Preliminary Results of an Anthropometric Data Collection of Portuguese Children with Overweight and Obesity

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INTRODUCTION

In the 21st century, according to the World Health Organization (WHO), childhood obesity has reached epidemic proportions. Worldwide, it is estimated that around 200 million children of school age have high Body Mass Index (BMI), of which 40-50 million are considered obese [1].

In the European Union (EU), according to the European Child Nutrition Surveillance System and the Childhood Obesity Surveillance Initiative (COSI), coordinated by the WHO European Office, childhood overweight and obesity has remained constant and it is particularly worrying among children from the most unfavorable socioeconomic strata [2].

Lobstein, quoted by Venâncio, Aguilar, and Pinto [3], states that southern European countries have higher rates of overweight children than northern countries. Portugal, as an example of a southern country, has more than 31.6% of the children aged between 6 and 8 above the recommended BMI, corresponding to 17.7% overweight and 13.9% with obesity [2]. Nowadays, the steady increase in the number and the spread of overweight children in different age groups is viewed as an alert to the Portuguese public health [4], turning this subject in one of the priority axes of the 2020 national health-extension plan.

For Solomon, cited by Winter and Moraes [5], overweight and obesity can lead to introspection, loneliness, social interaction difficulties, anxiety, and depression. Abrantes, Lamounier, and Colosimo [6] mention that these problems affect in children's self-esteem and school performance.

However, the problems faced by overweight children affect other aspects, like purchasing and use of clothing. It is possible to highlight that the clothing industry is not aware of such problems and usually, not able to offer suitable products to this niche market, using standard measurements based on normal BMI for the clothing design and manufacturing processes. The usability is poor: clothes are not adequate for children measurements and body shape, materials used and styles available for them can cause discomfort, with little aesthetic appeal for their ages. As a result, some children end up using clothing designed for adults. This is also noticed in the offer available for Portuguese children in most clothing brands.

As a result of this need, this paper presents some of the anthropometric data collected during an ongoing Ph.D. research, conducted in the Textile Engineering Department at University of Minho, Portugal. The overall goal of this study is the development of clothing for this market niche, considering the needs of the overweight and obese Portuguese child population and the knowledge of their anthropometric characteristics.

METHODOLOGY

This paper presents a descriptive data analysis of anthropometric measurements of Portuguese children. A sample of 816 children, aged from 2 to 12 years of both genders was used. Data was collected from 11 elementary schools located in three cities in northern Portugal (Braga, Guimaraes, and Vila Nova de Famalicao). It is important to highlight that not all of the 816 children measured were considered in the study of the target population, i.e., not all were overweight or obese. When gaining access to a school, all children were invited to participate in the study, aiming to avoid embarrassment and abuse by peers, but also to understand the percentage of each in each school.

During data collection, the following measurements were collected from each child:

- Height: obtained with a measurement tape fixed on a wall without baseboard. During the measuring process, children were asked to remain in a standing position with both arms parallel along the torso.

- Weight: obtained with a digital scale;

- Body measurements: obtained with a 3D digital body scanner (KBI – Kinect Body Imaging), assuring a fast, accurate and portable measurement process. This body scanner provides 110 different body measurements, obtained by 4 Kinect infrared sensors and a software program able to reproduce the body shape of each participant. Data collection followed a protocol, assuring the correct position of each child, and was repeated 5 times.

During data collection, an identification code was also developed to identify the measurement collected and the following parameters: gender, age, school, and city.

Data processing started using the software Microsoft Excel, organizing data according to the parameters and measurements collected. Nutritional condition was obtained through BMI (weight/(height)^2). From the 110 body measurements obtained by the KBI system, 18 were selected to be used in the study, considering their relevance in the clothing design process, namely during the development of the standard pattern blocks (slopers).

After the preliminary data processing, from the 816 children measured, only the data of 660 was used, not considering children aged from 2 to 4 years old, since WHO does not classify overweight and obese children in this range. Some scanners could not also be considered due to poor quality of the obtained images, specially in this same age group, as children had more difficulty in staying still in the correct position during the scanning process. Therefore, from the sample of 660 children, the best image obtained of each child was treated using the KBI software.

After this process, data was statistically analyzed using the SPSS software package (Version 21). Qualitative variables (gender, age, school, and city) were represented by their absolute and relative frequencies and the quantitative variables were described by their average, standard-deviation and quartiles. The chi-square test was performed to compare the variables proportions, using a level of significance of 5%.

Currently, there are several tables and BMI percentile reference curves for specific age and gender for nutritional assessment. There are BMI percentile reference curves of the Center for Disease Control and Prevention (CDC), International Obesity Task Force (IOTF) and WHO. There is a great variation between the values of each organization, making it difficult to compare data and literature related to overweight and obesity. Therefore, for the purpose of this study, the sample of overweight and obese children was defined using the values of BMI, calculated using WHO data to separate the sample.

RESULTS

From the valid sample of 660 children, 106 were considered overweight and 125 obese, representing 18.9% and 16.1%, respectively. The average BMI of the measured sample for the 3 cities was similar to the results presented by the WHO Childhood Obesity Surveillance Initiative for the North of Portugal (Table I).

Table I – COSI BMI for the northern region of Portugal and the average BMI for each city of this study.

	WHO Childhood Obesity Surveillance Iniciative (COSI) n (%)	**This resarch**		
	North Portugal	Braga	Guimaraes	Famalicao
BMI	17,0	17,3	17,0	18,2

When comparing the results from public schools (23.3% overweight and 29.5% obese) with the results from private schools (14.7% overweight and 18.3% obese), it was possible to corroborate the COSI study, where the prevalence of obesity is greater in the most unfavourable socioeconomic strata. This explains why in the city of Famalicao the BMI was greater, as only public schools were used.

PRELIMINARY CONCLUSIONS

Childhood overweight and obesity is a worldwide issue, currently recognized as reaching epidemic levels. Besides the physical and psychological impacts, overweight and obesity impacts the social interaction and aspects of everyday life of such children. One of them is the purchasing and use of clothing.

This paper describes part of an ongoing Ph.D. research study aiming to contribute to this subject. Using a 3D body scanner, a valid sample of 660 Portuguese children was measured. Data obtained was in accordance with the WHO Childhood Surveillance Initiative, in terms of proportions and socioeconomic strata.

It was possible to validate the sample, which will be used to identify the main biotypes, develop measurement tables for the Portuguese overweight and obese children. The process will include also the design of slopers and clothing prototypes for the identified biotypes in each age range, providing accurate data for the Portuguese children fashion industry.

Overweight and obese children anthropometrics, usually not considered by fashion industry in general, may represent a market opportunity for brands, allowing them to offer fitting clothes for such population, increasing their self-esteem and social acceptance, contributing to a higher inclusion of this growing market niche.

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