



An analysis of anthropometric data on Iranian primary school Student: A Review

Abdolreza Gilavand*

Employed Expert on Faculty Appointments, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

**Corresponding Email: gilavanda@gmail.com*

ABSTRACT

Physical factors and health and safety issues and training are the most effective and most fundamental natural growth factor in terms of physical, mental and educational development in students. This study was designed to obtain anthropometric dimensions of Iranian primary school student. We searched international databases such as Thomson Reuters, PubMed, Scopus, EMBASE, Cochrane Library, and Iranian databases such as SID, Magiran, Iranmedex using a searching strategy during 2000 to 2016 years. Database without language restriction, since 2000 sources, with the MeSH term "Anthropometric data" AND "Iranian primary school children". At first, in the initial search, 115 articles were found, and finally, 22 of them which were related to the subject of this research were used. This study showed significant differences in a set of anthropometric dimensions with regard to gender, age and ethnicity. Also this study indicates that there is a significant difference between the minimum and maximum acceptable dimensions and those of the available furniture ($p < 0.05$). According to the results of this study, difference between genders and among different ethnicities should be taken into account by designers and manufacturers of school furniture. In many schools, there is not proportion between students' anthropometric dimensions and the dimensions of existing tables and benches. Thus, it is suggested that required efforts are done to design educational furniture such as table and bench for various grades of elementary level in every region according to the existing anthropometric dimensions database.

Keywords: Anthropometric data, Iranian primary school, Student

INTRODUCTION

All experts of education and educational psychology of teaching and learning agree that effective education depends on having a goal, the appropriateness of the physical and social environment of class, motivation of teachers and students for teaching and learning, the students' cognitive, emotional and motor preparation, sound management of class by teachers, their mastery over the subject, and their passion for their work and the students' progress. The teacher can observe the high and trying to create a perfect environment for learning to learn prevent the formation of behavior and nuisance factors [1,2]. The learning environment dramatically affects the learning outcomes of students. Noise, inappropriate temperature, insufficient light, Educational Furniture, overcrowded classes, misplaced boards and inappropriate classroom layout make up factors that could be confounding variables distracting students in class [2-7].

In ergonomics, the anthropometric data (measurement of body dimensions) is used for designing work spaces, furniture, and clothes [8]. Regarding the difference of anthropometric dimensions of various nations and races, every community needs its specific anthropometric data [9]. For this reason, many studies have already been performed in Iran [10-18]. Provinces of Iran. Also, many studies have been carried out outside of Iran in this regard [8,9,19-22].

Anthropometric data can be used to identify the physical dimensions of equipment, furniture, etc. The use of furniture that fails to fulfill the anthropometric data of its users has a negative impact on human health. Specific

anthropometric dimensions are necessary to design school furniture. Anthropometric data have been measured in many communities especially among schoolchildren. There are different ethnic groups with probably different anthropometric data in Iran, and anthropometric data can change by time, so gathering data about anthropometric dimensions is important. This study was designed to obtain anthropometric dimensions of Iranian primary school student.

MATERIALS AND METHODS

We searched international databases such as Thomson Reuters, PubMed, Scopus, EMBASE, Cochrane Library, and Iranian databases such as SID, Magiran, Iranmedex using a searching strategy during 2000 to 2016 years. Database without language restriction, since 2000 sources, with the MeSH term "Anthropometric data" AND "Iranian primary school student". At first, in the initial search 115 articles were found, and finally, 22 of them which were related to the subject of this research were used.

RESULTS

Hafezi et al (2010): This study was designed to obtain anthropometric dimensions of Iranian children (Fars ethnicity) aged 7-11 years. In a cross-sectional study in Yazd, Iran, descriptive statistics as well as key percentiles for 17 static anthropometric data of primary school students (1015 males and 1015 females), were measured and compared between boys and girls. The age of the students was between 6 and 11 years. Mean weight was between 21.56±5.33 kg and 36.63±9.45 kg in boys and between 20.79±3.48 kg and 35.88±9.40 kg in girls. Mean height was between 1187.02±53.98 mm and 1420.83± 69.39 mm in boys and between 1173.90±51.01mm and 1421.27±70.82 mm in girls. There was also some difference in other anthropometric data between two genders. Results of this study showed some differences in anthropometric data with other studies. Also observed significant gender differences in some dimensions as well[10].

Habibi et al (2011): This study is aimed to examine the appropriacy of school furniture to Iranian pupils' anthropometric features. The participants in this cross-sectional study were 493 boys and 489 girls with the age-range of 7 to 12 years who were selected through a multistage random cluster sampling procedure. Age, weight, height, and anthropometric dimensions were determined. This study indicates that there is a significant difference between the minimum and maximum acceptable dimensions and those of the available furniture ($p < 0.001$). In designing suitable furniture for pupils the anthropometric differences of age and gender must be taken into account[11].

Mirmohammadi et al (2013): In this study, They measured some anthropometric dimensions of Iranian children from different ethnicities. A total of 12,731 Iranian primary school children aged 7-11 years were included in the study and their static anthropometric dimensions were measured. Descriptive statistics such as mean, standard deviation and key percentiles were calculated. All dimensions were compared among different ethnicities and different genders. This study showed significant differences in a set of 22 anthropometric dimensions with regard to gender, age and ethnicity. Turk boys and Arab girls were larger than their contemporaries in different ages. According to the results of this study, difference between genders and among different ethnicities should be taken into account by designers and manufacturers of school furniture[12].

Mehrpavar et al (2015): They measured some anthropometric dimensions of Iranian guidance school students selected from different ethnicities. Background: Anthropometric dimensions are used for design of equipment, furniture, and clothing. Furniture with inappropriate design not fulfilling the users' anthropometric dimensions may have a negative effect on health. A total of 7400 Iranian guidance school students aged 12-14 years entered the study and their static anthropometric dimensions were measured. Descriptive statistics such as mean, standard deviation, and key percentiles were calculated. All dimensions were compared among different ethnicities and different genders. This study showed significant differences in a set of 22 anthropometric dimensions regarding gender, age, and ethnicity. According to the results of this study, difference between genders and among different ethnicities should be taken into account by designers and manufacturers of guidance school furniture. Application: this study has prepared a data bank of anthropometric dimensions of 12-14-year-old students which can be used as basic information to find appropriate dimensions of school furniture[13].

Mehrparvar, Mirmohammadi et al (2015): This study was designed to measure some static anthropometric dimensions in Iranian high school students, considering ethnic differences. Nineteen static anthropometric dimensions of high school students were measured and compared among different Iranian ethnicities (Fars, Turk, Kurd, Lor, Baluch, and Arab) and different genders. In this study, 9,476 subjects (4,703 boys and 4,773 girls) ages 15 to 18 years in six ethnicities were assessed. The difference among ethnicities was statistically significant for all dimensions ($p < 0.001$ for each dimension). This study showed statistically significant differences in 19 static anthropometric dimensions among high school students regarding gender, age, and ethnicity[14].

Heidarimoghadam et al (2014): This study was aimed to examine the match between students' body dimensions and existing benches and desks dimensions in Hamadan female primary schools. In this study, 624 students of Hamadan female primary schools were investigated and some of their anthropometric dimensions including shoulder height, elbow height, knee height, popliteal height, popliteal-buttock length and hip breadth were measured. In this sense, a chair (with adjustable height, depth and elbow support) and a caliper with movable jaw were used for measurement of anthropometric dimensions. The measurements were performed in a way that thighs were in full contact with the seat, there was a right angle between the thighs and legs, the feet were in full contact with the movable pedal, the trunk was straight and the back and hips were in full contact with the backrest. Following, the match of the dimensions of existing benches and desks with the appropriate dimensions (based on the students' anthropometric dimensions) were examined. The results showed that the seat height, seat depth, seat width, back rest height, desk height, underneath desk height were in acceptable range for 10.1%, 17.3%, 5.6%, 53.5%, 1.9% and 31.1% of students, respectively. Despite differences in the body dimensions of primary school students, there is no regularity in using of school furniture. Overall, the dimensions of existing benches and desks are not matched with the anthropometric dimensions of student[15].

Heidarimoghadam et al (2015): This study was aimed to examine the match between students' anthropometric dimensions and the dimensions of existing benches and desks in Hamadan male primary schools. In this study, 600 students of Hamadan male primary schools were studied. In addition to height and weight, their anthropometric dimensions including shoulder height, elbow height, knee height, popliteal height, popliteal - buttock length and hip breadth were measured. Then, the comparison was made between the dimensions of existing benches and desks in Hamadan schools and the ergonomic dimensions. The results showed that the dimensions of two existing benches and desks do not match with students anthropometric dimensions. For benches and desks with common seat pans, the seat height, seat depth, seat width, back rest height, desk height, underneath desk height were not matched with 89.5, 76.5, 88.5, 62, 57, and 64 percent of students, respectively; while in benches and desks with separated seats, the dimensions were not appropriate for 61.5, 58.5, 58, 73.5, 76.5, and 60.5 percent of students, respectively. Both kinds of existing furniture in the Hamadan primary schools were not appropriate for students. Seat depths and heights of benches with separated seats were relatively better than of those with common seats[16].

Ghofraniet al (2014): Due to the deleterious effects of mismatch between body dimensions of students and educational furniture, this study aimed to assess the size of students' body in Yazd. The study population included all high school students in Yazd city. Popliteal height, buttock popliteal length, elbow rest height, hips width, thighs thickness and scapular elevation were measured in 307 students. Besides, in furniture used in the schools studied, two chairs and two benches that had a greater frequency of analysis were chosen. The results of the statistical comparisons showed that type 1 furniture, seat width was acceptable for 96.74% and thigh freedom was 100% fit. The type 2 furniture depth for most students was appropriate, and seat width was acceptable for 96.42% of students. Thigh freedom was fit for 100% with a good rating. In type 3 furniture, there was not any parameter with good fit and in type 4 furniture, wide seat width and thigh freedom was desirable. In general, the furniture conformity with students' anthropometry was not desirable[17].

Ghanbari et al (2015): In this cross-sectional research 1695 native 7-12 years old children from Arak (Central Iran) were investigated. Some of the physical variables such as head length, width and circumference, facial length and width were measured. Cephalic and facial indices based on these variables were evaluated. The results showed that the dominant type of cephalic index was the mesocephalic one, while the dolicocephalic type was less frequent. The dominant type of facial index was the euryprosopic one, the less frequent type the hyperleptosopic one. Between males and females no statistically significant differences in the distribution of these indices could be observed. The types of head and face of the Arak children differ somewhat from those observed in populations from other parts of Iran as well as from those of neighboring countries. These differences indicate the importance of the physical standards of the Arak children as a Fars subgroup of Caucasians[18].

Gilavand (2016): This research has been performed to investigate Impact of Educational Furniture of Schools on Learning and Academic Achievement of Students at Elementary Level of the city of Ahvaz, at the southwest of the Islamic Republic of Iran year 2015-2016. At a cross-sectional study a total of 210 students were selected randomly

as sample of study. Cluster sampling was done by appropriate allocation and questionnaires were randomly divided among students. Data collection tools included Hermance's achievement motivation questionnaire and researcher-constructed questionnaire (observation checklist to examine the physical parameters of educational furniture in educational institutions) and interviews with students. Data of study were analyzed using SPSS- 21 software. The results obtained from this study showed that appropriate educational furniture has positive impact on the ratio of learning and educational progress of students at elementary level [6].

Table 1. An analysis of anthropometric data on Iranian primary school children

Title	Authors (Year)	Country and city studied	METHODS	RESULTS
An analysis of anthropometric data on Iranian primary school children.	Hafeziet al (2010)	Iranian children (Fars ethnicity) aged 7-11 years. Yazd	In a cross-sectional study in Yazd, Iran, descriptive statistics as well as key percentiles for 17 static anthropometric data of primary school students (1015 males and 1015 females), were measured and compared between boys and girls.	The age of the students was between 6 and 11 years. Mean weight was between 21.56±5.33 kg and 36.63±9.45 kg in boys and between 20.79±3.48 kg and 35.88±9.40 kg in girls. Mean height was between 1187.02±53.98 mm and 1420.83±69.39 mm in boys and between 1173.90±51.01mm and 1421.27±70.82 mm in girls. There was also some difference in other anthropometric data between two genders.
Proportion of elementary school pupils' anthropometric characteristics with dimensions of classroom furniture in Isfahan, Iran.	Habibiet al (2011)	Isfahan	The participants in this cross-sectional study were 493 boys and 489 girls with the age-range of 7 to 12 years who were selected through a multistage random cluster sampling procedure. Age, weight, height, and anthropometric dimensions were determined.	This study indicates that there is a significant difference between the minimum and maximum acceptable dimensions and those of the available furniture (p < 0.001).
An epidemiologic study on anthropometric dimensions of 7-11-year-old Iranian children: considering ethnic differences	Mirmohammadiet al (2013)	Turk boys and Arab girls were larger than their contemporaries in different ages	In this study, we measured some anthropometric dimensions of Iranian children from different ethnicities. A total of 12,731 Iranian primary school children aged 7-11 years were included in the study and their static anthropometric dimensions were measured. Descriptive statistics such as mean, standard deviation and key percentiles were calculated. All dimensions were compared among different ethnicities and different genders.	This study showed significant differences in a set of 22 anthropometric dimensions with regard to gender, age and ethnicity. Turk boys and Arab girls were larger than their contemporaries in different ages. According to the results of this study, difference between genders and among different ethnicities should be taken into account by designers and manufacturers of school furniture.
Anthropometry of Iranian Guidance School Students with Different Ethnicities: A Comparative Study.	Mehrpavaret al (2015)	Iranian guidance school students aged 12-14 years	A total of 7400 Iranian guidance school students aged 12-14 years entered the study and their static anthropometric dimensions were measured. Descriptive statistics such as mean, standard deviation, and key percentiles were calculated. All dimensions were compared among different ethnicities and different genders.	This study showed significant differences in a set of 22 anthropometric dimensions regarding gender, age, and ethnicity. Conclusion. According to the results of this study, difference between genders and among different ethnicities should be taken into account by designers and manufacturers of guidance school furniture. Application. This study has prepared a data bank of anthropometric dimensions of 12-14-year-old students which can be used as basic information to find appropriate dimensions of school furniture.
Static anthropometric dimensions in a population of Iranian high school students: considering ethnic differences.	Mehrpavaret al (2015)	Different Iranian ethnicities (Fars, Turk, Kurd, Lor, Baluch, and Arab) and different genders.	Nineteen static anthropometric dimensions of high school students were measured and compared among different Iranian ethnicities (Fars, Turk, Kurd, Lor, Baluch, and Arab) and different genders.	In this study, 9,476 subjects (4,703 boys and 4,773 girls) ages 15 to 18 years in six ethnicities were assessed. The difference among ethnicities was statistically significant for all dimensions (p values < .001 for each dimension).

				This study showed statistically significant differences in 19 static anthropometric dimensions among high school students regarding gender, age, and ethnicity.
Assessing the match between female primary students' anthropometric dimensions and furniture dimensions in Hamadan schools in 2013	Heidarimoghadam et al (2014)	Hamedan	In this study, 624 students of Hamadan female primary schools were investigated and some of their anthropometric dimensions including shoulder height, elbow height, knee height, popliteal height, popliteal-buttock length and hip breadth were measured. In this sense, a chair (with adjustable height, depth and elbow support) and a caliper with movable jaw were used for measurement of anthropometric dimensions. The measurements were performed in a way that thighs were in full contact with the seat, there was a right angle between the thighs and legs, the feet were in full contact with the movable pedal, the trunk was straight and the back and hips were in full contact with the backrest. Following, the match of the dimensions of existing benches and desks with the appropriate dimensions (based on the students' anthropometric dimensions) were examined	The results showed that the seat height, seat depth, seat width, back rest height, desk height, underneath desk height were in acceptable range for 10.1%, 17.3%, 5.6%, 53.5%, 1.9% and 31.1% of students, respectively
Investigating the Match between Male Primary Students' Anthropometric Dimensions and Existing Furniture Dimensions in Hamadan Schools in 2013	Heidarimoghadamet al (2015)	Hamedan	In this study, 600 students of Hamadan male primary schools were studied. In addition to height and weight, their anthropometric dimensions including shoulder height, elbow height, knee height, popliteal height, popliteal - buttock length and hip breadth were measured. Then, the comparison was made between the dimensions of existing benches and desks in Hamadan schools and the ergonomic dimensions	The results showed that the dimensions of two existing benches and desks do not match with students anthropometric dimensions. For benches and desks with common seat pans, the seat height, seat depth, seat width, back rest height, desk height, underneath desk height were not matched with 89.5, 76.5, 88.5, 62, 57, and 64 percent of students, respectively; while in benches and desks with separated seats, the dimensions were not appropriate for 61.5, 58.5, 58, 73.5, 76.5, and 60.5 percent of students, respectively.
Assessing the appropriateness of educational furniture with body size of students in Yazd	Ghofrani et al (2014)	Yazd	The study population included all high school students in Yazd city. Popliteal height, buttockpopliteal length, elbow rest height, hips width, thighs thickness and scapular elevation were measured in 307 students. Besides, in furniture used in the schools studied, two chairs and two benches that had a greater frequency of analysis were chosen.	The results of the statistical comparisons showed that type 1 furniture, seat width was acceptable for 96.74% and thigh freedom was 100% fit. The type 2 furniture depth for most students was appropriate, and seat width was acceptable for 96.42% of students. Thigh freedom was fit for 100% with a good rating. In type 3 furniture, there was not any parameter with good fit and in type 4 furniture, wide seat width and thigh freedom was desirable. Conclusions
Characterization of the head and face in 7-12 years old Fars children of Arak (Central Iran): An anthropometric study	Ghanbari et al (2009)	Arak	In this cross-sectional research 1695 native 7-12 years old children from Arak (Central Iran) were investigated. Some of the physical variables such as head length, width and circumference, facial length and width were measured. Cephalic and facial indices based on these variables were evaluated.	The results showed that the dominant type of cephalic index was the mesocephalic one, while the dolicocephalic type was less frequent. The dominant type of facial index was the euryprosopic one, the less frequent type the hyperleptoprosopic one. Between males and females no statistically significant differences in the distribution of these indices Could be observed. The types of head and face of the Arak children differ somewhat from those observed in

				populations from other parts of Iran as well as from those of neighboring countries. These differences indicate the importance of the physical standards of the Arak children as a Fars subgroup of Caucasians.
The Impact of Educational Furniture of Schools on Learning and Academic Achievement of Students at Elementary Level	Gilavand (2016)	Ahvaz	At a cross-sectional study a total of 210 students were selected randomly as sample of study. Cluster sampling was done by appropriate allocation and questionnaires were randomly divided among students. Data collection tools included Hermance's achievement motivation questionnaire and researcher-constructed questionnaire (observation checklist to examine the physical parameters of educational furniture in educational institutions) and interviews with students. Data of study were analyzed using SPSS- 21 software.	The results obtained from this study showed that appropriate educational furniture has positive impact on the ratio of learning and educational progress of students at elementary level

CONCLUSION

Working or studying in a comfortable environment enhances not only wellbeing, but also satisfaction and therefore productivity and learning. Educational ergonomics focuses on the interaction between educational performance and educational design. By improving the design or pointing out the possible problems, educational ergonomics can be utilized to have positive impacts on the student performance and thus on education process. In many schools, there is not proportion between students' anthropometric dimensions and the dimensions of existing tables and benches. In spite of the difference among body dimensions of the students of various elementary levels, there is not a specific order in using the table and bench with different dimensions, and it is sometimes observed that in one school the same size of table and bench is used for all levels. This causes, for instance, the seat height and table for lower grade students and the seat dept for higher grade students do not fit, that causes physical problems and hence disturbance in learning process and educational progress of students in long term, and makes the optimum and efficient education and training to face with problem. Thus, it is suggested that required efforts are done to design educational furniture such as table and bench for various grades of elementary level in every region according to the existing anthropometric dimensions database.

REFERENCES

- [1] Gilavand A. The Comparison of Iranian and Foreign Students' Motivations to Choose Dentistry Field of Study. *Int J Pediatr* 2016; 4(6): 1993-2010.
- [2] Gilavand A, Jamshidnezhad A. The Effect of Noise in Educational Institutions on Learning and Academic Achievement of Elementary Students in Ahvaz, South West of Iran. *Int J Pediatr* 2016; 4(3): 1453-63.
- [3] Gilavand A, Hosseinpour M. Investigating the Impact of Educational Spaces Painted on Learning and Educational Achievement of Elementary Students in Ahvaz, Southwest of Iran. *Int J Pediatr* 2016; 4(2): 1387-96.
- [4] Gilavand A, Espidkar F, Gilavand M. Investigating the Impact of Schools' Open Space on Learning and Educational Achievement of Elementary Students in Ahvaz, Southwest of Iran. *Int J Pediatr* 2016; 4(4): 1663-70
- [5] Gilavand A, Gilavand M, Gilavand S. Investigating the Impact of Lighting Educational Spaces on Learning and Academic Achievement of Elementary Students. *Int J Pediatr* 2016; 4(5): 1819-28.
- [6] Gilavand A. The Impact of Educational Furniture of Schools on Learning and Academic Achievement of Students at Elementary Level. *Int J Med Res Health Sci.* 2016; 5(7S): 343-348.
- [7] Gilavand A. Investigating the Impact of Environmental Factors on Learning and Academic Achievement of Elementary Students: Review. *Int J Med Res Health Sci.* 2016; 5(7S) 360-369.
- [8] Purwaningrum L, Funatsu K, Xiong J, Rosyidi CN, Muraki S. Effect of Furniture Weight on Carrying, Lifting, and Turning of Chairs and Desks among Elementary School Children. *PLoS One.* 2015 Jun 8;10(6):e0128843.
- [9] Castellucci HI, Catalán M, Arezes PM, Molenbroek JF. Evaluation of the match between anthropometric measures and school furniture dimensions in Chile. 2016 Jan 22;53(3):585-95
- [10] Hafezi R, Mirmohammadi S, Mehrparvar A, Akbari H, Akbari H. An analysis of anthropometric data on Iranian primary school children. *Iran J Public Health.* 2010;39(4):78-86.

- [11] Habibi E, Asaadi Z, Hosseini SM. Proportion of elementary school pupils' anthropometric characteristics with dimensions of classroom furniture in Isfahan, Iran. *J Res Med Sci.* 2011 Jan;16(1):98-104.
- [12] Mirmohammadi SJ, Hafezi R, Mehrparvar AH, Gerdafaramarzi RS, Mostaghaci M, Nodoushan RJ, Rezaeian B. An epidemiologic study on anthropometric dimensions of 7-11-year-old Iranian children: considering ethnic differences. *Ergonomics.* 2013;56(1):90-102
- [13] Mehrparvar AH, Hafezi R, Mirmohammadi SJ, Mostaghaci M, Davari MH. Anthropometry of Iranian Guidance School Students with Different Ethnicities: A Comparative Study. *Scientifica (Cairo).* 2015;2015:893489.
- [14] Mehrparvar AH, Mirmohammadi SJ, Hafezi R, Mostaghaci M, Davari MH. Static anthropometric dimensions in a population of Iranian high school students: considering ethnic differences. *Hum Factors.* 2015 May;57(3):447-60.
- [15] Heidarimoghadam R, Golmohammadi R, Roshanaei G, Zare R. Assessing the match between female primary students' anthropometric dimensions and furniture dimensions in Hamadan schools in 2013. *JHSW.* 2015; 5 (1) :47-56
- [16] HeidarimoghadamR, Motamedzade M, Roshanaei G, AhmadiG. Investigating the Match between Male Primary Students' Anthropometric Dimensions and Existing Furniture Dimensions in Hamadan Schools in 2013. *Journal of Ergonomics,* 2014; 2 (1) :9-18
- [17] Ghofrani M, Noori H, Roshan Bakhsh Yazdi A. Assessing the appropriateness of educational furniture with body size of students in Yazd. *Journal of Ergonomics,* 2014; 2(3): 77-87
- [18] Ghanbari, Ali; Bayat, ParvinDokht .Characterization of the head and face in 7-12 years old Fars children of Arak (Central Iran): An anthropometric study. *ANTHROPOLOGISCHER ANZEIGER .* 2009;67(1):77-81.
- [19] Dotterer AM, Lowe K. Classroom context, school engagement, and academic achievement in early adolescence. *J Youth Adolesc.* 2011 Dec;40(12):1649-60.
- [20] Benden ME, Zhao H, Jeffrey CE, Wendel ML, Blake JJ. The evaluation of the impact of a stand-biased desk on energy expenditure and physical activity for elementary school students. *Int J Environ Res Public Health.* 2014;11(9):9361-75.
- [21] Da Silva LB, da Costa Eulálio EJ, SoutoCoutinho A, GonçalvesSoares EV, de Lourdes Silva dos Santos R. Analysis on the relationship between the school furniture and the work surface lighting and the body posture of public Middle School students from João Pessoa, Paraíba, Brazil. *Work.* 2012;41(1):5540-5542.
- [22] Macedo, Angela C.; Morais, Andre V.; Martins, Henriqueta F.; et al. Match Between Classroom Dimensions and Students' Anthropometry: Re-Equipment According to European Educational Furniture Standard. *HUMAN FACTORS.* 2015;57(1):48-60.