ORIGINAL ARTICLE

Analysis of psychomotor development and level of physical activity of children with extracurricular physical activities

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ABSTRACT

Objective: The objective was to evaluate the psychomotor development in the areas of global motor skills, balance and body structure and level of school extracurricular physical activity. **Method:** The sample consisted of 30 individuals of both sexes from 6 to 10 years old, divided into two groups: Active Extracurricular Group and Sedentary Extracurricular Group. Data collection included the characterization of the subjects, anthropometric data, and the tests Development Scale Motor and the IPAQ short version. The variables were expressed as frequencies and proportions, the normality was tested with the Shapiro-Wilk test. Student t test was used to determine the statistical significance of normal data and Mann Whitney test for the non-normal data. Statistical significance was set at $p < 0.05$. **Results:** The classification of BMI / age of both groups was eutrophic (53.3%) and the remainder (46.6%) were overweight. The sedentary group had better results in overall motor development, and the active group in balance and body scheme. **Conclusion:** The children who engage in extracurricular physical activity showed better development in balance and body structure, when compared to those that do not.

Keywords: Motor Activity, Psychomotor Disorders, Child

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INTRODUCTION

Psychomotor development refers to an improvement of the skills of psychomotor functions, which is influenced by several sources, such as cognitive and affective.[1, 2]

Developmental disorders are characterized by deficits in several areas, such as in fine and global motor skills[3], balance, body scheme, timeline organization and laterality.[1]

Psychomotor activities are important for child development, both fine and globally.[2] Psychomotor development comes as a sensory-perceptual-motor foundation and is an essential contributor for education and psychomotor reeducation processes because it works directly on the organization of sensation, perceptions and cognitions, therefore it can be focused on previously planned and scheduled adaptive responses.[4]

For the evaluation of psychomotor development, there are several batteries and tests, such as the Motor Development Scale (MDS), which assesses psychomotor areas according to chronological age (CA) of the child.[1] Some studies assessed psychomotor development in different clinical and social situations such as school,[5-7] deficiency,[8,9] learning difficulties,[10,11] physical activeness,[12,13] gender,[14] age, socioeconomic status,[15] virtual reality influence[16] and obesity,[5] and others.

Among the clinical situations mentioned, obesity is an important factor that impairs motor development, as it can change the posture, balance and global praxis of overweight and obese individuals.[5] Childhood obesity has gained epidemic proportions around the world. Contrary to what was then the basic concern for obese children, i.e. the high risk of becoming an obese adult, nowadays there is growing concern about the repercussions of obesity during childhood on the development of the individual.[17]

An undesirable condition that poses a great risk to health, can lead to physical inactivity and obesity is physical inactivity.[18] According to the World Health Organization (WHO) the practice of physical activity is a key health indicator, what emphasizes its importance. Therefore, it is necessary to encourage the practice of exercise in both the family and the school as well as in the community where the child lives. Moreover, it is believed that children who perform physical activity on a daily basis, have better psychomotor development.[2]

Some public institutions have focused at encouraging children to participate in extracurricular programs of sport initiation, in which activities are carried out for the acquisition and / or improvement of basic motor skills.[1] In these activities, there is intense work of body awareness, temporal, spatial, balance and other characteristics such as cognitive. The practice of motor activities through exercise or motor skills games provides an effect on the physical, perceptual-motor, moral and affective aspects of a child.[19]

Hence, an important tool for early detection of problems in basic motor skills is to use physiotherapy with extracurricular activities offered by schools, including the evaluation of psychomotor functions, to check the development of fine motor skills, overall motor skills, balance, body scheme, spatial organization, temporal organization and laterality, and postural assessments to identify changes and / or body dysfunctions. To provide it, there must be an organization of the proposed physiotherapy actions by combining separate groups according to their difficulties. The evaluation of physical performance and perceived difficulty of a task facilitates the planning of exercise programs with safe and successful participation.[20]

Thus, it is justified to carry out this study, to check data on the development and level of physical activity of children, and that these findings may contribute to the stimulation of physical activity in this population, for improving psychomotor development.

OBJECTIVE

This study has the objective to analyze psychomotor development in the areas of global motor skills, balance and body structure and level of extracurricular physical activity.

METHOD

The participants in this study were 30 children with chronological age (CA) between six and ten years, of both genders. Initially, children who were already engaged in extracurricular physical activity were recruited, after they were matched for sex and age with those who were not. A maximum of 6 months' difference more or less among these children were allowed. The children were divided into two groups: Active extracurricular Group (AG), and Sedentary Extracurricular Group (SG).

To participate in the study, the children's parents signed the informed consent form after been informed about the purposes and procedures of the study. This consent form was also signed by the child. Children were excluded if they had any disease condition during the study period, or those with neurological, cognitive, or musculoskeletal alterations that impaired their understanding or the realization of the tests.

Activities started with the child's demographic (age and gender), and anthropometric data (weight, height, and CA). Verification of BMI and CA were based on the methodology described by Moser and colleagues.[21]

To analyze the level of physical activity, we used a modified and adapted questionnaire suggested by Silva and colleagues,[22] that addresses the means of transportation, physical activity performed in and out of school and sedentary time, which includes the individual hours in front of the television, playing computer or video games and telephone conversations. The subjects answered the questionnaire through interviews conducted by the researcher. And then they were classified according to frequency and intensity of exercises performed into: inactive individuals (those who did not perform any physical activity); inadequately active (those who performed physical activity at a frequency of twice or less, or shorter duration of one hour per week); and active (those who performed physical activity three or more times, or longer than one hour per week).

The weight was measured with a portable digital scale – Plena® brand, with a maximum capacity of 160 kg and a resolution of 100 grams. The individual was positioned standing in the center of the platform, barefoot and with arms along the body. The dress used was the school uniform (pants and shirt). For the height, a tape measure fixed to a wall was used. Its scale was metric (m) with a precision of 0.1 cm. The individual was placed in standing position, barefoot, with the feet together and the occiput, shoulder girdle, pelvic and posterior region of the heel in contact with the wall. The head remained in the Frankfurt horizontal plane. The AC was measured in centimeters (cm), also with the measure tape which was placed about the umbilicus and parallel to the ground. The child remained in standing position with feet together, with abdomen relaxed and loose arms along the body.

The nutritional diagnosis was established with the classification of BMI / age according to the Food and Nutrition Surveillance System (SISVAN),[23] used in the Brazilian population with the cutoffs by the World Health Organization (WHO). There were analysis of growth curves, whose ratings are as follows: Percentile < 0.1 corresponds to severe malnutrition;

Percentile ≥ 0.1 to < 3 = thinness; Percentile ≥ 3 to ≤ 85 = Eutrophic; Percentile > 85 to ≤ 97 = overweight; Percentile > 97 to ≤ 99.9 = Obesity; and Percentile > 99.9 = severe obesity.

To assess the psychomotor development in the aspects of global motor skills, balance and body image, tests of the Motor Development Scale (MDS) proposed by Rosa Neto[1] were used.

MDS includes specific tasks for each age group (2-11 years) on each element of motor development. The complexity of the task to be performed increases as the age increases. Participants were evaluated from the corresponding test of their CA element in each area evaluated in this study, and the evaluation was considered completed when they were unable to achieve a proposed task. The age corresponding to the last task correctly performed by the child was characterized as the Motor Age (AM). This scale also allows the analysis of the relationship between AM and CA, which is called the Motor Quotient (QM).

This cross-sectional and observational study was conducted in a public primary school of Bataguassu, a city in the state of Mato Grosso do Sul in Brazil, was approved by the Ethics Committee Board (CEP) of the *Oeste Paulista* University, UNOESTE, and received the protocol number 1981.

Statistical analysis was conducted with SPSS, 20.0. With the Graphped Prism program, the variables were expressed as frequencies and proportions. The normality of the data was evaluated with the Shapiro Wilk test, and the Student t test was used to determine the statistical difference. As for the non-normal data, we applied the Mann Whitney test. A p value of p <0.05 was considered statistically significant.

RESULTS

10 female and 20 male children whose mean age was 106.36 ± 7.78 months were evaluated and divided into two groups: 15 to the AG, composed of individuals considered active, and 15 to the SG, composed of individuals considered inactive or inadequately active. They were matched for sex and AG.

Table 1 shows the anthropometric data in which there was a statistically significant difference in the category CA, achieving a p value of 0.0321. The table 2 shows the BMI classification / age percentage, where no significant differences were found.

Regarding the number of hours of weekly physical activity, the AG obtained an average of 19.38 hours ± 9, and the SG obtained 7.54 hours ± 12.6, and p value of 0.0251, showing a statistically significant difference. Table 3 shows the AM values divided into the groups by mean and standard deviation, whereas the Table 4 shows the ratings of the QM per group, in which the sedentary group had higher results in global motor development, and the active group in balance and body scheme.

Table 1. Characteristics of the sample according to the anthropometric variables with meanss and standard deviatiosn

	AG	SG
CA (months)	111.86 ± 14.41	108.13 ± 15.52*
Weight (kg)	37.4 ± 10.38	35.22 ± 11.91
Height (m)	1.38 ± 0.10	1.36 ± 0.11
BMI (kg / m²)	19.11 ± 3.28	18.42 ± 3.52
AC (cm)	67.8 ± 10.07	66.20 ± 9.58

CA: chronological age in months; BMI: body mass index; AC: abdominal circumference; AG: Active extracurricular Group; SG: Sedentary extracurricular Group.

Table 2. BMI rating / age groups in percentage (%)

	Eutrophic	Overweight	Obesity	Severe obesity
AG	53.3	20	20	6.6
SG	53.3	33.3	6.6	6.6

AG: Active extracurricular Group; SG: Sedentary extracurricular Group.

DISCUSSION

The main findings of this research were that AG children had higher QM in the areas of balance and body scheme, but the SG had higher global motor development. In both groups, there was a predominance of eutrophic individuals.

According to Santos and Freire,[24] it is believed that social projects that encourage physical activity contribute to an increased interest in sportive activities, and therefore have a positive impact on motor development, so promoting this systematic practice decreases sedentary lifestyles and the risk of cardiovascular diseases such as obesity. This can then justify the findings of greater weight and AC in the AG, considering the parents' desire to involve their children in social projects for the prevention or treatment of obesity. One study[25] investigated cognitive function by using a neurocognitive battery test in children and adolescents with obesity. Their results show that children and adolescents with obesity had a significantly worse performance than healthy non-obese in all cognitive domains.

By analyzing the BMI, we found the same number of individuals in the two groups with normal weight proportion (53.3%), which differs from previous findings[26] that assessed the relationship between nutritional status, eating habits and level of physical activity of 661 schoolchildren aged 6 to 14. They found 516 individuals classified as eutrophic, however, only 130 practiced physical activities for more than 300 minutes per week. Another finding was that there was a greater number of overweight children in SG than AG, which corroborates another study,[6] in which, among 133 inactive and inadequately active children, 31 were overweight and looking for physical activity to improve this situation. Another relevant factor of this study is that both were performed in very small towns with few opportunities for physical activity or sport.

In Cabrera's study[6] that verified the diagnosis of BMI / age according to SISVAN, 40 individuals, representing 9.95% of the study sample had overweight and were classified as having obesity or severe obesity. Significantly, in our study, subjects with obesity and severe obesity were found to correspond to 20% of the sample. Another study,[27] compared children and adolescents who were eutrophic and overweight / obese, and found that the level of physical activity was similar in both groups. What demonstrating the demand for research into other factors that can lead to obesity. A study of 2003[28] evaluated 2,519 children between 7 and 10 years of age, and found that obese children were less active than non-obese children. The authors also claim that the nutritional status, the mother's presence, and eating habits interfered with the physical activity patterns of these children.

In a study of Valerio et al.[29] the authors found that obese children had worse physi-

Table 3. MI values of the sample showing mean and standard deviation

	AG	SG	P
Global Motricity	122.4±19.87	124.2±8.62	0.2286
Balance	120.8±17.25	116.8±18.95	0.5311
Body Scheme	106.4±21.68	108±21.75	0.8491

AM: motor age; AG: Active extracurricular Group; SG: Sedentary extracurricular Group.

Table 4. Rating of the QM group

		Very high	High	Normal/high	Normal/medium	Normal / low	Low
Global Motricity	AG	1	2	6	4	2	0
	SG	3	4	4	2	2	0
Balance	AG	1	3	4	5	2	0
	SG	2	1	3	8	1	0
BodyScheme	AG	0	0	5	2	6	2
	SG	0	0	2	11	2	0

QM: motor quotients; AG: Active extracurricular Group; SG: Sedentary extracurricular Group.

cal performance relative to normal weight or overweight children, in addition to having greater perceived difficulty with activities of daily living. Queiroz et al.[14] when evaluating children aged 3 to 5 years, found that children who practice sports showed significant advantages in relation to motor skills when compared to the group that did not practice sports. Physical activity from an early age has a positive impact on the motor learning process and adherence to the practice of long-term physical activity. Moreover, this practice can be a way to prevent or recover from obesity and other diseases associated with physical inactivity.

It was also noted that, of the three areas of development assessed in our study, active children out of school, had a higher QM in balance, which leads us to believe that children who perform regular physical activity have better development of balance. This is consistent with a study by Granacher et al.[30] in which, after an eight-week training period, they investigated the effects of short-term strength training and found improvements in the scores for balance. Ziereis and Jansen[11] also demonstrated improvement in the motor skills of children with attention deficit and hyperactivity after a 12-week program of physical activity.

Considering all this data and discussion, the results may have been influenced by the environment, because it is a city in the state of Mato Grosso do Sul, where children have more freedom than in larger cities – they can play, go cycling and spend less time in front of the television (TV) and video games, which may explain the results of even those who did not perform extracurricular physical activity. This agrees with the findings of Rivera, Silva, Silva, Oliveira and Carvalho[31] who, when evaluating children from the city of Alagoas, a state capital, concluded that physical inactivity is present in 93.5% of children and adolescents, and that this is largely accounted for by the amount of time that is spent in front of the TV.

Therefore, it is suggested that further research should be carried out with a larger sample and that a comparison of these results with cities above fifty thousand inhabitants, to verify the accuracy of the data presented in this study.

CONCLUSION

Children who engage in physical activity outside of school have a better development of balance and body structure than children who do not. We found that children who do not perform any physical activity outside of school have the same weight as those who practice, and that the results of the study may have been influenced by the environment and the city in which this study was conducted.

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