Monitoring the Condition of Overweight Among Children Aged 6 to 10 years from 2009 to Present

G. Musella[1], D. Marasso[1], G. Bardaglio[1], F. Magno[1], E. Rabaglietti[2]

[1] Centro Ricerche SUISM, Unità Operativa *Sviluppo e Abilità Motorie*, Università degli Studi di Torino.
E-mail: giovanni.musella@unito.it
[2] Dipartimento di Psicologia, Università degli Studi di Torino

KEY WORDS: BMI, children, reference cut-off.

Introduction

Overweight and obesity in children are relevant problems in the current society. In Italy, 23,6% of children are overweight, while 12,3% are obese (OKkio alla salute, 2008).
Recent researches underline that only one on three children practice a sufficient quantity of physical activity (Racioppi *et al.*, 2002). For instance, in Italy, only the 20% of children exercise with sport more than once a week (Sassi, 2010). Besides, only the 30% of children usually go to school walking and only the 27% of children take part in outdoor plays for more than two hours a day during school days.
With respect to structured kinds of activity, physical education is frequently confined to a marginal role in primary schools (Zeigler, 2003). The substantial inactivity of children may have short-and long-term negative effects on their general health and physical development. The World Health Organization (WHO, 2004) estimated that a lot of deaths at a worldwide level are connected to physical inactivity, such as cancer, diabetes and cardio-vascular problems. In particular, physical inactivity and unhealthy diet are important risk factors for overweight and obesity in childhood, that are predictors of overweight and obesity in adulthood.
BMI is the most common measure for prevalence of overweight and obesity in children (Dietz, 2009), but there is no agreement about some characteristics of this measure. First: the use of international or national references (Toschke, 2008); Second (probably most important): the choice of a standard cut-off to asses overweight and obesity or an arbitrary cut-off based on 85th and 95th percentile (Bellone, 2006).
The selection of a different approach (national/international, standard/arbitrary) changes the outcome of the values of overweight and obesity with different implication on public health.
In Italy, the most representative project for obesity surveillance, "OKkio alla salute" (Spinelli, 2008), has chosen the normative references proposed by Cole *et al.* (2000), according to the International Obesity Task Force (IOTF).
The research questions are:

1. Which is the percentage of children in a weight risk condition?
2. Which is the trend of BMI in children with the same age in different years?
3. Are there differences in the use of different normative values and consequently different standard cut-off (national vs international references)?

Materials and Methods

Participants were 2044 children from Cuneo, Asti and Torino, three big cities in Piedmont, a region in North-west of Italy. The sample was balanced by gender (51% males) and by city (39% Cuneo; 30% Asti; 31% Torino) All subject took part in a longitudinal and multidisciplinar research project called "Educata...mente Sport", started in 2007. The project, still in progress, aims to monitor anthropometric (height, weight, BMI), psychological (life skills, friendship, psychosocial behavior) and motor (gross-motor skill and balance) aspects of children attending primary school.
We employed an experimental design with two waves (pre-test and post-test) for two consecutive scholastic years (2008/2009 and 2009/2010).
Weight was measured with an impedance scale, while height was measured by an anthropometer. BMI was analyzed through normative curves of BMI, to assess weight categories (Underweight, Normal weight, Overweight, Obesity). Specifically, we used international growth curves and relative normative values (standard cut-off) proposed by IOTF (Cole, 2000) and national ones, proposed by SIEDP, Italian Association of Endocrinology (Cacciari, 2006). To do a correct comparison, we used the same standards (Cole, 2000) used by the Italian Project "OKkio alla salute" (2008).

Results

Using normative values of IOTF (Cole, 2000), 20% of the sample was overweight and 8% was in a condition of obesity, while children underweight were few (3%). 70% of the sample is not in a risk condition. These results were lower than those from the National project "OKkio alla salute"(2008), in particular for the values of overweight

and obesity. The results from the four waves seemed to be stable.

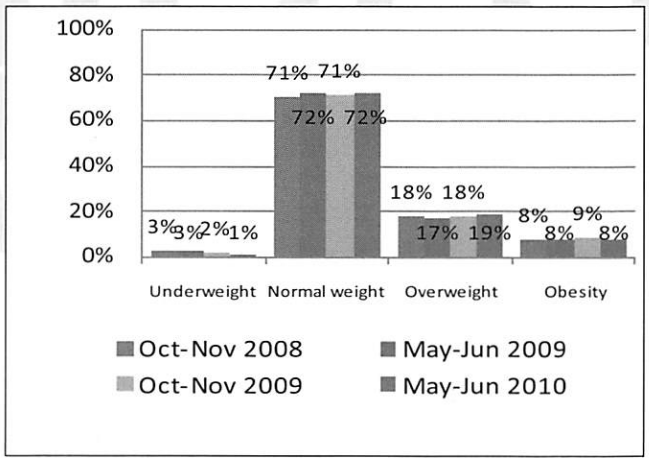

Fig. 1 *Distribution of BMI in 4 consecutive data collections IOTF normative values (Cole, 2000)*

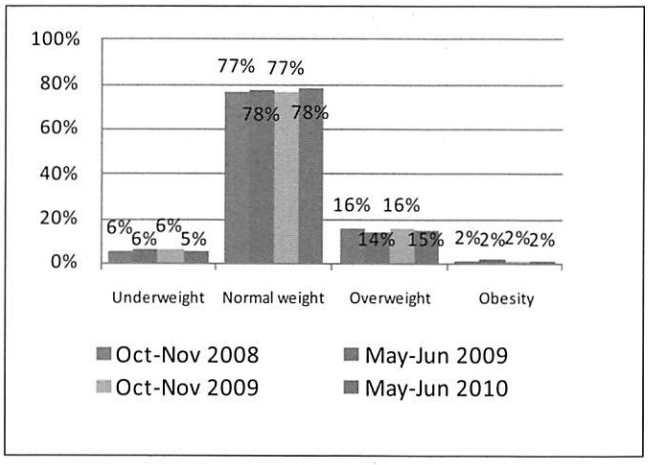

Fig. 2 *Distribution of BMI in 4 consecutive data collections SIEDP normative values (Cacciari, 2006)*

Comparing the use of IOTF (Cole, 2000) International references with the National ones proposed by the SIEDP (Cacciari, 2006), the sample had different percentage of overweight and obesity. With the national references,

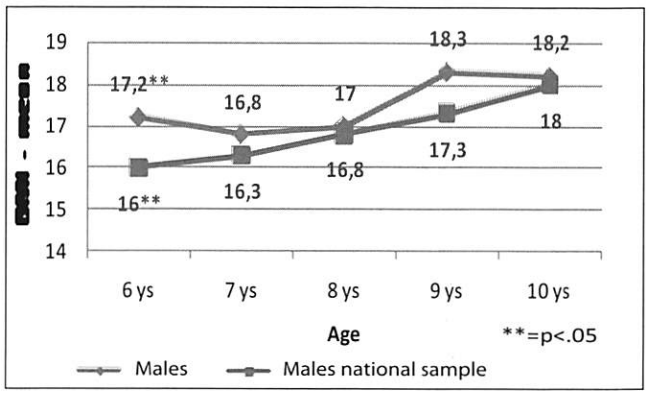

Fig. 3 *Comparison between the distribution of BMI: "Educata…mente Sport" sample vs national sample (Cacciari, 2006) – Males*

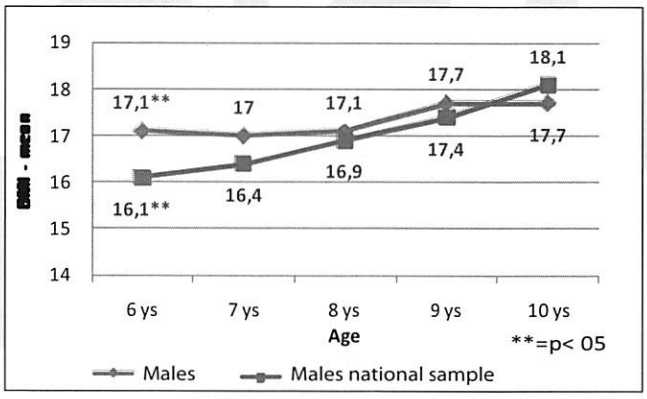

Fig. 4 *Comparison between the distribution of BMI: "Educata…mente Sport" sample vs national sample (Cacciari, 2006) – Females*

less than 20% of the sample were in a risk condition (overweight and obesity).

Figure 3 and 4 show the results of the comparison between the mean of the sample of this study with the same age of the National normative sample. T-Student test showed that there was a significant difference ($p<.05$) between 6 year old children, in both genders. In particular, our sample had a mean of BMI higher than the normative sample.

To verify the presence of a negative trend in children of same age in different years, BMI in two different years (2010 and 2011) were compared. In 2010, 7 years old children had a significantly higher BMI than same age children in the previous year (Female: $F(1,298)=3,404$; $p<.08$. Male: $F(1,281)=6,489$; $p<.05$). 8 and 9 years old children did not show significant differences.

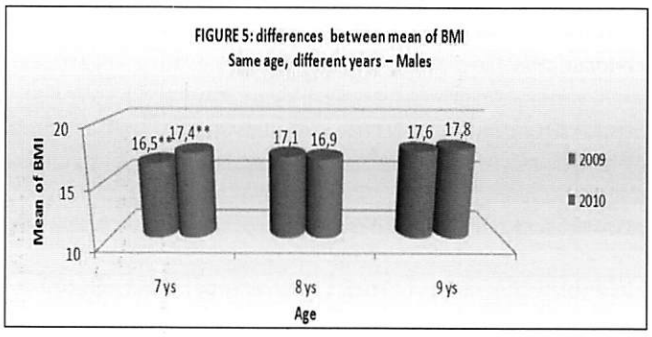

Fig. 5 *Differences between mean of BMI Same age, different years – Males.*

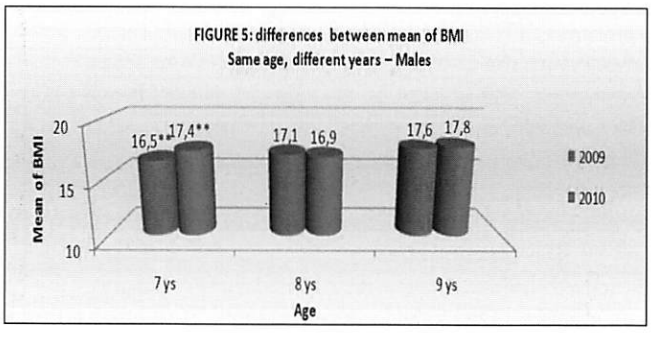

Fig. 6 *Differences between mean of BMI Same age, different years – Females.*

Discussion

The general purpose of this study was to analyze the body mass condition of children between 6 and 10 years old, in Piedmont. The results about the distribution of BMI showed that overweight and obesity were not a urgent socio-politic problem, even if the percentage of children in a normal weight condition was only around 70%. 27% of children with overweight or obesity was a considerable percentage, but not so high like in other countries (for example in the USA). These data were similar to those found in the project "OKkio alla salute", promoted by the Health Ministry. The data collected with our research project, "Educata...mente Sport", showed a less percentage of children in overweight condition (18,5% vs 19,5%), and a greater percentage of obese children (8,2% vs 7,8%).
The analysis showed differences between children of same age in different years. There was an increase of mean of BMI between 2009 and 2010. This increase regarded only 7 years old children, while with children of 8 and 9 years old the mean of BMI was stable in years.
These results were confirmed by the comparison between growth curve of national sample and growth curve of our sample (Fig. 3 and 4). Also in this analysis, statistical difference occured between younger children, while is not evident with older children. In particular, the 6 years old children of our sample had a mean of BMI higher than same age children of the national sample. These results could mean that in the first years of primary school there is a low attention for healthy life style, good diet and adequate physical activity. Preventive interventions to control the body fat in children should concentrate on 6 and 7 years old children. For this purpose, the collaboration with primary schools is fundamental.
The last point of this study regarded the use of different normative references and growth curves (national/international, standard/arbitrary). Through the comparison between two different references, one international (Cole, 2000) and the other national (Cacciari, 2006), we underlined the differences in the distribution of overweight and obesity. National references are built with a national sample, and are more representative of the growth phases of Italian children. On the other hand, without an international reference is impossible (and wrong) to compare Italian data with those of other countries. This notion is important not only to assess correct preventive interventions and data analysis, but also for a correct reading of statistics related to the problem of obesity.

Acknowledgments

This study was partially funded by CRC Foundation (Cuneo) and CRT Foundation (Turin), Italy. We warmly thank Fulvia Gemelli, S.U.I.S.M., Torino, Italy, for her support and suggestions for the realization of this research. We also thank the students of MA at the Faculty of Psychology and at S.U.I.S.M., Torino, Italy who served for evaluating the children's Body Mass Index. Finally, we thank the children and their parents and teachers who accepted to participate at this study with great enthusiasm.

References

Bellone S., Cavallo L., Bona G. 2006. Growth reference charts: which are more appropriate? *J. Endocrinol. Invest.*, 29(7): 579-580.

Cacciari E., Milani S., Balsamo A., Spada E., Bona G., Cavallo L., *et al.* 2006. Italian cross-sectional growth charts for height, weight and BMI (2 to 20 yr). *J. Endocrinol. Invest.*, 29(7): 581-593.

Cole T.J., Bellizzi M.C., Flegal K.M., Dietz W.H. 2000. Establishing a standard definition for child overweight and obesity worldwide: international survey. *Bmj.*, 320(7244): 1240-1243.

Dietz W.H., Story M.T., Leviton L.C. 2009. Issues and implications of screening, surveillance, and reporting of children's BMI. *Pediatrics*, 124 (Suppl. 1): S98-101.

Racioppi F., Dora C., Krech R., Ehrenstein von O. 2002. *A physically active life through everyday transport. With a special focus on children and older people and examples and approaches from Europe.* WHO, Regional Office for Europe, Copenhagen.

Sassi F., 2010. *Obesity and the economics of preventions: fit not fat.* OECD, Organization for Economic Co-operation and Development.

Spinelli A., Lamberti A., Baglio G., Andreozzi S., Galeone D. 2009. *OKkio alla SALUTE: sistema di sorveglianza su alimentazione e attività fisica nei bambini della scuola primaria. Risultati 2008.* Istituto Superiore di Sanità, Roma. (Rapporti ISTISAN 09/24).

Toschke A.M., Kurth B.M., von Kries R. 2008. The choice of cutoffs for obesity and the effect of those values on risk factor estimation. *Am. J. Clin. Nutr.*, 87(2): 292-294.

Zeigler EF. 2003. Guiding professional students to literacy in physical activity education. *Quest.*, 55: 285-305.

WHO - World Health Organization. 2004. *Global strategy on diet, physical activity and health.* World Health Organization (WHO).