ORIGINAL ARTICLE

# Relationships between motor performance and body composition of school adolescents

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## Abstract

**Introduction:** Motor coordination is a result of interactions between many body systems, producing accurate and balanced kinetic actions. The evaluation of motor performance levels in children and teenagers may conserve and improve health and life qualities. Body composition may interfere considerably in motor coordination, particularly in overweight and obese conditions.

**Objective:** To analyse the relationships between motor performance and body composition in children.

**Methods:** Motor coordination was evaluated through the Körperkoordinations test für Kinder (KTK test), considering the motor quotient (MQ) and body composition using the body fat percentage (BF%) and body mass index (BMI).

**Results:** BMI (38% and 36%) and BF% (28% and 22%), from boys and girls respectively, demonstrated that body composition is above the recommended. Girls presented MQ values lower than those observed in boys ($p < 0.001$). The groups with BFPs below the recommended value showed higher values of MQ than the normal group ($p<0.05$) and than children above the recommended ideal ($p < 0.05$). A reverse correlation was observed between MQ with BF% ($r = -0.432$) or BMI ($r = -0.254$).

**Conclusion:** There are relationships between body composition and motor coordination in teenagers between 11 and 14 years old, related or not to gender and age.

**Keywords:** body composition, performance motor, teenager.

**Why was this study done?**
This study was part of the master's dissertation of Prof. Giliard Mores in the Graduate Program in Physical Education at UFMT (Federal University of Mato Grosso). The theme was the result of the author's observation, as an active teacher of the State Basic Education Network, of disinterest in the practice of physical activities, increase of obesity and decrease in the motor capacity of students in the last decade.

**What did the researchers do and find?**
Using KTK (Körperkoordinationstest für Kinder), the evaluation of body mass index and body fat percentage, in 105 students, the aim was to investigate the relationship between motor performance and body composition in schoolchildren. Through this study, according to the tests applied, there was a high incidence of students with performance deficits to perform motor tasks, elevated rates of overweight and obesity, and a strong relationship between the increase in adiposity levels and a decrease in motor performance in the study population.

**What do these findings mean?**
They mean the need for greater care with the factors that trigger obesity, especially sedentary lifestyle, in children and adolescents, since they are related to the level of motor performance, which may reflect in the practice of physical activity and the health of these individuals at the moment current and adult life.

## ■ INTRODUCTION

Motor development is a distinct process that begins at the moment of an individual's birth, presenting a period of great importance during childhood and adolescence where motor skills are being discovered, refined and executed in increasing complexity[1]. Parallel to growth, the child acquires skills and movement patterns in a continuous way, involving the interaction of several factors, among them neuromuscular maturation, the genetic component and the experiences in the environment in which it lives[2].

In this sense, considering that in childhood and adolescence an accelerated rate of biological transformations occurs and a high capacity of adaptations to environmental stimuli, it is important that the individual develops the coordinating capacities that contribute, among other things, to an improvement in spatial orientation, rhythm and balance[1]. Motor coordination, in this way, can be defined as a harmonious interaction between various body systems to produce precise and balanced kinetic actions[3]. Therefore, the development of motor coordination in these phases can decisively influence the motivation and interest in the practice of physical and sports activities[3,4].

However, in recent years, there have been negative changes in the lifestyle of children and adolescents, such as inadequate eating habits and increased sedentary lifestyle[2,5]. In this perspective, lower levels of physical activity and physical fitness are observed in overweight students when compared to eutrophic students[6]. As a consequence, some evidence proposed in studies are that the active or sedentary behaviour presented in childhood tends to persist in adulthood[6,7], which has contributed to the expansion of the problems related to being overweight and sedentary in the general population.

In childhood and adolescence, obesity has been related to the early development of cardiovascular diseases, increased incidence of metabolic syndrome and maintenance of obesity in adulthood[5]. In addition, significantly lower rates of motor coordination are found in overweight and obese children compared to underweight and eutrophic children[8].

Thus, considering that motor performance and body composition are important markers for the health of children and adolescents, the objective of this study is to analyse relationships between motor performance and body composition of school adolescents.

## ■ METHODS

This study was characterized by being descriptive and transversal, using quantitative variables. The sample comprised 105 individuals, male (n = 60) and female (n = 45) students, between 11 and 14 years old (12.67 ± 1.11 years old) enrolled and attending the Heronides Araújo State School City of Barra do Garças, Mato Grosso, Brazil. Were excluded from the survey students who did not submit the Informed and Consent Term (ICT); did not adapt or recur to the test procedures and, at the time of data collection, had an inadequate clinical condition that could interfere in the performance of the evaluations.

Data collection was initiated after prior consent of the school board. The invitation to participate in the study was extended to all pupils within the stipulated age group and duly enrolled in the school. The data collection period totalled four weeks, and the tests were performed in the morning and evening. The present research was approved by the Ethics and Research Committee of the Federal University of Mato Grosso under the opinion 1,117,380.

### Instruments and Procedures

The adolescents were instructed to wear appropriate clothing for the tests. In an individual form, participants' identification data and other information considered relevant to the research were collected and recorded. The student was then given guidelines on the procedures that would be used to collect the following data: anthropometric (weight, height and skinfolds) and motor performance (Körperkoordinationstest für Kinder - KTK).

The body mass index (BMI) was determined after the measurement of body mass and stature by means of a Filizola bal mechanical scale and its stadiometer. The students were instructed to stay on top of the equipment in the orthostatic position, barefoot and with the least possible clothing.

The evaluated students were classified into three groups and adapted for this study, being: Below the Ideal, Ideal and Above the Ideal. This classification used as reference the Growth Curves of the World Health Organization[9] that indicate the nutritional status of children and adolescents between 5 and 19 years of age of both sexes. Thus, specific cut-off points were determined considering the sex and age for the BMI indicator and adapted for this study, being: Below the Ideal (z score values below -2); Ideal (Z-score values greater than or equal to -2 and less than +1) and Above the Ideal (Z-score values greater than or equal to +1).

The body fat percentage (BF%) measurement involved the skinfolds analysis (CD) method. This technique determines the thickness of subcutaneous adipose tissue, establishing a linear relationship between anatomical points and body adiposity[10]. For CD measurement, a Slim Guide compass was used, following the standards required by the Lohman protocol[11] for children and youngsters from 6 to 17 years of age that considered tricipital and subscapular DC. The measurements were made on the right side of the evaluated patient, and the patient was in the orthostatic position. A series of three successive measures were carried out in one place, and the three measures were averaged[10].

The BF% was determined from the regression equation proposed by Lohman[11]. For the classification of body fat levels, the adiposity index proposed by the same author was adapted[12], classifying the students into three groups: Less than Ideal (male < 10.0 and female < 15.0), Ideal (male 10.1–20.0 and female 15.1–25.0) and More than Ideal (male > 20.1 and female > 25.1).

Motor performance was assessed using the Körperkoordinationstest für Kinder (KTK) developed by Kiphard and Schilling[13] and used in several studies related to motor performance with longitudinal and transversal

characteristics[8,14,15]. The test consists of four tasks, such as: Balance Balance or Rear Balance, Single Jump Jumps, Jumps and Transfer on Platform, which allow us to investigate and classify the level of motor coordination of children and young people from 5 to 14 years of age. KTK tests the general body domain through the homogeneity of test tasks[16].

To define the motor coefficients, we used normative tables by sex and age proposed by the original manual[13], to which a value is assigned for each task. The total of the values in turn establishes the total motor quotient (MQ), which allows us to classify the evaluated students according to their level of coordinative development: high coordination, good coordination, normal coordination, coordination disorder or coordination insufficiency[13].

### Statistical Analysis

Descriptive analysis of the variables was done using statistical indicators of central tendency (mean), variability (standard deviation) and percentage frequencies. ANOVA was used for the comparison between sexes, age group and body composition classification. For the comparison between the averages of the obtained results, the multiple comparisons test of "Bonferroni" was applied. For the correlations, Pearson's correlation test was used through the Statistical Package for Social Science (SPSS) version 20.0. The level of significance was set at $p < 0.05$.

### ■ RESULTS

In this study, 105 students were evaluated, 60 males and 45 females, and divided into two age groups: 11/12 years old (n = 45) and 13/14 years old (n = 60). For purposes of analysis and presentation of the results, the protocols of body composition were adapted, classifying the individuals into three groups: Below the Ideal, Ideal and Above the Ideal. The results of the body composition of the sample evaluated are described in Table 1.

**Table 1:** Results of body composition by BMI and %BF of the sample evaluated. Barra do Garças. Mato Grosso. Brazil, 2014.

| | BMI – kg/m² | | | %BF | | |
|---|---|---|---|---|---|---|
| | **Less than ideal** | **Ideal** | **More than ideal** | **Less than ideal** | **Ideal** | **More than ideal** |
| General (105) | 13.97±0.47 | 18.52±1.76 | 24.59±3.42 | 10.05±2.03 | 16.99±3.68 | 27.55±3.81 |
| | 3.0%(n=3) | 60.0%(n=63) | 37.0%(n=39) | 19.0%(n=20) | 55.0%(n=58) | 26.0%(n=27) |
| Male (n=60) | 14.23±0.0 | 18.46±1.70 | 24.90±3.44 | 9.06±0.80 | 14.79±2.82 | 26.23±3.74 |
| | 2.0%(n=1) | 60.0%(n=36) | 38.0%(n=23) | 20%.0(n=12) | 52.0%(n=31) | 28.0%(n=17) |
| Female (n=45) | 13.84±0.59 | 18.60±1.88 | 24.14±3.36 | 11.53±2.57 | 19.52±2.85 | 29.79±2.86 |
| | 4.0%(n=2) | 60.0%(n=27) | 36%.0(n=16) | 18%.0(n=8) | 60.0%(n=27) | 22.0%(n=10) |
| 11/12 years (n=45) | 13.84±0.59 | 17.45±1.79 | 23.90±2.99 | 10.64±2.31 | 18.05±4.68 | 27.28±4.46 |
| | 5.0%(n=2) | 51.0%(n=23) | 44.0%(n=20) | 15.0%(n=7) | 49.0%(n=21) | 36.0%(n=17) |
| 13/14 years (n=60) | 14.23±0.00 | 29.14±1.44 | 25.32±3.77 | 9.73±1.97 | 17.01±3.63 | 28.29±3.52 |
| | 1.0%(n=1) | 67.0%(n=40) | 32.0%(n=19) | 22.0%(n=13) | 60.0%(n=36) | 18.0%(n=11) |

%BF – Body Fat Percentage. BMI – Body mass index

Regarding the classification of body composition by BMI, it is observed that the majority of the students evaluated were classified as Ideal BMI (60%), followed by the classification of Above the Ideal BMI (37%). When the analysis was done by sex, it was identified that both boys and girls were classified as Ideal BMI (60%), followed by the Above the Ideal BMI classification (38% and 36%, respectively). Regarding the age group, the group aged 11/12 years had most of the students classified as Ideal BMI (51%), followed by the Above the Ideal BMI classification (44%). In the group aged 13/14 years, there was a predominance of schoolchildren with Ideal BMI (67%), followed by the Above Ideal BMI group (32%).

Considering the classification of body composition by body fat percentage (%BF), it is observed that most of the sample was classified as Ideal (55%), followed by the classification Above the Ideal (26%). Considering gender, for the male group, a predominance of schoolchildren were classified as %BF Ideal (52%), followed by the Above the Ideal classification (28. For the female group, %BF Ideal (60%) followed, followed by the Above the Ideal classification (22%). When investigating the groups aged between 11/12 and 13/14 years, it was observed that a preponderance of schoolchildren were classified as %BF Ideal (49% and 60%, respectively), followed by the Above the Ideal classification in the 11/12 years old group (36%) and Below the Ideal in the 13/14 years old group (22%).

Table 2 presents the data referring to the classification of motor coordination.

**Table 2:** Total Motor Quotient Score (MC) and Motor Coordination Classification of the evaluated students. Barra do Garças. Mato Grosso. Brazil, 2014.

| Motor Coordination Classification | Sex | | | Age (years) | |
|---|---|---|---|---|---|
| | General | male | female | 11/12 | 13/14 |
| | (n=105) | (n=60) | (n=45) | (n=45) | (n=60) |
| Total score (MQ) | 76.03±15.88 | 82.12±14.20 | 67.91±14.40* | 78.22±16.0 | 74.34±15.74 |
| Normal Coordination | 30.5% (n=32) | 48.4% (n=29) | 6.7% (n=3) | 26.7%(n=12) | 33.3% (n=20) |
| Disorders Coordination | 34.3% (n=36) | 30.0% (n=18) | 40.0% (n=18) | 53.3%(n=24) | 20% (n=12) |
| Insufficiency Coordination | 35.2% (n=37) | 21.6% (n=13) | 53.3% (n=24) | 20.0% (n=9) | 46.7% (n=28) |

* = $p<0.05$ comparing male vs female and age group 11/12 vs 13/14. QM –Motor Quotien

Considering the total score that quantifies the MQ and classifies the motor coordination of the evaluated students, it is observed in the sample that most of the individuals were classified as having motor disturbances and insufficiency (34.3% and 35.2%, respectively). With regard to sex, it is noticed that the value of the MQ was lower among the girls when compared to the boys ($p < 0.001$). It was found that a large number of boys were classified as having normal coordination (48.4%), while the majority of the boys were classified as having insufficient motor coordination (53.3%).

When evaluated by age group and comparing students from 11/12 to 13/14 years old, no statistically significant values were observed; however, the 11/12 years old group had a high percentage of individuals classified with motor coordination disturbances (53.3%), while the 13/14 years old group had a considerable number of individuals with motor coordination insufficiency (46.7%). These results demonstrate better motor coordination for boys compared to girls and suggest lower motor coordination among older individuals compared to the younger individuals.

Table 3 presents the data regarding the classification of motor coordination based on the body composition of the students evaluated, considering %BF) and BMI.

**Table 3:** Total Motor Quotient Score (MQ) and motor coordination classification, considering the body composition by means of% CG and BMI of the evaluated students, of both sexes. Barra do Garças. Mato Grosso. Brazil, 2014.

| Motor Coordination Classification | %BF | | |
|---|---|---|---|
| | Less than Ideal (n=20) | Ideal (n=58) | More than Ideal (n=27) |
| Total score (MQ) | 85.15±10.43 | 74.44±17.20[a] | 72.70±14.08[b] |
| Normal Coordination | 50.0% (n=10) | 31% (n=18) | 14.8% (n=4) |
| Coordination Disorders | 45.0% (n=9) | 24.5% (n=14) | 48.1% (n=13) |
| Insufficiency in Coordination | 5.0% (n=1) | 44.5% (n=26) | 37.1% (n=10) |

| Motor Coordination Classification | BMI | | |
|---|---|---|---|
| | Less than Ideal (n=3) | Ideal (n=63) | More than Ideal (n=39) |
| Total score (MQ) | 91.0±13.0 | 77.0±16.54 | 74.26±13.84 |
| Normal Coordination | 2 | 34.9% (n=22) | 20.5% (n=8) |
| Coordination Disorders | 1 | 30.2% (n=19) | 43.6% (n=17) |
| Insufficiency in Coordination | 0 | 34.9% (n=22) | 35.9% (n=14) |

a – less than ideal vs ideal; b – less than ideal vs more than ideal. MQ –Motor Quotient. %BF – Body Fat Percentage. BMI – Body Mass Index

In the analysis of the Motor Quotient, from the Body Fat Percentage (% GC), statistically larger values were observed for the Below Ideal group compared to the Ideal ($p <0.05$) and Above the Ideal ($p <0.05$). Considering the BMI, there was no statistical significance. These results demonstrate an inversely proportional relationship between the classification of motor coordination and the% CG of the evaluated ones. The results can be confirmed by the high number of adolescents with GC% and BMI Above Ideal, classified with motor coordination disorders (% GC - 48.1%, IMC - 43.6%) and motor coordination insufficiency (% 37.1%, BMI - 35.9%).

Figure 1 represents the correlation of the body composition variables and the QTK of the KTK test. Considering the% GC, the values showed an inverse and moderate correlation with the QM ($p <0.001/r= -0.423$**). Considering the BMI and QM, the values showed an inverse and weak correlation between BMI and QM ($p <0.009 / r = -0.254$ **)
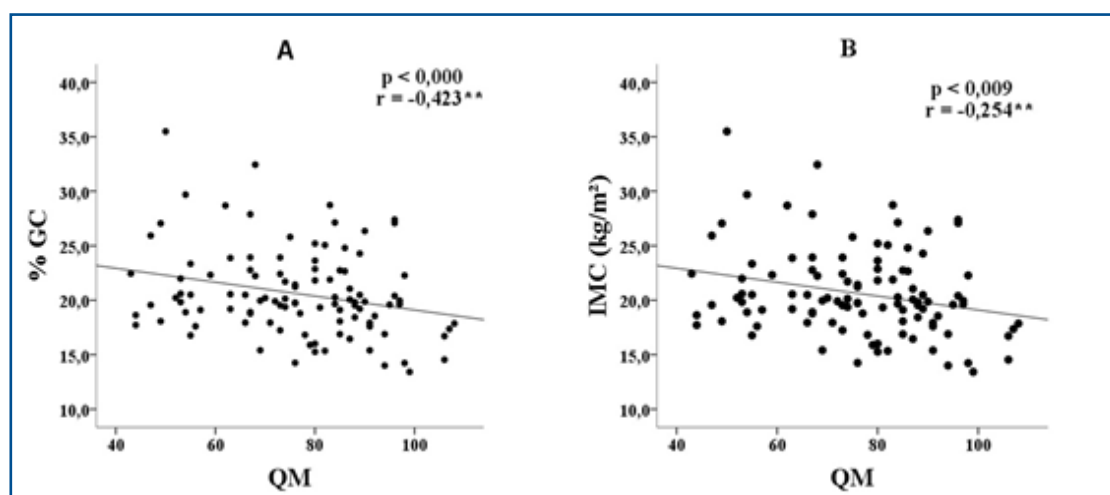
**Figure 1:** Pearson correlation for Body Composition variables (A – %BF e B – BMI) and Motor Quotient (MQ) of the evaluated students. r = Pearson's Correlation. **p<0,01

## ■ DISCUSSION

Considering the body composition, it was observed by the BMI that 37% of the evaluated students were classified in the Above the Ideal group. These results are superior to a study conducted in northeastern Brazil, which investigated 1,247 students aged 12 years and over, whose prevalence of being overweight was 17.3%[5]. In another study carried out in southern Brazil involving 1,664 schoolchildren aged 7 to 17 years, 27% were identified as being overweight or obese[17], confirming that the findings of the present study were high. As in these studies[5,17], no significant differences between the sexes were observed in the present study. On the other hand, an investigation carried out in southeast Brazil involving 321 students aged 10 to 16 years, analysed by BMI, found expressive rates of overweight and obesity in the sample in 54.2% of the girls and 45.8% of the boys, demonstrating a strong increase of being overweight in this young population[18].

Regarding the %BF, the data showed values Above the Ideal for 26% of the students. These results are elevated when compared to a national study conducted with 383 students aged 13 to 16 years, in which obesity was detected in 10.2% of those evaluated[7]. However, these authors considered body fat indexes above 25% for boys and 30% for girls[7] as a parameter for obesity[7], whereas in this study, it was considered Above the Ideal at 20% and 25%, respectively. On the other hand, the results found in the present study are similar to those of a study carried out in southeastern Brazil that evaluated 403 adolescents between 10 and 14 years of age that detected overweight in 30.1% of those evaluated in both sex[19].

Considering the age range, there was a decrease in the number of individuals with BMI and %GC classified as Above the Ideal among the 11/12 years old (44% and 36%, respectively) and 13/14 years old (32% and 18%, respectively). In this perspective, a survey of school adolescents in the northern region of Brazil found an inverse association between age and overweight[20]. The authors pointed out that age was a protective factor for overweight in adolescence due to, among other factors, concern with body image, better control of food consumption and, in some cases, greater participation in physical activities, including leisure and sports practice[20].

In this sense, it should be noted that during school age, overweight and obesity can lead to health problems, such as cardiorespiratory changes, arterial hypertension, respiratory changes and orthopaedic diseases, as well as changes in motor development compared to individuals with normal weight[21].

Regarding motor coordination, 69.5% (34.3% of coordination disorders and 35.2% of coordination failures) were found to have low motor coordination in the study population. These results were high when compared to the findings of some research involving children and adolescents. In a study of 84 children and adolescents aged between 9 and 16 years in the southern region of Brazil, 27.4% of the patients had coordination disorders and 13.1% had coordination insufficiency[22]. Another study carried out in the northern region of Brazil involved 108 schoolchildren (9 to 12 years old) found an index of 35.19% of those evaluated with motor coordination below normal[23].

The majority of studies confirm significant differences in motor performance between the sex[8,24]. In this study, the boys presented better MQ values than the girls. This particularity was observed in national and international surveys with schoolchildren aged between 10 and 13 years[24] and between 6 and 14 years, where boys presented better levels of motor coordination than girls in all the age groups evaluated[8].

In a study involving 2,849 boys and girls from a southeastern Brazilian state in the age group between 6 and 18 years, in general, it was demonstrated that the boys presented higher scores in the motor tests, confirming that in this age period boys tend to have better motor performance when compared to girls[25]. In addition, there is a difference in maturation and growth between the sexes in the period from 11 to 16 years old, and in girls there is a gradual increase in body fat, negatively influencing the performance of motor skills[1].

Gender differences in motor performance can also be explained by cultural factors, environmental requirements and opportunities for motor experiences, as boys and girls are culturally encouraged to do different

activities in their daily lives, requiring the distinct development of physical-motor skills to perform tasks[26].

Considering the age range, a high percentage of students (46.7%) were classified as having motor coordination insufficiency in the group aged 13/14 years. This inverse association between motor performance and age is noticeable mainly in girls, due in part to changes in body composition, characteristics of the puberty stage and to motivational and sociocultural factors that imply less engagement in physical activity by girls in this stage of childhood[25].

At another point, a decreasing involvement of adolescents of both sexes in the practices of diverse physical activities, with the consequent increase of sedentarism in this population[5], may be contributing to the functional restriction and alterations in motor development. In a national study involving adolescents aged 14 to 19 years, the authors detected the prevalence of insufficient levels of physical activity and a prevalence of sedentary behaviour in these individuals[27]. In an international study that evaluated 6,917 schoolchildren aged 7 to 14 years, the authors concluded that disorders in fundamental motor skills were strongly associated with lower levels of physical activity among those assessed[28].

In the analysis of the motor performance of the adolescents evaluated according to body composition, higher MQ values were observed for individuals with %BF Below the Ideal ($85.15 \pm 10.43$) and Ideal ($74.44 \pm 17.20$) compared to the Above the Ideal group ($72.70 \pm 14.08$). These results are confirmed by the BMI analysis, in which the Above the Ideal group presented high percentages of individuals classified as having motor coordination disorders and motor coordination insufficiency (43.6% and 35.9%, respectively).

Similar results in relation to BMI were observed in international studies involving children and adolescents aged 6 to 14 years who were overweight and showed lower levels of motor coordination when compared to eutrophic children, pointing to high BMI as a negative predictor for motor coordination[8,15]. In a systematic review with a meta-analysis of 10 national and international studies on the relationship between BMI and motor performance in schoolchildren, an inverse relationship was found between BMI values and KTK performance scores in both children and adolescents[3].

Considering the % BF, we can see an inverse relationship between excess body fat and motor performance. In a Portuguese study that analysed 596 children aged 9 to 12 years, lower motor coordination was observed in boys and girls with a high percentage of fat[29]. Excess body fat, from a mechanical perspective, represents an inert load that must be moved and, generally, negatively influences motor performance[20].

In relation to the variables body composition and motor performance, Pearson's correlation test was used to confirm their possible associations. It was found in the present sample that the body composition analysed by BMI and %BF correlated inversely with motor performance. A similar result was found in a study involving 333 schoolchildren aged 7 to 11 years that confirmed a negative correlation between high %BF and the performance of several motor tests[30]. The authors found differences in the motor development of children with normal weight compared to overweight and obese children[30]. This evidence is confirmed in a systematic review involving 44 national and international studies published between 2012 and 2013, where the authors detected an inverse association between motor coordination and overweight in children and adolescents in the results of the surveys[14].

In this perspective, the correlation results presented in Figure 1 are in agreement with a study that evaluated 7,175 schoolchildren between 6 and 14 years old that detected an inverse relationship between motor coordination and BMI throughout childhood and adolescence[8]. In summary, it was pointed out that overweight and obese individuals of both sexes have less motor coordination than their eutrophic congeners[8]. In addition to negative the repercussions on health, overweight may be a limiting factor for motor skills[20].

It is believed that this work contributes to the reflection of the importance of early education for an active lifestyle, since it investigates the relationship between the motor performance and body composition of adolescents. Thus, the study is relevant in terms of public health, as it addresses the negative influence of being overweight on the healthy development of school-age youth and therefore, motivate for prior interventions with programmes, projects and guidelines in the field of activity practice to combat obesity and improve the health of children and adolescents.

## ■ CONCLUSION

In conclusion, the present study revealed a large number of individuals with low levels of motor coordination, with boys performing better in relation to girls and the younger age group compared to the older age group. Regarding body composition, a considerable incidence of overweight was observed in the investigated sample and a decrease of the same with advancing age. In addition, overweight had a negative association with the motor performance of the evaluated students. In this sense, it can be affirmed that there are relationships between the variables of body composition and motor performance in schoolchildren aged between 11 and 14 years, and these associations can be influenced by age, sex and body composition.

## ■ REFERENCES

1.  Ré AHN. Crescimento, maturação e desenvolvimento na infância e adolescência: Implicações para o esporte. Motricidade. 2011;7(3):55-67. DOI: http://dx.doi.org/10.6063/motricidade.7(3).103.

2.  Rodrigues D, Avigo EL, Leite MMV, Bussolin RA, Barela JA. Desenvolvimento motor e crescimento somático de crianças com diferentes contextos no ensino infantil. Motriz. 2013;19(Suppl. 3):49-56. DOI: http://dx.doi.org/10.1590/S1980-65742013000700008

3. Luz LGO, Seabra AFT, Santos R, Padez C, Ferreira JP, Coelho-e-Silva MJ. Associação entre IMC e teste de coordenação corporal para crianças (KTK). Uma meta-análise. Rev Bras Med Esporte. 2015;21(3):230-5. DOI: http://dx.doi.org/10.1590/1517-869220152103144469

4. Carmo N, Gringer C, Souza Neto JB, França JC, Victorino R, Pereira CCDA. A importância da educação física escolar sobre aspectos de saúde: sedentarismo. Rev Educare CEUNSP. 2013;1(1):21-9.

5. Santos NHA, Fiaccone RL, Barreto ML, Silva LA, Silva RCR. Association between eating patterns and body mass index in a sample of children and adolescents in Northeastern Brazil. Cad Saúde Pública. 2014;30(10):2235-45. DOI: http://dx.doi.org/10.1590/0102-311X00178613

6. Menezes AS, Duarte MFS. Condições de vida, inatividade física e conduta sedentária de jovens nas áreas urbana e rural. Rev Bras Med Esporte. 2015;21(5):338-44. DOI: http://dx.doi.org/10.1590/1517-869220152105145322

7. Brito AKA, Silva Júnior FL, Coelho LS, França NM. Nível de atividade física e correlação com o índice de massa corporal e percentual de gordura em adolescentes escolares da cidade de Teresina-PI. Rev Bras Ativ Fís Saúde. 2012;17(3):212-16.

8. Lopes VP, Stodden DF, Bianchi MM, Maia JA, Rodrigues LP. Correlation between BMI and motor coordination in children. J Sci Med Sport. 2012;15(1):38-43. DOI: http://dx.doi.org/10.1016/j.jsams.2011.07.005

9. World Health Organization (WHO). Who child growth standards: lenght/height-for-age, weight-for-lenght, weight-for-height and body mass index-for-age. Methods and development. Geneva: WHO; 2007.

10. Benedetti TRB, Pinho RA, Ramos VM. Dobras Cutâneas. In: Antropometria: técnicas e padronizações. 5 ed. São Paulo: Fontoura, 2011; p.49-60.

11. Lohman TG. Applicability of body composition techniques and constants for children and youths. Exerc Sport Sci Rev. 1986;14:325-57.

12. Lohman TG. The use of skinfold to estimate body fatness on children and youth. J Phys Educ Recr Dance. 1987;58(9):98-103. DOI: https://dx.doi.org/10.1080/07303084.1987.10604383

13. Kiphard EJ, Schilling VF. Köper Koordinations-test für Kinder - KTK: manual Von Fridhelm Schilling. Weinheim: Beltz Test Gmbh, 1974.

14. Carttuzo MT, Henrique RS, Ré AHN, Oliveira IS, Melo BM, Moura MS, et al. Motor competence and health related physical fitness in youth: a systematic review. J Sci Med Sport. 2016;19(2):123-9. DOI: http://dx.doi.org/10.1016/j.jsams.2014.12.004

15. D´Hont E, Deforche B, Gentier I, Bourdeaudhuij I, Vaeyens R, Philippaerts R, et al. A longitudinal analysis of gross motor coordination in overweight and obese children versus normal-weight peers. Int J Obes. 2013;37(1):61-7. DOI: https://dx.doi.org/10.1038/ijo.2012.55

16. Gorla JI, Duarte E, Montagner PC. Avaliação da coordenação motora de escolares da área urbana do município de Umuarama-PR Brasil. Rev Bras Ciênc Mov. 2008;16(2):57-65.

17. Burgos MS, Reuter CP, Tornquist L, Piccin AS, Reckziegel MB, Pohl, HH, et al. Perfil de aptidão física relacionada à saúde de crianças e adolescentes de 7 a 17 anos. J Health Sci Inst. 2012;30(2):171-5.

18. Rizzo AC, Goldberg TB, Silva CC, Kurokawa CS, Nunes HRC, Corrente JE. Metabolic syndrome risk factors in overweight, obese , and extremely obese brazilian adolescents. Nutri J. 2013;12:19. DOI: https://dx.doi.org/10.1186/1475-2891-12-19

19. Oliveira PM, Silva FA, Oliveira RMS, Mendes LL, Pereira Netto M, Cândido APC. Associação entre índice de massa de gordura e índice de massa livre de gordura e risco cardiovascular em adolescentes. Rev Paul Pediatr. 2016;34(1): 30-7. DOI: http://dx.doi.org/10.1016/j.rppede.2015.06.020

20. Krinski K, Elsangedy HM, Hora S, Rech CR, Legnani E, Santos BV, et al. Estado nutricional e associação do excesso de peso com gênero e idade de crianças e adolescentes. Rev Bras Cineantropom Desempenho Hum. 2011;13(1):29-35. DOI: http://dx.doi.org/10.5007/1980-0037.2012v13n1p29

21. Aleixo AA, Guimarães EL, Walsh IAP, Pereira, K. Influence of overweight and obesity on posture, overall práxis and balance in schoolchildren. J Hum Growth Dev. 2012;22(2):239-45. DOI: http://dx.doi.org/10.7322/jhgd.44937

22. Brasil MR, Oliveira VM, Chumlhak Z, Estevão BJ, Silva TR, Silva SR. Associação entre (in) satisfação com a imagem corporal, estado nutricional e nível de coordenação motora em crianças e adolescentes de projetos esportivos. Cinergis. 2015;16(2):82-6. DOI: http://dx.doi.org/10.17058/cinergis.v16i2.5603

23. Soares NIS, Leone ID, Costa VB, Silva VF, Cabral PUL, Vieira CMS, et al. Coordenação motora em escolares: relação com a idade, gênero, estado nutricional e instituição de ensino. Rev Biomotriz. 2014;8(1):36-48.

24.  Saker ARPM, Lima Neto AJ, Oliveira LS, Souza MSC, Carvalho MIMM. Avaliação da coordenação corporal pelos escolares da bateria de testes KTK em escolares do ensino fundamental. Coleção Pesquisa em Educação Física. 2012;11(1):89-98.

25. Guedes DP, Miranda Neto JT, Silva AJRM. Desempenho motor em uma amostra de  escolares brasileiros. Motricidade. 2011;7(2):25-38. DOI: http://dx.doi.org/10.6063/motricidade.7(2).108

26. Capistrano R, Ferrari EP, Alexandre JM, Silva RC, Cardoso FL, Beltrame TS. Relation between motor perfomance and physical fi tness level of schoolchildren. J Hum Growth Dev. 2016;26(1):174-80. DOI: http://dx.doi.org/10.7322/jhgd.119261

27. Tenório MCM, Barros MVG, Tassitano RM, Bezerra J, Tenório JM, Hallal PC. Atividade física e comportamento sedentário em adolescentes estudantes do ensino médio. Rev Bras Epidemiol. 2010;13(1):105-17. DOI: http://dx.doi.org/10.1590/S1415-790X2010000100010

28. Hardy LL, Reinten-Reynolds T, Espinel P, Zask A, Okeley AD. Prevalence and correlates of low fundamental movement skill competency in children. Pediatrics. 2012;130(2):390-8. DOI: http://dx.doi.org/10.1542/peds.2012-0345

29. Lopes L, Santos R, Moreira C, Pereira B, Lopes VP. Sensitivity and specificity of different measures of adiposity to distinguish between low/high motor coordination. J Pediatr. 2015;91(1):44-51. DOI: http://dx.doi.org/10.1016/j.jped.2014.05.005

30. Prskalo I, Badric M, Kunjesic M. The percentage of body fat in children and the level of their motor skills. Coll Antropol. 2015;39(Suppl 1):21-8.

**Resumo**

**Introdução:** A coordenação motora é uma interação harmoniosa entre diversos sistemas corporais para produzir ações cinéticas precisas e equilibradas. Diagnosticar níveis de desempenho motor em crianças e adolescentes pode favorecer a prevenção, conservação e melhoria da saúde e qualidade de vida. A composição corporal pode interferir consideravelmente na coordenação motora, principalmente em situações de sobrepeso e obesidade.

**Objetivo:** Analisar relações entre desempenho motor e composição corporal de escolares.

**Método:** Foram avaliados em 105 escolares a coordenação motora através do teste KTK (Körperkoordinationstest für Kinder) considerando o Quociente Motor (QM) e a composição corporal por meio do Percentual de Gordura Corporal (%GC) e Índice de Massa Corporal (IMC).

**Resultados:** Os resultados da composição corporal demonstraram que pelo IMC (38% e 36%) e %GC (28% e 22%) dos meninos e meninas, respectivamente, foram classificados no grupo Acima do Ideal. Com relação ao desempenho motor as meninas apresentaram valores de QM inferiores aos dos meninos ($p<0,001$). O grupo com %GC Abaixo do Ideal apresentou maiores valores de QM que os grupos Ideal ($p<0,05$) e Acima do Ideal ($p<0,05$). Foi observada correlação inversa entre o QM, o %GC e o IMC ($r=-0,432$ e $r=-0,254$, respectivamente).

**Conclusão:** existem relações entre composição corporal e coordenação motora de adolescentes entre 11 e 14 anos, específicas ou não ao sexo e a faixa etária.

**Palavras-chave:** composição corporal, desempenho motor, adolescentes.