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ORIGINAL ARTICLE

The Role of Motor Skills in the Sociometric Status and Perceived Social Status of Schoolchildren

El rol de las habilidades motoras en el estado sociométrico y el estado social percibido de los escolares

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What do we know about the subject matter of this study?

Children who present specific and appropriate movements for a given situation are more likely to succeed in performing the motor tasks, contributing to positive effects in other aspects of daily life, promoting satisfaction and sustaining social relationships among peers.

What does this study contribute to what is already known?

The difficulties found in children with low motor skills go beyond the motor domain, extending to social relationships.

Abstract

Children with better motor skills tend to develop more positive peer relationships. However, there is little information about the relationship between motor skills and the five sociometric status groups, as well as how much it interferes with self-perception of social status. **Objective:** To analyze the association of low motor skills with sociometric status and perceived social status in students aged 7 to 10 years. Subjects and **Method:** Cross-sectional, descriptive study with convenience sampling. Participated in the study children in public schools from Florianopolis, Brazil. Children with disabilities and those who changed schools during the school year were excluded. Motor skills were evaluated by the Movement Assessment Battery for Children (MABC-2), validated for this population. Movement skills were considered low when they were below the 15th percentile. Sociometric Status was assessed using the Subjective Scale of Social Status in the Classroom, according to the sociometric method, and the Perceived Social Status by the MacArthur Scale of Subjective Social Status, classifying children into five groups. Multinominal logistic regression analysis was performed. **Results:** 439 children participated (242 girls and 197 boys), with a median age of 8.94 ± 1.03. Participants classified as rejec-

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ted, neglected, and controversial, regarding sociometric status, were 5.01, 2.40, and 2.86, respectively, more likely to present low motor skills when compared with the average group. Regarding perceived social status, there were no significant differences. **Conclusion:** The difficulties found in children with low motor skills go beyond the motor domain, extending to social relationships.

Introduction

The ability to perform motor abilities, described as motor skills, is considered a prerequisite for successful participation in games and playing[1]. Children who present specific and appropriate movements for a given situation are more likely to succeed in performing the motor tasks, contributing to positive effects in other aspects of daily life, such as promoting satisfaction and sustaining social relationships among peers[2].

These relationships are considered the foundation for the construction of the child's identity and development, thus, behavior is not only related to individual characteristics, but also results from the social relationship network and how the child is judged by the rules defined by the group in which they are included[3]. These collective judgments define how the child is perceived and classified in the social hierarchy, and consequently, their sociometric status.

Sociometric status has been used in the literature to support the discussion about peer relationships[4]. It is based on the social position that the child occupies based on peer perceptions and is associated with the prestige and respect achieved in the social group and how the individual is related and inserted in this context[3]. This evaluation can have a negative or positive impact, especially during childhood, when children are more dependent on peer acceptance and approval.

In the school context, sociometric status is of special relevance, because, in general, the group develops an implied consensus on the individual's characteristics that are considered as valuable or derogatory, and it is believed that motor skills may be one of the factors considered as an indicator of interactions and relationships between students, defining acceptance and rejection among them[5]. Therefore, the importance of motor skills in social acceptance and in relationships between peers is increasingly being reported in the literature.

Corroborating this idea, there is evidence to indicate that children value athletic and motor skills and use this for social comparison processes in order to determine the position of their peers[6]. It is assumed that children with better motor skills tend to be more popular and to have more positive relationships with peers when compared to those who are less motor competent[7]. Thus, limitations related to motor skills can lead to lower scores of social preferences.

These data are also in line with the classic study by Schoemaker and Kalverboer[8], in which it was found that children with low motor skills are frequently excluded from games and playing and tend to move away from social situations to avoid failure. These situations can contribute to reduce positive relationships between peers, negatively influencing the sociometric status perceived by peers, which consequently interferes with the child's perceived social status[9,10]. In the study by Chase and Dumer[11], children with better athletic competence are preferred for classroom work and games in the playground, suggesting that being competent in terms of motor skills can have rewards associated with social relationships.

To date, investigations related to sociometric status in relation to motor skills have received little attention. Much of the research is related to athletic competence[6,11] and classifies children only as rejected and popular[12]. Thus, detailed investigations regarding motor skills considering the five possible groups of sociometric status –average, popular, rejected, neglected, and controversial groups– seem to be absent from the literature. The plausibility between these possible relationships, as well as the individual's self-perception of themself with regard to social relationships, could demonstrate that the factor motor skills contribute to a deeper understanding of social relationships, which allows perception of important factors for the child's development and how motor skills are associated with this behavior. Thus, the aim of this study is to analyze the association of low motor skills with sociometric status and perceived social status in students aged 7 to 10 years.

Subjects and Method

Sample

This study is characterized as descriptive with a cross-sectional design, with the objective of obtaining reliable data that, at the end of the research, will allow reliable, robust conclusions to be drawn up, in addition to generating new hypotheses. In addition to the description of the phenomena, a cross-sectional design is also useful in studies that seek cause and effect rela-

tionships, which attempt to analyze the relationships between risk factors, determinants, and their supposed consequences[13].

Recruitment was for convenience, we included children between 7 and 10 years old who attended to state school in Florianópolis, Santa Catarina, Brazil. The school was chosen intentionally, due to the high number of students who met the requirements of the project.

Participants were excluded due three factors: 1) Children with disabilities participated in the data collect, but some of their measurements had to be modified in consequence of their disability, so their data were excluded from the study; 2) Children who changed schools during the school year, and 3) Children who had signed the consent form but were outside the indicated age range.

Instruments

Motor skills

The Movement Assessment Battery for Children Second Edition-MABC 2[14], is one of the most commonly used instruments to identify motor difficulties in children and adolescents aged between 3 and 16 years, and validated for use with Brazilian children aged from 5 to 12 years[15]. The MABC is composed of three sets of tasks appropriate for specific age groups: Age group 1 (3 to 6 years); Age group 2 (7 to 10 years), used in this study; and Age group 3 (11 to 16 years). The general skills assessed by the motor battery are Manual Dexterity, Throw/Receive, and Balance (static and dynamic), and for each age group different tasks with different complexities are established. Children whose results are below or equal to the 5th percentile, receive an indication of significant difficulties in movement; values between the 5th and 15th percentile indicate that the child is at risk for movement difficulties, requiring developmental monitoring (borderline); and values equal to or higher than the 16th percentile indicate that the child has no movement difficulties, that is, presents typical development. In the current study, children below the 15th percentile were categorized with low motor skills[15,16].

Perceived Social Status

The "Subjective Social *Status* MacArthur Scale (SSS)" was also used[17] created to evaluate the self-perception of social status at school. An image of a "social ladder" is presented on which at the top of the ladder (10th step) are the people with the highest grades, most respected, and highest social standing and at the bottom (1st step) are the people with worst grades, who are not respected, and who nobody wants to be close to. The participant is required to mark an "X" on the step on which they perceive themselves in relation to those who are in a better or worse social situation. This assessment has been widely used with the Brazilian population[16-18]. The internal consistency of the instrument in the current sample was good (Cronbach's $\alpha = 0.79$). In a previous study the internal consistency was also considered good (Cronbach's $\alpha = 0.77$)[18], according to the criteria established by Portney and Watkins[19] (lower than 0.50 = poor, above 0.50 = acceptable, above 0.75 = good).

Sociometric Status

The Subjective Scale of Social Status in the Classroom[20], according to the sociometric method, is used to measure the relationships between people[21]. The sociometric method is able to describe and evaluate the relationships between peers, in addition to measuring the acceptance or rejection felt between them. The scale in question is composed of six sentences to evaluate the student in relation to their colleagues, by means of indications according to six specific abilities perceived in daily interactions. The evaluation is carried out individually and the student consulted is required to indicate up to 10 (ten) colleagues for each question, which are: 1. Who would be the first ones chosen to put together a team in a Physical Education class? 2. Who would be the last ones chosen to put together a team in a Physical Education class? 3. Who are the MOST physically strong? 4. Who are the LEAST physically strong? 5. Who would be the first ones chosen for classroom work? 6. Who would be the last ones chosen for classroom work?

After evaluating all students, a count was made of the frequency with which the students were indicated. Subsequently, the number of indications was standardized by the Z score, and from the social preference scores –difference between positive and negative nominations– and social impact –sum of positive and negative nominations– it was possible to classify children into five distinct groups, established by Coie et al.[22], as follows: a) average group: which provides a reference so that the most extreme groups can be compared; b) popular: has a greater number of positive indications, that is, a high acceptance rate; c) rejected: has a greater number of negative indications, that is, a high rejection rate; d) neglected: with low or zero rates of positive and negative choices; e) controversial: with high acceptance and rejection rates. Finally, it should be highlighted that the classic study by Coie et al.[22], emphasizes the importance of using the sociometric method, through the combination of positive and negative questions, to obtain more accurate results with regard to self-perception of social status, using a method known worldwide and widely used with the Brazilian population[12,23-25]. The internal

consistency of the instrument in the current sample was good (Cronbach's $\alpha = 0.65$).

Socioeconomic status

For the socioeconomic characterization of the participants, the Brazil Criterion questionnaire for socioeconomic classification-ABEP was used. The respondents check the number of items they have at home (bathrooms, domestic servants, automobiles, microcomputers, dishwashers, refrigerators, freezers, washing machines, DVDs, microwaves, motorcycles, clothes dryers), the education level of the head of the family (Illiterate/incomplete Elementary I; Complete Elementary I/incomplete Elementary II; Complete elementary school II/incomplete high school; Complete high school/incomplete higher education; Higher education complete), and the public services to which they are connected (running water and paved street), from which they receive a score which classifies them as from economic class A to class D-E.

Procedures

After approval under the Certificate of Presentation for Ethical Appraisal process no. 68039617.7.0000.0118, data collection started. The participants were informed about the research and consented to participate through the Term of Assent. A Free and Informed Consent Term was also prepared, a document which demonstrates the consent of the legal guardian of the child to participate in the research; a total of 1100 terms were sent, and we obtained a response rate of 497 terms (45.18%).

Data collections were carried out at three moments. First, the students answered an individual interview conducted by the researchers. At this moment, data on sociometric status were collected according to the perception of colleagues, and Perceived Social Status. At the second moment, the students were individually evaluated and were instructed to wear light clothes (clothes suitable for physical education class, such as t-shirts and shorts) for the motor skill tests. In the final step, the questionnaire was sent home to characterize the socioeconomic aspects of the participants, with guidance on how to complete the tool for the parents.

The first and second steps were carried out in a school environment, in spaces provided by the school in which there was no interference during the evaluations. Prior to the evaluations, the evaluators and collaborators participating in the research were trained to administer all tests.

Statistical analysis

At first, an exploratory analysis was performed, using descriptive statistics, mean, standard deviation, and frequency. Inferential statistics were performed using chi-square tests to evaluate the association between motor competence and sex, and socioeconomic and social status. In addition, the *Kolmogorov Smirnov* normality test was used to verify whether the data met the parametric assumptions, as the data did not demonstrate normal distribution, the *Mann-Whitney U* test was used to compare two groups and d-Cohen for the effect size –children with low motor skills and those with typical development– in relation to age. Multinomial logistic regression analysis was used to verify the association of social status (outcome variable) with the independent variables –motor skills and sex. The choice of this analysis is justified due to the fact that the result has more than two categories –popular, rejected, neglected, controversial, and average group– using individuals classified as belonging to the average group as a reference. *Odds ratio* estimates (OR) and 95% confidence intervals (95% CI) were also obtained. At first, a crude analysis was performed, followed by an analysis adjusted for sex. In all analyses, the significance level of 5% was adopted, using the statistical program *Statistical Package for the Social Sciences-SPSS*, version 20.0.

Results

We recruited 497 children, 58 participants were excluded due to disabilities (n = 8, being three children with attention deficit hyperactivity disorder, one with brain palsy, and four with autism spectrum disorder); and 50 due to attrition. Therefore, the final sample consisted of 439 children (242 girls, 197 boys), aged 7 to 10 years (median (M) = 8.94; standard deviation (SD = 1.03), since 130 children (29,6%) present low motor skills and 309 (70.4%) typical development. According to Brazilian norms for socioeconomic status (SES)[14], 73.6% of participants were classified as class "C" (working class, between middle and lower), 25.5% were considered as class "B" (middle class), and 0.8% were considered as class "A" or upper class.

In table 1, there was a significant difference in the Perceived Social Status, with children with low motor skills presenting lower means when compared to children with typical development ($p = 0.027$).

In table 2, there was a significant difference between groups with low motor competence and typical development regarding the categorization of sociometric status ($p < 0.000$). When comparing the sexes, it was observed that 35.5% of the boys had low motor skills and 24.8% of the girls ($p = 0.016$).

Table 3 presents the association between low motor skills and sociometric status and perceived social status. According to the results of the crude analysis, an association of low motor skills was observed with all variables. However, when adjusting the analysis,

Table 1. Characterization of participants and comparisons between groups for perceived social status and sex

Variables	Total $\bar{x}$ (SD)	Low motor skills $\bar{x}$ (SD)	Typical development $\bar{x}$ (SD)	U	p-value	Effect size
Perceived social status	8.04 (2.2)	7.6 (2.49)	8.23 (2.04)	2.21	p = 0.027	10.55

$\bar{x}$ = average; SD = standard deviation; U = value of *Mann Whitney U* test.

Table 2. Characterization and association of participants between groups for sociometric status

Variables	Total n (%) 439 (100)	Low motor skills n (%) 130 (29.6)	Typical development n (%) 309 (70.4)	χ^2 (df) p-value	Cramer's V
Sociometric status					
Average group	207 (47.1)	39 (30.0)	168 (54.3)	43.48(4)	0.315
Popular	58 (13.3)	10 (7.6)	48 (15.5)	p < 0.000	
Rejected	52 (11.8)	30 (23.1)	22 (7.1)		
Neglected	44 (10.1)	17 (13.1)	27 (8.8)		
Controversial	78 (17.7)	34 (26.2)	44 (14.3)		
Sex					
Boys	197 (100)	70 (35.5)	127 (64.5)	6.00 (9)	0.117
Girls	242 (100)	60 (24.8)	182 (75.2)	p = 0.016	

N = absolute frequency; χ^2 = chi-square test value.

Table 3. Analysis of association between the variables investigated with low motor skills

Variables	Crude Analysis OR (95%CI)	p-value	Adjusted analysis OR (95%CI)*	p-value
Sociometric status		< 0.001		< 0.001
Average group	1		1	
Popular	0.89 (0.41-1.19)		0.91 (0.42-1.99)	
Rejected	5.83 (3.04-11.19)		5.01 (2.57-9.76)	
Neglected	3.21 (1.81-5.68)		2.40 (1.17-4.93)	
Controversial	2.69 (1.33-5.42)		2.86 (1.59-5.13)	
Perceived social status	0.88 (0.80-0.96)	0.007	0.90 (0.82-1.00)	0.054

95%CI: 95% confidence interval; p < 0.005; *OR*: *Odds Ratio* adjusted for sex p < 0.20 in the crude model.

only the sociometric status remained associated with the outcome, since the participants classified as rejected, neglected, and controversial presented 5.01, 2.40, and 2.86 times more chances, respectively, of presenting low motor skills when compared with the average group (See table 2).

Discussion

In the current study, we sought to analyze the association of low motor skills with sociometric status and perceived social status in students aged 7 to 10 years. We observed that children with low motor skills are more likely to be rejected, controversial, and neglected.

Our results corroborate with the literature, which points out that children with low performance in games, play, and sports activities during recess and in Physical Education, tend to have less friends and are more rejected by peers[8,26]. In the study by Kanioglou et al.[27], children with low motor skills were associated with low socialization, which further reinforces this idea.

Similarly, Medeiros et al.[12], point out that in this age group, being motor competent is considered a prerequisite for being socially involved and not being rejected by peers. This is a worrying fact, especially with regard to the influence on the integral development of the child, since when we consider that this development is multifactorial and includes factors related to motor, social, affective, psychological, and mental development, when one of these aspects is impaired, the rest of the child's development can also be affected.

In the current study, children were indicated by peers for both playing and games, as well as activities

in the classroom, as we emphasize that children identified as rejected were mentioned as being the last to be remembered for participating in both situations. These results were also found by Ommundsen et al.[28], in which children with low motor skills were also less socially attractive to work with on classroom activities. However, the establishment of this relationship is still not well understood in the literature. Silva and Beltrame[29] presented evidence that children with learning difficulties may have low motor skills. On the other hand, Ommundsen et al.[28] bring another interpretation that can be made in light of this result, suggesting that students with low motor skills lose popularity in such a way that this situation can reflect on school activities and not necessarily be a result of their academic performance.

With regard to children neglected by peers in school settings, those with low rejection rates and zero acceptance –were more likely to present low motor skills. When evaluating only the impact and sociometric preference, it is possible that in many studies neglected and rejected children are classified in the same group. However, by categorizing them according to the Coie[22] classifications, these groups differ. According to the literature, neglected children tend not to be aggressive, in addition to being shy, ignored in the classroom, and having few social interactions[30]. According to the meta-analysis by Newcomb et al.[30], on the profile of relationships between peers, it is believed that this group is not necessarily excluded from games like rejected children, but more forgotten by peers. These facts may reflect on the participation related to Physical Education and the practice of physical activities both at school and in extracurricular activities, negatively interfering in the opportunities to acquire motor skills, affecting not only social relationships, but also motor development.

Regarding controversial children, described with high acceptance and rejection rates[22], we know that these children generally use prosocial and aggressive strategies to gain status before the group[7], and therefore, even with low motor skills, they may have visibility from their peers. Another possible interpretation for this contradictory result is based on the reflections of Hill and Merrell[31], who highlight that the behavioral profile of children who are classified as controversial is difficult to define, considering that their status before the group depends on the characteristics that are appreciated by peers. In the case of the present study, participants may have obtained positive indications related to work performed in the classroom, while negative indications may be related to motor skills, or even, this contradiction may also refer to compensatory prosocial strategies or defensive strategies such as aggression.

Thus, the use of the five groups of categories defined by Coie et al.[22] and not just preference and social impact, bring a new look at this issue, added to the large sample size that enabled us to better analyze it. Furthermore, in the current study, sociometric *status* represents a variable that goes beyond financial conditions to determine the social hierarchy among a homogeneous peer group, since all participants in this study presented similar socioeconomic conditions, and despite this, variations in sociometric *status* were observed.

While recognizing the contributions to expand the knowledge of the influence of social status on motor competence, the results need to be interpreted in light of their limitations. First, the majority of participants were considered to belong to social class "C" and it is known that motor skills can be influenced by many factors, including socioeconomic status. Second, the non-normality of the data and the convenience sample reduce the power of generalizations, considering that it presents a specific social reality. Third, the cross-sectional design of the study does not allow verification of the causality of the associations found. Fourth, this study did not have access to the history of the participants, in relation to previous experiences (e.g., pre-school experience, academic mobility before the study, etc.), as well as being limited to analyzing only the relationship of a psychosocial variable with motor competence. For this reason, the results should be viewed with caution.

In addition, the development of qualitative research could complement our findings, making it possible to observe the behavior of these children in their daily school activities (Physical Education classes, recess, and other classes), in order to understand the roles assumed in each context in which they are included.

In this context, the importance of raising awareness and creating strategies for teachers and parents and/or caregivers in terms of improving motor skills in children with low motor skills is emphasized, aiming to improve social status in the group. Parents are responsible for making their children aware of their strengths, encouraging them to participate in games and sports that are interesting to them, and emphasizing leisure more than competition.

Regarding the role of the Physical Education teacher, it is suggested that inclusion strategies be created for these children and, even in competitive activities, it is recommended that participation and overcoming one's own challenges be emphasized, if necessary, adaptations are made to activities and equipment, so that these children can have more effective participation, contributing to the improvement in motor competence and, consequently, social skills, making them more accepted by peers, and thus reducing the chances of having low self-perceptions.

We emphasize the importance of conducting stu-

dies that adopt a longitudinal design, enabling the monitoring of alterations which occur over time in order to identify the effects exerted by low motor skills on social and personal resources during the development of each child, as well as including more research on the participants' background and the influence of more psychosocial and environmental variables, thus verifying possible causal relationships.

Finally, it is suggested that future studies explore intervention strategies with the age group of the current study, presenting data that can be used to benefit children with low motor skills.

Conclusions

We concluded that children with low motor skills had lower perceived social status, as well as being more likely to be rejected, neglected, and controversial, when compared to children with typical development. Thus, we realize that the difficulties encountered in children with low motor skills are not limited to this domain but extend to social relationships and the child's perception of themself.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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