: this cost had risen to 92.6 billion dollars. In Italy, there are 8-10 million of obeses.

Prevention of childhood obesity
The first years of life it should be a good time to initiate prevention that may have an impact on the lifestyle, and later on overweight and obesity. Schools are an attractive for the implementation of interventions on children. The "Igiene, Alimenti e Nutrizione" AUSL Modena in a workshop of 2010, establishes certain requirements and organizational policies, summarized in the following list so that interventions to promote health. More specifically, it should need to prevention of overweight and obesity in childhood and adolescence and determine some positive effects.

1. The optimal context of action is school;
2. Interventions must be multidimensional;
3. Messages must be easy to understand and in a limited number;
4. It’s better that the messages are conveyed by the same teachers;
5. Should actively involve children and young peoples;
6. It’s necessary to define practical solutions and provide concrete examples
7. Projects must always contemplate the consumption of healthy snacks;
8. It’s essential to involve families;
9. It need to give continuity even outside the school.

The school is the optimal environment, allowing easy access to children and young people and mitigating the effects of any differences in socio-economic conditions of families. The school environment can be create excitement and expectations, and allow the active involvement of students, which can themselves become the architects of the projects. Therefore, the school must promote physical activity inside and outside the school, encourage the use of healthy foods, especially fruit and vegetables, improve the nutritional quality of school meals, inform/educate families, scouragge to TV/video, games/computer, act on the external environment to encourage mobility on foot or by bicycle (Zenzen et al, 2009).

The ultimate goal is to promote healthy diet and regular physical activity.

**Physical activity and benefits on body weight**

It is commonly accepted that a proper physical activity needs at least 150 minutes per week of moderate intensity to achieve positive outcomes for the health (Pate et al., 1995). Children training programs must keep in mind several factors age-related and motivational-related in order to make a workout a “fun game”. Brambilla and colleagues (Brambilla et al., 2012) proposed a guideline to drawing up a training program suitable for obese or overweight children, characterized by two exercise sessions, lasting 90 minutes each, for each of the 12 weeks provided by the study. Each session was based on a combination of aerobic exercise and a resistance circuit training, using specific sports movements such as football, rugby, basketball and volleyball. Physical activity has been adapted to the physical and functional capacity of the subjects, and the intensity was gradually increased during sessions. At the end of the training program were found: a significant improvement in BMI, SDS-BMI, waist circumference, waist circumference ratio / height, body fat percentage, fasting blood glucose, triglycerides, systolic blood pressure, VO2max and muscular endurance. An improvement, although not significant, was also observed on the level of fasting plasma insulin. The results obtained are reported in Table 6 (Brambilla et al., 2012).

The physical activity recommendations of healthy children are not suitable for obese children; the clinical condition of each obese child or adolescent may suggest a specific type of activity, with a different exercise intensity, frequency and duration. A multi-step strategy for the rehabilitation of physical activity, is the most appropriate for obese children, especially for those with a diagnosis of metabolic syndrome (Brambrilla et al., 2011). The best results in terms of constant participation, are obtained if the activity is adapted to the participants’ capacity and involves only obese or overweight children.
Conclusions
This argument stems from the desire to find a link between childhood obesity and neurological delay or alteration in the motor/sensory development. Referring to the study of Grunwald et al. (2001), we tried to trace a process of research in order to highlight the possible correlation between eating disorders, particularly obesity, which belongs to the largest family of uncontrolled Binge Eating Disorder (BED), and the development of motor/sensory. Because the poor references, we have only dealt with neuropsychological studies report the facts on anorexia nervosa, demonstrating how sensory-perceptual tasks are organized in the parietal cortex (Kolb & Whishaw, 1993; Reed, Caselli, & Farah, 1996), from the data obtained is shown how these subjects have processes of information processing tactile compromises. This could be due to a disorder of the visual-spatial processes of the parietal-occipital regions (Bradley et al., 1997; Kolb & Whishaw, 1993). After, we focused the attention on the "pandemic" of the third millennium, childhood obesity, trying to illustrate risk factors, detectable with the "early adiposity rebound" useful to be able to identify the increased risk of pediatric obesity. Given the constant increase in physical inactivity, caused by the change of

Table 6: Clinical, metabolic and stress-testing parameters of subjects before and after exercise (Brambilla et al., 2012).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-exercise</th>
<th>Post-exercise</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>32.9±4.3</td>
<td>31.9±4.6</td>
<td>0.002</td>
</tr>
<tr>
<td>SDS-BMI</td>
<td>2.52±0.55</td>
<td>2.37±0.67</td>
<td>0.003</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>103.7±10.9</td>
<td>97.8±12.4</td>
<td>0.004</td>
</tr>
<tr>
<td>Waist circumference ratio / height</td>
<td>0.64±0.06</td>
<td>0.56±0.14</td>
<td>0.001</td>
</tr>
<tr>
<td>% Fat mass</td>
<td>39.3±6.3</td>
<td>36.0±7.6</td>
<td>0.001</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>118.3±10.0</td>
<td>111.0±9.8</td>
<td>0.04</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>72.1±7.3</td>
<td>68.4±5.5</td>
<td>0.12</td>
</tr>
<tr>
<td>Fasting blood glucose (mg/dl)</td>
<td>77.7±14.3</td>
<td>64.9±11.9</td>
<td>0.001</td>
</tr>
<tr>
<td>Metabolic parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting plasma insulin (mIU/ml)</td>
<td>22.3±22.2</td>
<td>16.2±7.6</td>
<td>0.14</td>
</tr>
<tr>
<td>HOMA-IR</td>
<td>4.2±4.1</td>
<td>2.6±1.4</td>
<td>0.04</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>87.2±45.8</td>
<td>72.9±35.4</td>
<td>0.03</td>
</tr>
<tr>
<td>Cholesterol HDL (mg/dl)</td>
<td>44.9±10.9</td>
<td>45.8±10.3</td>
<td>0.55</td>
</tr>
<tr>
<td>Ergometric parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VO₂ max</td>
<td>28.9±5.8</td>
<td>32.8±6.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Resistance (hand grip)</td>
<td>29.6±9.3</td>
<td>32.3±9.8</td>
<td>0.003</td>
</tr>
<tr>
<td>Flexibility (sit and reach)</td>
<td>1.3±8.3</td>
<td>2.7±10</td>
<td>0.26</td>
</tr>
</tbody>
</table>
the lifestyle of children, most tend to have fun with video games and or simultaneously watching TV. There is a reduction in the ability to do physical activity, thereby increasing the risk of gain weight. Social policies should take into account the complexity and severity of the situation and activate a machine multidisciplinary intervention, including experts of movement, psychologists, nutritionists, pediatricians and other figures to drastically attend with target programs not only for the child but also for the family environment in which they live.

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