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The prevalence and association of motor competence with weight status and bullying: a cross-cultural study

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ABSTRACT

The purpose of this study was to compare the prevalence of motor competence among children and adolescents from two metropolitan cities, one in Portugal and one in Brazil, and analyzed the association between motor competence and weight status and bullying roles. A Cross-sectional and cross-cultural study was applied. The sample comprised 785 children and adolescents aged 7-14. Motor competence was assessed using The Körperkoordinationtest Für Kinder (KTK) test, while participation in bullying was assessed using a sociometric test and the students' Body Mass Index (BMI), which was calculated from height and weight and reported as kg/m^2. Portuguese students had a higher prevalence of impairment/disturbance in motor coordination. Also, obese students and bullying victims had higher odds of having a motor competence below normal values in both countries. These findings provide evidence of a link between motor competence and sex and weight status of schoolchildren and suggest that motor competence is associated with bullying roles.

KEYWORDS: motor skills; body composition; peer relationships; school.

INTRODUCTION

Motor competence is a broad and complex concept that encompasses the level of performance of fundamental motor skills, i.e., object control and locomotor skills (Gallahue, Ozmun, & Goodway, 2013; Estevan et al., 2018). Utesch and Bardid (2019) have suggested that motor competence implies a degree of proficient performance in a wide range of motor skills at an individual level alongside underlying mechanisms that include quality of movement, motor coordination and motor control. The study of motor competence, as a distinct topic, is a flourishing area of research, mainly due to the positive implications of motor competence on health and developmental outcomes (Lopes et al., 2021). Motor competence is important for successful participation in physical and sport activities (Barnett et al., 2016; Henrique et al., 2016; Lopes et al., 2019) because, it influences the way children perceive themselves and perceive their peers, and when they experience a fun sensation, satisfaction, and success in physical activities, their self-esteem and motivation levels tend to increase (Ulrich, 2000; Haywood & Getchell, 2004). Therefore, motor competence in childhood and adolescence is fundamental for the perception and feelings that individuals have of themselves (Del Prette & Del Prette, 2017). In addition, children and adolescents who have a wide motor repertoire are coveted partners in physical games and those who can run fast, catch a ball well and are agile, are popular amongst peers (Medeiros, Zequinão, & Cardoso, 2016).

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Thus, success in physical activities and involvement in sports at school contribute to popularity, as well as narrow the possibilities of being intimidated by peers at school (Peguero, 2008; Del Prette & Del Prette, 2017). By contrast, children and adolescents with low motor skills tend to have fewer friends, are rejected by peers, are less often invited to play, are more likely to be intimidated at school and are more susceptible to depression (Campbell, Missiuna, & Vaillancourt, 2012; Scarpa, Carraro, Gobbi, & Nart, 2012; Medeiros et al., 2018).

This intimidation at school, which inclues bullying, often occurs in a context in which the student practices physical activity, whether in the playground and/or in physical education classes (Roman & Taylor, 2013; Medeiros et al., 2016; Martínez-Baena & Faus-Boscá, 2018). These experiences are exacerbated in team sports and instances of collective collaboration and may lead to bullying, as students with poor skills and low motor competence become more vulnerable targets for bullies (Scarpa et al., 2012; Cascales & Prieto, 2019). As such, students with poor motor skills may experience intimidation, aggression, and exclusion from games and activities, as well as receive malicious comments about their poor coordination and performance in activities (Bomfim et al., 2012; Del Prette & Del Prette, 2017).

Because of this, many children withdraw from these situations as they seek to avoid a demonstration of their poor motor skills. This makes this problem even greater and with lasting effects, leading to impairment in motor development, an increasing risk of weight gain and obesity (Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006; L. Lopes, Santos, Pereira, & Lopes, 2012; Lopes, Santos, Moreira, Pereira, & Lopes, 2015) and a subsequent loss in interpersonal relationships (Dewey, Kaplan, Crawford, & Wilson, 2002; Del Prette & Del Prette, 2017; Medeiros et al., 2018). Therefore, some researchers have indicated that poor motor skills are closely related to poor social skills (Bejerot, Edgar, & Humble, 2011; Medeiros et al., 2016; Medeiros et al., 2018). Given that human beings are evolutionarily social beings, this relationship indicates that poor motor skills have an independent effect on the likelihood of being bullied or have a role as a mediating factor between involvement in sports and bullying (Bejerot et al., 2011; Bejerot & Humble, 2013; Bejerot, Plenty, Humble, & Humble, 2013).

Studies investigating bullying and motor competence have mainly involved groups with deficits in motor development, such as Developmental Coordination Disorder (DCD) (Lingam et al., 2012; Bejerot & Humble, 2013) and other chronic disorders, for instance, the Tourette Syndrome and Motor Tic (Zinner, Conelea, Glew, Woods, & Budman, 2012), although most recently the Körperkoordination Test für Kinder (KTK) has been used to detect the motor competence of normative samples (Santos et al., 2020). However, studies that have controlled other risk factors or that have included healthy individuals, have shown that poor motor competence is an independent and strong risk factor for victimization among peers in different populations, and as such deserves further investigation (Bejerot et al., 2011; Bejerot & Humble, 2013; Bejerot et al., 2013).

Noteworthy, is that few studies have used general motor assessments in their investigation of motor competence and bullying. Indeed studies have included tests such as the Movement Assessment Battery for Children (MABC) (Lingam et al., 2012), the Movement Assessment Battery for Children Second Edition (MABC-2) (Kennedy-Behr, Rodger, & Mickan, 2013), the McCarron Assessment of Neuromuscular Development (MAND) (Piek, Baynam, & Barrett, 2005), and clinical evaluations of successive vertical jumps (Bejerot & Humble, 2013). Despite their usefulness, these tests are best suited for detecting impairments in motor development that require clinical interventions (Piek, Bradbury, Elsley, & Tate, 2008; Goulardins et al., 2015; Caçola & Killian, 2018).

Moreover, motor competence has not been directly measured in many studies, and has rarely been assessed during childhood and adolescence (Robinson et al., 2015; Lopes et al., 2021). Studies with more objective measures and involving the assessment of motor skills in children and adolescents have been suggested by researchers in this field (Lingam et al., 2012; Scarpa et al., 2012; Bejerot & Humble, 2013). Moreover, studies investigating motor competence and school bullying, particularly with normative groups of children from different countries, are scarce. Since motor competence depends substantially on social contexts, a study involving children from different countries becomes relevant. Although motor competence is primarily seen as a biological factor, a fuller understanding of it should also take into account the context and the individual culture in which it occurs (Karmiloff-Smith, 1991).

This research seeks to fill these gaps in the literature by examining normative children and adolescents from different cultural contexts. Furthermore, for international comparisons, this research employed a widely used test for general motor competence known as the Körperkoordinationstest Für Kinder (KTK) (Iivonen, Sääkslahti, & Laukkane, 2014).

The results of this study may contribute to thinking about public policies for prevention, intervention and combating different types of bullying (Zequinão, Medeiros, Lise, Trevisol,

& Pereira, 2019; Silva et al., 2020; Zequinão, Medeiros, Silva, Pereira, & Cardoso, 2020; Zequinão, Oliveira et al., 2020), low motor competence (Medeiros et al., 2016; Medeiros et al., 2018; Lopes et al., 2021) and obesity (L. Lopes et al., 2012; Pelegrini et al., 2014; Lopes et al., 2019) problems that have been seriously affecting school-age children and adolescents around the world.

Thus, the purpose of this study was to compare the prevalence of motor competence among children and adolescents from two metropolitan cities, one in Portugal and one in Brazil, as well as to analyze the association between motor competence, weight and bullying status.

We hypothesized that motor competence, as well as its relationship to bullying, would vary according to the culture of each country, although the prevalence of bullying was equivalent in both countries. We expected that good coordination would be associated with the role of bullying others and lower body weight, while impairmed/disturbed motor coordination would be associated with the role of victim and bully-victim and greater body weight, when compared to the group that did not participate in bullying.

METHODS

A cross-sectional and cross-cultural study using intentional sampling (schools who showed interest and willingness to participate in the research) was undertaken in the metropolitan city of Braga, in the Minho region, in northern Portugal, and in the metropolitan city of Florianópolis, Santa Catarina, in southern Brazil, between November 2014 and May 2015. The study was carried out in two stages. In the first stage, students completed a sociometric scale to assess bullying status, while the second stage involved the application of a motor test battery (the KTK) and measurement of Body Mass Index (BMI).

Sample

Four public schools and one private school in Braga, and one public school and two private schools in Florianópolis participated in the study. All children and adolescents from 3rd to 6th grade at these primary schools were invited to participate in the study. The only exclusion criteria used for the recruitment of participants was the presence of intellectual or physical disability that prevented students from understanding the instruments used or impaired the performance of motor tasks. This evaluation was undertaken in consultation with the Special Education Service in schools.

A total sample size was calculated from the number of children and adolescents enrolled in public and private schools in each participating city and who were in the age group stipulated by the study. An assumed alpha of 0.05 and power of 80% was used for the sample size calculation separately in each of the strata (stratum 1= total students from public schools in Florianópolis; stratum 2= total students from private schools in Florianópolis, stratum 3= total students from public schools in Braga, stratum 4= total of students from private schools in Braga). The final sample size comprised 785 participants; 390 (49.7%) in Portugal (306 (78.5%) from public schools and 84 (21.5%) from private schools) and 395 (50.3%) in Brazil (266 (67.3%) from public schools and 129 (32.7%) from private schools). Participants' ages ranged from 7 to 14 years, with an average age of 9.89 years (S.D.= 1.30) for Portuguese students (n= 390) and 9.76 years (S.D.= 1.45) for Brazilian students (n= 395). The distribution of students across grades was as follows: 24.1% were in the 3rd grade, 26.2% in the 4th grade, 22.3% in the 5th grade, and 27.4% in the 6th grade.

This research was part of a project approved by an Ethics Committee for Research with Human Beings and an Ethics Committee of Social and Human Sciences, in Brazil and Portugal, respectively. Prior to data collection, parents and their children and adolescents received detailed information about the research. Students only participated if they were interested and assented to the study and if they had an appropriate Consent Form signed by a legal guardian. After returning the signed consent forms, all participants took part individually in both stages of data collection.

Procedures

Data were collected during regular school hours in a room offered by the school, in two different stages, in order not to take children out of their school activities for too long, and to keep students motivated. In stage 1, participants answered questions on the participation of peers in school bullying, in which each participant named the peers who experienced more instances as bullies and, or victims (about 30 minutes). Stage 2 involved the application of the motor test battery and the measurement of body weight and height (about 40 min). All data were collected individually, and researchers were trained in all procedures.

All tests were performed in a venue provided by the school in which there was no interference during the evaluation and without any risk during the tests. Students were evaluated individually and asked to wear appropriate clothes for the tests. Prior to participating in the research, the evaluators were trained to apply all the instruments used in the study.

Instruments

Sociometric scale

To assess bullying status, the Scale Sociometric (Olweus, 1994; Levandoski & Cardoso, 2013) was used in the first stage of the research. This instrument comprises questions about everyday behaviors of students involved in school bullying, either as victims or as bullies (Levandoski & Cardoso, 2013; Zequinão et al., 2017; Zequinão, Medeiros et al., 2020). For example, "Which classmates make MORE THREATS or challenge other classmates?" or "Which classmates are MORE THREATENED by these classmates?"

Each participant indicated the names of three classmates who were more involved in the situations described. Thus, all the students had two scores, one for aggression (sum of six questions) and one for victimization (sum of six questions), generated by the number of times in which they were cited in each block of questions. As the number of participants per class varied, standardized z-scores were used. From these scores, it was possible to establish a classification of participation in school bullying, according to the established method used to set the size of sociometric measures by Coie, Dodge, and Coppotelli (1982).

The names of the bullying role categories used by Coie et al. (1982) were adapted for this study,.

Accordingly, participants were classified into five categories:

- not involved: students who were not nominated by their peers or those nominated in sporadic episodes of aggression or victimization;
- average group: students who were moderately nominated in aggression and victimization situations, but with scores not high enough to be classified into one of the roles played in bullying;
- victims: students with a high number of nominations, but only in victimization;
- bullies: students with a high number of nominations, but only in aggression perpetration ;
- bully-victims: students with a high number of nominations, in both victimization and aggression perpetration.

In order to meet the objective of identifying characteristics of the roles played by students consistently involved in bullying, students in the average group were excluded from further analyses. This sociometric test presented an acceptable level of internal consistency, with a Cronbach's alpha of 0.744.

Körperkoordinationstest für Kinder

Students completed four tasks or the motor competence assessment using the *Körperkoordinationstest für Kinder (KTK)* (Kiphard & Schilling, 2007). Students were required to perform the following tasks:

- Task 1 – Balance while walking backwards;
- Task 2 – Hop on one leg;
- Task 3 – Jump sideways; and
- Task 4 – Shift platforms.

The KTK test uses the same coordination tasks for all ages, so tasks must include additional difficulties for older individuals. In both countries, the KTK was used according to the guidelines established by Kiphard and Schilling (2007) and the normative data of the German sample were used.

The standardized scores were summed and a total motor quotient (MQ) was calculated for each individual. The total MQ allows motor competence to be classified into five categories: impairment in motor coordination; disturbance in motor coordination; normal motor coordination; good motor coordination; and very good coordination. However, for better interpretation of the data, and due to the low prevalence in some motor competence categories, it was decided to categorize the performance into only two categories: impairment/disturbance in motor coordination and normal/good/very good motor coordination. Regarding internal reliability, the KTK battery presented a good level of internal consistency, with a Cronbach's alpha equal to 0.813.

Body mass index

Body weight and height were assessed using the procedures described by Ross and Marffell-Jones (1991) with an anthropometric scale to the nearest 0.1 kg and with a stadiometer to the nearest 0.1 centimeters, respectively. Body mass index (BMI) was calculated using the standard formula of body weight(kg)/height(m^2). BMI was classified according to the cut-off points established by Cole, Flegal, Nicholls, and Jackson (2007), stratifying participants into four categories: underweight and eutrophic, overweight, and obese. Due to the small percentage (1.8%) of underweight children and adolescents, this category was grouped with the eutrophic category for analysis purposes.

Statistical analysis

The association between impairment/disturbance in motor coordination and other independent variables was analyzed using a binary logistic regression model in SPSS (Statistical Package for the Social Sciences), version 20.0. Two models were tested, one simple and the other with adjustment for all the variables in the gross model with $p< 0.20$. The adhesion test explained 60.6% for adjustment. The quality of the adjustment of the final model was evaluated using the Hosmer and Lemeshor test. A level of significance of 5% was adopted in all analyses.

RESULTS

Table 1 shows the general characteristics of Portuguese and Brazilian participants. No significant differences were found between countries regarding gender and age group. Regarding the school system, the majority of Portuguese participants were students in the public school system. There was a significant difference in weight status, with 50.5% of Brazilian children being eutrophic, while Portuguese children had a higher frequency of overweight and obesity. In addition, there was no difference in the frequency distribution of the roles played in bullying and the country of origin, indicating a homogeneous distribution of these roles regardless of context. Finally, there was a difference in motor competence and the country of origin, wherein the Portuguese participants had greater insufficiency/disturbance in motor coordination compared to the Brazilian students.

Table 2 shows the association of impairment/disturbance in motor coordination with weight status and roles played in bullying for Brazilian participants. According to the results of the initial analysis, an association was observed between impairment/disturbance in motor coordination and all independent variables. In the adjusted analysis, all variables remained associated with the outcome. Those who were obese and victimized had 5.53 (95%CI 3.06–9.99) and 2.08 (95%CI 1.12–3.86) greater odds of having impairment/disturbance in motor coordination in relation to underweight/eutrophic participants and those who did not participate in bullying, respectively.

Finally, Table 3 shows the association of impairment/disturbance in motor coordination with weight status and roles played in bullying for Portuguese participants. According to the results of the initial analysis, an association was observed between impairment/disturbance in motor coordination and all independent variables. Similarly, to the previous analysis for the Brazilian participants, in the adjusted analysis all variables remained associated with the outcome. Those who were overweight and obese had 2.61 (95%CI 1.51–4.54) and 4.77 (95%CI 2.62–8.66) greater odds of having impairment/disturbance in motor coordination than those who were underweight/eutrophic, respectively. In addition,

Table 1. General characteristics of Portuguese and Brazilian participants.

Variable	Total	Portugal	Brazil	*p-value***
	n (%)	n (%)	n (%)	
Sex				
Boys	387 (48.5)	192 (49.0)	195 (48.0)	*0.422*
Girls	411 (51.5)	200 (51.0)	211 (52.0)	
Age group				
7-9	339 (42.9)	161 (41.1)	178 (44.7)	*0.579*
10-11	364 (46.1)	187 (47.7)	177 (44.5)	
12-14	87 (11.0)	44 (11.2)	43 (10.8)	
School system				
Public	584 (73.1)	308 (78.6)	276 (67.8)	*< 0.001*
Private	215 (26.9)	84 (21.4)	131 (32.2)	
Weight status				
Underweight / Eutrophic	344 (44.1)	141 (37.2)	203 (50.5)	*0.001*
Overweight	222 (28.4)	126 (33.2)	96 (24.0)	
Obese	215 (27.5)	112 (29.6)	103 (25.5)	
Bullying				
Do not participate	470 (59.9)	225 (57.7)	252 (62.0)	*0.208*
Victim	122 (15.5)	58 (14.9)	64 (16.2)	
Bully	85 (10.8)	52 (13.3)	33 (8.4)	
Bully-victim	108 (13.8)	55 (14.1)	53 (13.4)	
Motor competence				
Impairment/disturbance in coordination	424 (54.0)	228 (58.5)	196 (49.6)	*0.008*
Normal/good/very good motor coordination	361 (46.0)	162 (41.5)	199 (50.4)	

n: number of participants; **Chi-squared.

Table 2. Odds ratios using impairment/disturbance in coordination as the dependent variable for Brazilian participants.

Variable	OR (95%CI)	*p-value*	OR** (95%CI)	*p-value*
Weight status				
Underweight/Eutrophic	1	< 0.001	1	< 0.001
Overweight	1.17 (0.71–1.91)		1.04 (0.61–1.80)	
Obese	4.64 (2.74–7.87)		5.53 (3.06–9.99)	
Bullying				
Do not participate	1	0.078	1	0.072
Victim	1.90 (1.07–3.36)		2.08 (1.12–3.86)	
Bully	0.69 (0.33–1.45)		0.80 (1.10–0.48)	
Bully-victim	1.07 (0.60–1.94)		0.10 (1.78–0.89)	

OR: *odds ratio*; 95%CI: 95% confidence interval; **OR adjusted for variables that presented $p< 0.20$ in the gross model; ***Adjustment quality: $X^2= 5.828$; $p= 0.39$. Adjusted for all variables, plus sex and age group.

Table 3. Odds ratios using impairment/disturbance in coordination as the dependent variable for Portuguese participants.

Variable	OR (95%CI)	*p-value*	OR** (95%CI)	*p-value*
Weight status				
Underweight/Eutrophic	1	*< 0.001*	1	*< 0.001*
Overweight	2.33 (1.42–3.82)		2.61 (1.51–4.54)	
Obese	4.16 (2.42–7.17)		4.77 (2.62–8.66)	
Bullying				
Do not participate	1	*< 0.001*	1	*0.002*
Victim	2.56 (1.28–5.14)		2.35 (1.11–4.95)	
Bully	0.35 (0.18–0.67)		0.38 (0.19–0.77)	
Bully-victim	0.80 (0.44–1.46)		0.77 (0.40–1.50)	

OR: *odds ratio*; 95%CI: 95% confidence interval; **OR adjusted for variables that presented $p< 0.20$ in the gross model; ***Adjustment quality: $X^2= 5.828$; p =0.999. Adjusted for all variables, plus sex and age group.

bullying victims had an odds ratio that indicated they were 2.35 (95%CI 1.11–4.95) times more likely to have impairment/disturbance in motor coordination than those who did not participate in bullying. In contrast, participants who were bullies were 0.38 (95%CI 0.19–0.77) times less likely to have impairment/disturbance in motor coordination compared to those who did not participate in bullying.

DISCUSSION

This study sought to compare the prevalence of motor competence with weight status and bullying roles in children and adolescents from two metropolitan cities, one in Portugal and one in Brazil. The main findings of this study highlight the high prevalence of participants with impairment/disturbance in motor coordination, mainly in Portugal, and the associations between this variable and weight status and bullying roles were confirmed.

The high prevalence of participants with motor competence below the expected level for sex and age, although troubling, should be interpreted with caution. Even though the KTK test battery is widely used worldwide, several studies have found that, in general, the MQ values found are lower than the reference values of the original test with German children. This has been verified in studies conducted in Portugal (Lopes, Stodden, & Rodrigues, 2014; Antunes et al., 2015), Brazil (Brasil et al., 2015; Cunha, Macedo, Pereira, Nunes, & Lima, 2015; Medeiros et al., 2016; Medeiros et al., 2018), and also in other countries such as Belgium (Bardid, Rudd, Lenoir, Polman, & Barnett, 2015) and Australia (Bardid et al., 2015).

Researchers provide some explanation for such results, including the question of the impact of cultural differences between countries (Bardid et al., 2015; Magalhães, Cardoso, Guimarães, & Van Petten, 2015; D'Hondt, Venetsanou, Kambas, & Lenoir, 2019). Also, another issue that has been highlighted in the literature is the reduction in physical activity and the increase in overweight and obesity among children and adolescents in the society in question (Lopes et al., 2014; Bardid et al., 2015). As such, these behaviors may be

worsening the motor competence, so that the current normative data might be lower than those data observed about 40 years ago, when the test was created.

Regarding the students' general characteristics, our findings showed that the Portuguese participants had poorer motor competence when compared to the Brazilian participants. In part, this may reflect the daily life of Portuguese children in terms of time and space for play and physical activity. In a cross-cultural study conducted in 16 countries to assess children's mobility (Shaw et al., 2015), in which Brazil and Portugal were part, Brazil occupied the 11th place, while Portugal was only the 14th. Brazilian children reported going to school more often on foot or by bike than the Portuguese children. The problems related to this issue have already been strongly highlighted in the literature regarding the problems related to physical inactivity and obesity in Portugal, reported as one of the countries with the highest obesity rates in Europe (V. P. Lopes, Stodden, Bianchi, Maia, & Rodrigues, 2012).

With regard to the relationship between motor competence and weight status, the results were in line with those presented in the literature. Generally, researchers have found that, regardless of sex, children and adolescents who are overweight or obese tend to have lower levels of motor competence when compared to eutrophic peers (Lopes et al., 2014; Bardid et al., 2015; Chaves et al., 2015). Because it is a cross-cultural study, these results not only reinforce this issue, but also point out that this relationship also seems to be independent of issues related to the context in which children and adolescents are inserted.

Finally, there was association with the roles played in school bullying and impairment/disturbance in motor coordination. These data confirm the hypotheses of previous studies in which the victims were more likely, while bullies were less likely, to have poor motor competence. Many studies have shown that victims who have been characterized as students with poor motor competence, or underdeveloped motor coordination, and who have poor performance in sports, are more likely to be excluded from the fun and games in schoolyards and in physical education (Campbell et al., 2012; Del Prette & Del Prette, 2017; Martínez-Baena & Faus-Boscá, 2018). Children with poor motor skills often exhibit atypical physical characteristics which can be seen as differences and weaknesses, being perceived by peers as a social disability or strangeness. This is likely to reduce sympathy and compassion, and, consequently, increases the risk of the child becoming a bullying victim (Plenty, Bejerot, & Eriksson, 2014; Vianna, Souza, & Reis, 2015).

However, poor motor competence is not necessarily a cause of victimization, as children with poor motor skills also tend to have poor social skills, and these may be more important in understanding the bullying roles than the actual poor motor competence (Bejerot et al., 2013). It is likely however, that these factors are inextricably linked, because from the perspective of the Bioecological Theory of Human Development (Bronfenbrenner, 2011) it is possible to understand bullying as a systemic and relational phenomenon that influences and is influenced by imbricated and interdependent ecological systems. The studies by Bronfenbrenner (2011) highlight the importance of interpersonal relationships in the process of human development. He emphasizes the merit of relationships between people as a way of establishing reciprocal relationships and for training, as the development process of one of the individuals contributes to the process of the other, reinforcing the bonds of healthy coexistence between students, in the case of the environment in question, the school (Monteiro & Asinelii-Luz, 2020). The people with whom the child interacts play an important role in shaping the structures of proximal processes, which favor the development of interpersonal relationships (Monteiro & Asinelii-Luz, 2020).

Although the relationship between being an aggressor and being less likely to have weak motor competence has been found only for Portuguese participants, many studies have also indicated that bullies constitute the group of children and adolescents who present better motor competence and, consequently, also have advantages in certain games, sports and fight (Piek, Barrett, Allen, Jones, & Louise, 2010; Levandoski & Cardoso, 2013; Martínez-Baena & Faus-Boscá, 2018). In addition, good motor skills may be characteristics of the aggressors, both by increasing their popularity among peers and by giving greater physical qualities to intimidate other peers, especially in the early grades (Jansen, Veenstra, Ormel, Verhulst, & Reijneveld, 2011; Cascales & Prieto, 2019). However, this relationship seems to be more fluctuating depending on the context in which children and adolescents are inserted, since this result was not found in Brazilian participants.

One limitation of this study is that there is still no validation of the KTK battery for the Portuguese and Brazilian populations, although its use and importance are highlighted in the assessment of overall motor coordination in children and adolescents (Ribeiro, David, Barbacena, Rodrigues, & França, 2012). Although the KTK battery is used worldwide, it evaluates only German motor skills tested in the 1970s. It is suggested that for future studies other validated test batteries be used, ones that evaluate fine motor skills.

Another limitation is the cross-sectional design of the study, which prevents inferences about the direction of the identified relationships, not allowing the establishment of causal relations. Future research may adopt a longitudinal design, enabling the tracking of changes over time, in order to identify the effects exerted by the impairment/disturbance in the motor coordination on BMI status and involvement in bullying situations, thus identifying cause and effect relationships.

The third limitation concerns the absence of data regarding the socioeconomic status of students. Although we have collected data from samples of public and private schools equivalent to the respective number of students enrolled in education level in both cities investigated, the absence of the socioeconomic status can further restrict reflections on the results found.

It is important that further studies aim to address these limitations so that they can clarify these relationships between motor competence and other study variables. More precise data can improve our understanding of motor competence of children and adolescents and contribute to the prevention and reduction of bullying in schools in different countries. However, the results of this study provide relevant information indicating that poor motor competence can be a common characteristic of bullying victims, indicating that, regardless of cause and effect relationships, this seems to be a typical characteristic of children and adolescents who play this kind of role in bullying, regardless of the country of origin.

The results presented provide relevant information regarding the motor competence of students in different countries, indicating that low motor competence seems to be a global problem among children and adolescents. The data indicate that this variable is not dissociated from the social context in which children and adolescents live, as well as reinforce data already present in the literature concerning the relationship between this variable and weight status.

This study also provides evidence that motor competence, based on a real measure (motor test battery), is associated with the different roles played in school bullying. However, further research is needed and recommended to determine if these characteristics extend to other countries. The data found in this research are very relevant to all teachers, but especially to physical education teachers, as by having information about students' motor competence, they can not only identify students who may be involved in school bullying, but also take measures to prevent and reduce this type of violence.

Therefore, physical education classes can be directed towards a greater inclusion of bullying victims in games and sports, contributing to improved motor competence and, consequently, social skills, making them more accepted by peers, reducing situations of victimization. In the same sense, strongly emphasizing the better motor competence of the aggressors to the detriment of less skilled students should be avoided. Students with better motor competence should be instructed to use their skills in an assertive manner, sharing experiences and contributing to the inclusion of all peers during class and playtime. However, further research is needed and recommended to determine if these characteristics extend to other countries.

CONCLUSION

The main findings of this study highlight factors such as the high prevalence of participants with impairment/disturbance in motor competence in both countries, although greater in Portugal, and the association between motor competence and the odds of being overweight or obese and the odds of being a victim of bullying was found in Brazil and in Portugal, while the relationship between being a bully and being less likely to have weak motor competence was found only for Portuguese participants.

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