

MOTOR COMPETENCE OF SCHOOLCHILDREN FROM PUBLIC EDUCATION IN SÃO PAULO CITY, BRAZIL

COMPETÊNCIA MOTORA EM CRIANÇAS DO ENSINO PÚBLICO DA CIDADE DE SÃO PAULO

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ABSTRACT

The objective of this study was to assess motor competence in children from low socioeconomic status and compare results between sexes and age groups. The study included 529 children enrolled in public schools in the eastern region of São Paulo. The Test of Gross Motor Development (TGMD-2) was used to assess MC, considering the raw scores and the standard scores (percentiles). The comparison of performance between genders in different age groups was performed using analysis of variance of two factors and chi-square test was used to compare the percentiles distribution (<15, very low MC, 15-30, low MC; > 30, normal MC) between the sexes in different age groups. In both genders, there were a statistically significant decrease in percentiles classification at older ages. Considering the original classification of the TGMD-2, 76.4% of girls and 70.5% of boys presented a motor competence much lower than expected for age (percentile <15) and in both genders there were a statistically significant decrease in percentiles classification at older ages. These results suggests that it is possible that the quality of environmental stimuli currently available to these children is not sufficient for the development of motor competence.

Keywords: Childhood. Motor development. Motor skills.

RESUMO

O objetivo deste estudo foi avaliar a competência motora em escolares de baixo nível socioeconômico e comparar os resultados entre os sexos e faixas etárias. Participaram 529 crianças entre 3 e 10 anos de idade matriculadas em escolas públicas na região Leste da cidade de São Paulo. A competência motora foi avaliada por meio do *Test of Gross Motor Development* (TGMD-2) e as análises usaram dados brutos e padronizados (percentis). Foi realizada a comparação do desempenho entre sexos e faixas etárias por meio da análise de variância de 2 fatores e o teste qui-quadrado foi utilizado para comparar a proporção de crianças nos três níveis de classificação (percentil <15, CM muito baixa; 15-30, CM baixa; >30, CM normal). Considerando a classificação original do TGMD-2, 76,4% das meninas e 70,5% dos meninos apresentaram competência motora muito abaixo do esperado para a idade (percentil < 15) e em ambos os sexos houve queda estatisticamente significante nos percentis de classificação nas idades mais avançadas. Esses resultados sugerem que, possivelmente, a qualidade dos estímulos ambientais atualmente disponíveis a essas crianças não seja suficiente para o desenvolvimento da competência motora.

Palavras-chave: Infância. Desenvolvimento motor. Habilidades motoras.

Introduction

Motor competence (MC) is a global term that represents the degree of performance in a wide variety of motor tasks, as well as the quality of the movement, the coordination and the control underlying a given movement¹. The development of MC during childhood favors physical and motor², social³, cognitive⁴, academic⁵ and emotional⁶ development, besides being a strong predictor of continuity of physical activity practice in adulthood⁷, with positive consequences for quality of life and prevention of chronic-degenerative diseases associated with obesity, diabetes, some cancers and cardio-vascular-respiratory problems⁸.

In contrast, low MC, a condition characterized by the inability to perform motor skills at a level appropriate to age⁹, negatively affects the entire human life cycle. Recently, a higher

prevalence of physical inactivity¹⁰ and low MC has been reported in children with low socioeconomic status¹¹⁻¹³, particularly in regions of greater social vulnerability, where access to physical activities is restricted by factors such as violence and lack of appropriate public spaces¹⁴.

Thus, MC evaluation has been strongly recommended in regions of greater social vulnerability, especially during childhood, taking into account the socio-cultural reality and the need to identify children at risk and provide adequate intervention strategies¹⁵. The eastern part of the city of São Paulo has a high population rate and is a region of great concentration of poor communities. Despite its scientific and social relevance, no studies on MC in children of this population were found. A greater understanding of the developmental profile of these children is important for the planning of intervention programs that favor the motor and psychosocial development of children. In the medium and long term, this will contribute to the reduction of sedentarism rates and the consequent prevention of chronic degenerative diseases, allowing even greater social integration and evolution in their quality of life.

Thus, the objective of this study was to evaluate indicators of motor competence in schoolchildren of low socioeconomic level and to compare the results between the sexes and age groups. As a hypothesis, due to the environmental limitations associated with the socioeconomic level in large urban centers, we expect to find low levels of motor competence in these children.

Methods

Participants

This cross-sectional study included 529 healthy children (45% girls, 237/529) aged 3 to 10 years old, living in the borough of Ermelino Matarazzo, in the eastern part of the city of São Paulo. Although some Brazilian children start elementary education at age of 6, in the present study all children between 3 and 6 years old were still in the preschool (table 1). The inclusion criteria were: all children were regularly enrolled in public schools, they were apparently healthy, and without any medical contraindications to physical activity. The Ethics Committee approved this study. The legal guardians signed a free and informed consent form and the children provided their assent.

Table 1. Number of participants according to gender and age group

	Female	Male	Total
3-4 years old (Pre-school)	33	61	94
5-6 anos (Pre-school)	77	86	163
7-8 years old (Elementary School)	100	111	211
9-10 years old (Elementary School)	27	34	61
Total	237	292	529

Source: The authors

Procedures

We used the Test of Gross Motor Development - Second Edition (TGMD-2) to evaluate MC, following the protocol proposed by Ulrich¹⁶. TGMD-2 consists of the qualitative evaluation of six locomotor skills (running, galloping, hopping, leaping, horizontal jumping, sliding), and six object control skills (kicking, rolling, catching, striking, bouncing and throwing). This test had satisfactory validity indexes in Brazilian children¹⁷.

The child received verbal instruction and demonstration for each skill, and tried to perform the movement. Soon after, two valid attempts were filmed (Sony Cyber-Shot DSC-H20 Digital Camera, 10.1 Megapixel) for further evaluation. In the checklist of the test, there are performance criteria related to the quality of the movement for each skill; if the child's performance meets the criterion, it receives a point (1), if it does not, the performance in that criterion is scored as zero (0). The maximum possible score is 96 points (48 points in locomotion tasks and 48 points in object control tasks).

Two trained researchers in the TGMD-2 analysis independently assessed all children. The percentage of concordance in the evaluations was calculated according to Baumgartner et al.¹⁸ recommendations [Number of concordances/(number of concordances + discrepancies) x 100]. The inter-rater agreement was 88%, while the intra-rater agreement was 96%.

The results reported in the present study include the raw data (points) and the standardized scores (percentiles) according to the normative tables proposed in the original TGMD-2 manual for locomotion, object control and overall performance skills.

Statistical analysis

The comparison of scoring and classification percentiles in the TGMD-2 battery was performed using the Analysis of Variance (ANOVA) at 2 factors [2 (sexes) x 4 (age groups: 3-4 years, 5-6 years; -8 years and 9-10 years)]. The post-hoc contrasts, when necessary, were made through the Tukey test. The chi-square test was used to evaluate the frequency of percentiles distribution (<15, very low MC, 15-30 low MC, > 30, normal CM), comparing the sex ratio in different bands age groups. The SPSS 16.0 for Windows program was used and the significance level set at 5%.

Results

Overall, the analysis of raw data (Figure 1) indicates a low improvement in MC with increasing chronological age. There was no statistically significant difference in any age group when we compared the results between the sexes in the locomotor skills. However, girls scored lower in all age groups ($p < 0.05$) in object control skills. There was a statistically significant improvement ($p < 0.05$) in the locomotion and object control scores only up to 7-8 years of age in both sexes,.

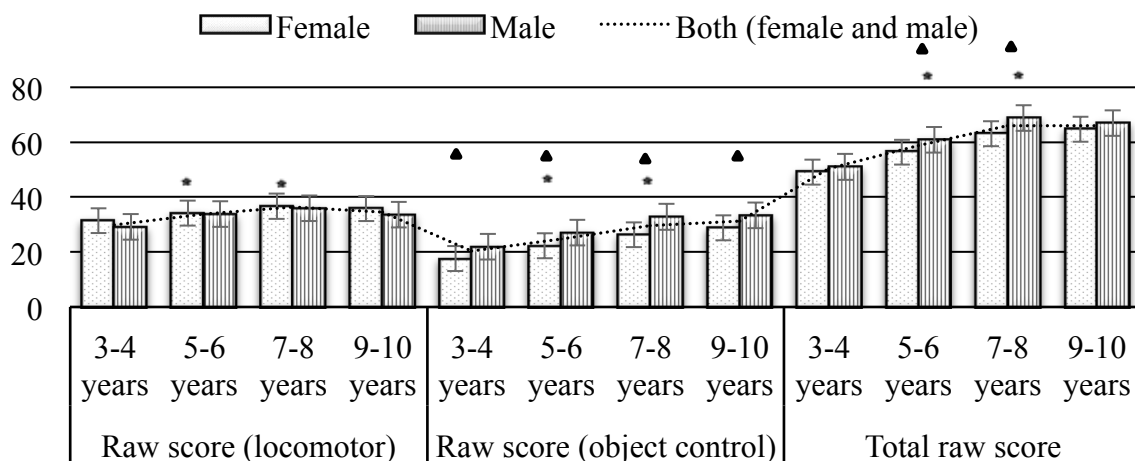


Figure 1. Average score (standard deviation) obtained in the TGMD-2 test according to gender and age group

Source: The authors

Standardized results (percentiles) (Figure 2) show poor performance in the test in all age groups, especially from the age of 5 years. In both sexes, there was a statistically significant decrease in the mean percentiles of classification among all age groups.

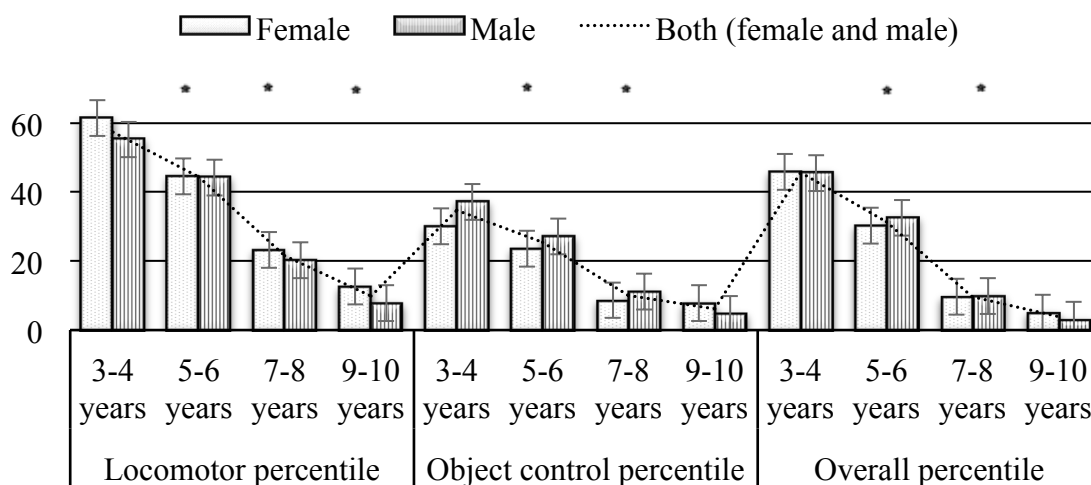


Figure 2. Mean percentile (standard deviation) of the classification in the TGMD-2 test, according to gender and age group

Note: *p < 0.05 considering the previous age group

Source: The authors

Figure 3 shows the percentage distribution of classification according to gender and age group. The majority of schoolchildren (76.4% of the girls and 70.5% of the boys) presented low MC (classification below 30%). As the chronological age increased, there was a statistically significant increase ($X^2 = 248.24, p < 0.001$) in the percentage of children below 30%, ranging from 33% (3-4 years) to 100% (9-10 years). Comparing the classification between the sexes, there was a significantly lower percentage of boys with motor development delays at 3-4 years of age ($\% < 30$) ($X^2 = 7.88, p = 0.019$). There was similarity between the sexes in the high proportion of children with low motor performance from the age of 5 ($p > 0.05$).

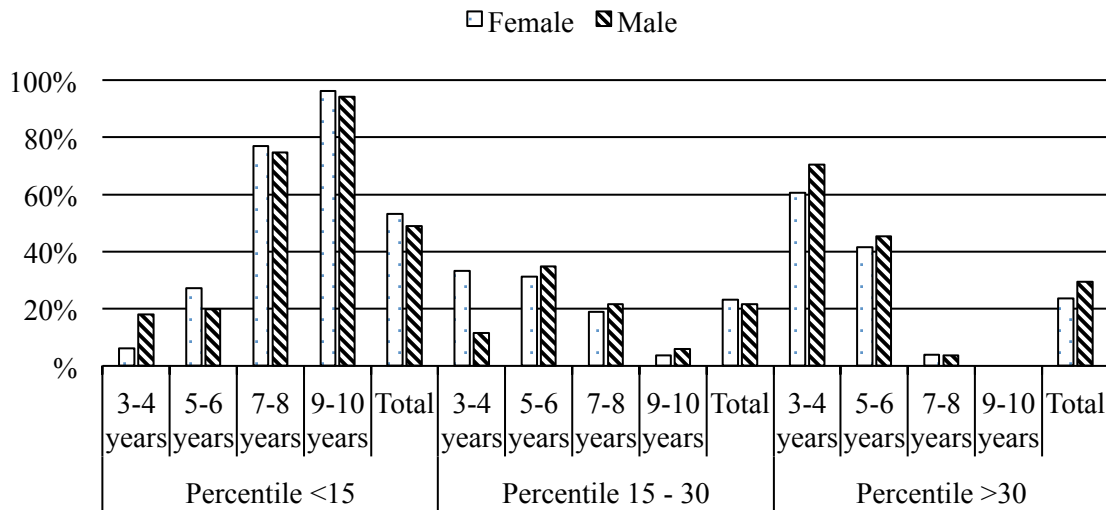


Figure 3. Percentile distribution in the TGMD-2 test according to gender and age group
Source: The authors

Discussion

The main objective of this research was to evaluate MC of children of low socioeconomic level. We confirmed our hypothesis that these children tend to have low MC, especially in the transition from preschool to elementary school. In both sexes, there was a low evolution of MC with the increase in chronological age, with girls presenting a significantly lower performance in object control skills. Considering the standardized data from the normative tables of North American children¹⁶, we observed a significant decrease in the average percentiles of classification among all age groups for both sexes, indicating that the MC of the children evaluated decreases with age, that is, the evolution of motor performance is much lower than expected.

The high prevalence of children with motor development delays (below the 30%) raises the question about the use of US normative data to evaluate MC of Brazilian children. It is possible that the cultural differences between Brazil and the USA and the time when Ulrich data¹⁶ were collected (1997 and 1998) result in an overestimation of low MC in the present study. In spite of the limitations of the use of normative data, the fact is that the evolution of the score associated to the increase of the age was not enough even for the maintenance of the percentiles of classification of the previous age groups, both in locomotion skills and in object control. TGMD-2 is a validated test for Brazilian children¹⁷ and the use of raw data (points) reinforces the existence of a low MC and a small improvement in performance in older children, with a score stabilization from the age of seven in both the sexes. There was a statistically significant inferiority of girls in object control tasks, in all age groups.

This difference between the sexes in the domain in skills that require control of objects (in this case, the ball) has also been verified in other studies^{19,20}. In the present study, it is possible that the practice of PA with the use of objects is diminished due to lack of opportunities in school and social life, especially among girls. This is another troubling result, since the domain of childhood control skills has been associated with the continuity of the practice of PA and improvement of physical fitness in subsequent years^{21,22}.

It is plausible to assume that the high prevalence of children with low MC is related to the socioeconomic disadvantages and environmental constraints that result in a poor quality of

the practice of PA and consequently limit the opportunities for motor experiences adequate for motor development. In general, children attend overcrowded school classes and the space allocated to the practice of PA is restricted both in the school and in the community, which in turn has indicators of high social vulnerability, such as high levels of violence, which admittedly limit opportunities of physical activity practice¹⁴. Combined, these factors create difficulties for low-income children to have opportunities to practice age-appropriate motor skills and suggests that lack of motor experience has a cumulative effect throughout childhood, causing impairment in motor development to increase as children get older.

To date, researches conducted with children in Brazil^{11,13}, the United Kingdom²³, Australia¹², Israel²⁴, Oceania²⁵ and the United States²⁰ confirm the association between low socioeconomic status and delays in motor development, suggesting the lack of access to practice physical activity as among the probable causes. However, surveys conducted in Scotland²⁶, the United States²⁷, Belgium²⁸ and Brazil²⁹ did not identify the influence of the socioeconomic level in the practice of PA. Possibly, socio-cultural factors specific to a particular region/country make the impact of the socioeconomic level on the practice of physical activity and MC be differentiated^{30,31}. In economically developed places, this impact is likely to be lower than in places of greater social vulnerability, especially in large urban centers such as the city of São Paulo.

Given this context, it is necessary to emphasize the importance of public policies aimed at children that meet the specific needs of the population and promote the acquisition and development of motor skills. Relatively simple strategies such as valuing school physical education and expanding opportunities for movement through the creation/use of public spaces and adequate vocational guidance tend to produce positive results³².

Some limitations of this study should be mentioned. Considering the relative homogeneity of the sample in relation to the socioeconomic stratum and the housing region, the generalization of the results to other populations (e.g., low socioeconomic level children living in small towns) is not adequate. Other important limitations were the use of cross-sectional data and the lack of control over the opportunities children have for the practice of PA, and additional research is needed to verify the causes of low MC as well as the longitudinal effects of observed outcomes. However, among the main positive aspects of this study are the inclusion of the entire age range (3-10 years) that can be evaluated using TGMD-2, which is the first study to report MC indexes in children living in a needy community in the eastern part of the city of São Paulo, one of the largest megalopolis in the world.

Conclusions

There was an increasing and continuous deficit in MC development during childhood in both sexes. As chronological age increases, delays in motor development also increase. There was a significant decrease in the percentiles of classification among all age groups, from the age of 3 years. There was no evolution of the score obtained in the tests from the age of 7. These results suggest that this sample of children is at risk of developmental delays in the motor domain. Therefore, it is fundamental to prioritize intervention strategies aimed at the quality of physical activity and development of MC, especially during pre-school and beginning of elementary school. In future studies, a better understanding of the relationships between the children's lifestyle and their respective MC indexes is necessary.

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