apunts EDUCACIÓN FÍSICA Y DEPORTES

ISSUE 141

Published 01 July 2020
https://doi.org/10.5672/apunts.2014-0983.es.(2020/3).141.03

OPEN ACCESS

Motor Skills Competence in Preschool Education

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Cite this article:
García-Marín, P., & Fernández-López, N. (2020). Motor Skills Competence in Preschool Education. *Apunts. Educación Física y Deportes*, *141*, 21-32. https://doi.org/10.5672/apunts.2014-0983.es.(2020/3).141.03

Editor:

ISSN: 2014-0983

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Section:
Educación física

Original language:
Spanish

Received:
12 November 2019

Accepted:
23 March 2020

Published:
1 July 2020

Cover:
New Olympic Sports for Tokyo 2020. Surf. Photo: Gabriel Medina (BRA) riding a wave at Supertubes beach 2018 WSL Champsionship held in Peniche, Portugal. REUTERS / Pedro Nunes.

Abstract

The purpose of this study was to analyse competence in fundamental motor skills of Galician preschoolers. A descriptive ex-post facto design was used. The sample was composed of 80 participants (68.2±4.0 months) from three Galician state schools. Motor skills were evaluated with the Test of Gross Motor Development, 2nd edition (TGMD-2). The scores achieved were 93.3±13.1 (percentile 37.3±25.9) in gross motor coefficient, 9.2±2.3 (percentile 41.7±23.5) in the locomotor skills subtest and 8.6±2.5 (percentile 36.1±24.7) in the object control skills subtest. In the comparisons by gender, differences were found in striking (male = 6.3±2.0; female = 4.9±2.2; p = .004) and dribbling (male = 4.3±1.8; female = 2.9±2.3; p = .003). The qualitative analysis was used to identify the performance criteria which the preschoolers in the sample found most difficult to master. In locomotor skills, the worst performance was in bending the non-support leg in running. In object control skills it was the position of the hands when gripping the bat. In conclusion, preschoolers' competence in fundamental motor skills needs to be improved by optimising teaching-learning processes.

Keywords: motor development, preschoolers, gender, assessment, TGMD.

Introduction

Fundamental motor skills are regarded as the basic vocabulary of motor development, the building blocks of the most complex and specialised motor responses (Gallahue et al., 2011). They also allow us to rise successfully to the motor challenges of daily life and adapt to the features of a changing environment (Castañer et al., 2012). Gallahue et al. (2011) classify them into locomotor, object control and balance. Their development takes place in tandem with the maturation of the brain between the ages of four and ten (Malina et al., 2004), although if the right stimuli are received, good levels of competence can be achieved from the age of six (Gallahue et al., 2011).

Learning and developing motor skills is positively influenced by a wide variety of biological, psychosocial and environmental factors, which include: teacher training and proficiency (Adamo et al., 2016); the characteristics of the setting and facility (Barnett et al., 2013; Castañer et al., 2012); the level of motor coordination (Sánchez-Lastra et al., 2019); effective laterality based on contralateral synergy, i.e. when the non-dominant limb provides postural support to help the dominant limb achieve gestural precision (Castañer et al., 2012; Castañer et al., 2018); and competence as perceived by the actual children (LeGear et al., 2012). However, much of the research has focused on assessing the impact of specific programmes on motor competence in motor skills (Bardid et al., 2017; Robinson et al., 2016; Veldman et al., 2017).

The significance of achieving good motor development in childhood lies in its potential positive impact on other human dimensions (biological, cognitive, affective, social and psychological). Thus, associations have been found between motor skills and reading and writing (Callcott et al., 2015) or the ability to control attention, emotions and impulses (Robinson et al., 2016). Becker et al. (2014) believe that these benefits might have a positive influence on academic performance in primary school. Consequently, the number of studies quantifying physical activity derived from motor skills has increased (Adamo et al., 2016; Foweather et al., 2015).

The assessment of motor skills can be geared towards the quantitative or qualitative performance of motor execution. In the qualitative form, a series of motor pattern indicators are assessed in order to identify the degree of maturity of each skill (Hardy et al., 2010). Subsequently, motor activities more specifically based on the needs of the students and the indicators which they have not yet mastered can be programmed (Foulkes et al., 2015). One of the most widely used instruments in qualitative assessment is the Test of Gross Motor Development, 2nd edition (TGMD-2) (Ulrich, 2000).

Results from previous studies using the TGMD-2 found poor values in the gross motor coefficient of 267 Canadian preschoolers (5±.9 years) (LeGear et al., 2012) and 284 Brazilian preschoolers (3-6 years) (Spessato et al., 2012). In other studies with samples of 168 English preschoolers (4.65±.58) (Foulkes et al., 2015), 425 Australian preschoolers (4 years) (Hardy et al., 2010), and 339 U.S. preschoolers (3-5 years) (Kit et al., 2017), scores for locomotor skills were higher than for object control skills.

Studies comparing female and male preschoolers found no differences in gross motor coefficient (Foulkes et al., 2015; Hardy et al., 2010). The same result was obtained with a sample of 71 Europeans (5.58±, 5-6 years) (Stock et al., 2014). By contrast, in Cliff et al. (2009), female preschoolers scored higher in a sample of 46 Australians (3-5 years).

When the comparison focused on object control skills, most male preschoolers demonstrated greater competence (Foulkes et al., 2015; Hardy et al., 2010; Kit et al., 2017; Spessato et al., 2012). The same conclusion was reached with samples of 93 (3-5 years) and 1,123 (5.9±1.6 years) Belgian (Bardid et al., 2013; Bardid et al., 2017), 76 Australian (4.1±.68 years) (Barnett et al., 2013) and 99 English preschoolers (4.6±.5 years) (Foweather et al., 2015). However, in Cliff et al. (2009) female preschoolers scored higher, and Stock et al. (2014) found no gender differences.

In terms of locomotor skills, several studies found no differences by gender (Bardid et al., 2017; Foulkes et al., 2015; Foweather et al., 2015; Spessato et al., 2012). By contrast, female preschoolers performed better in others (Cliff et al., 2009; Hardy et al., 2010; Kit et al., 2017; Stock et al., 2014).

More specifically, competence in running, galloping and hopping was higher in female preschoolers, while it was higher in male preschoolers for striking, kicking, throwing and catching (Foulkes et al., 2015; Hardy et al., 2010).

Only one study was found in Spain which evaluated TGMD-2 motor skills in preschoolers (González et al., 2009) with a sample of 70 Asturians between 4 and 6 years old. Other research either focused on one specific motor skill or assessed different skills. Consequently, in order to improve knowledge of motor competence in children, this study was undertaken with the following objectives: a) to evaluate and compare general and specific (locomotor and object control) competence in the fundamental motor skills of five-year-old Galician preschoolers;

b) to identify the qualitative performance criteria of the motor patterns which are most difficult to master.

Methodology

The research design was ex-post facto descriptive using accidental sampling.

Participants

The sample was comprised of 80 participants, 34 female (69.5±4.1 months; 21.9±3.2 kg; 117.1±3.03 cm; 15.9±1.7 kg · m-2) and 46 male (68.9±3.9 months; 23.3±3.5 kg; 118.5±3.06 cm; 16.5±1.9 kg · m-^{2}).

The inclusion criteria were: a) be aged between 60 and 71 months; b) be in the last year of preschool stage; and c) be healthy and not have been diagnosed with physical or intellectual disability prior to the research. Any participants who did not complete all the trials in the TGMD-2 were excluded.

The sample was obtained from three state preschools in Galicia in towns with more than 90,000 inhabitants. Based on Galician Statistics Institute figures, the educational level of family members resident in the schools' catchment areas was as follows: university (15.9%), secondary and/or vocational training (34.0%), primary (19.0%) and no studies (31.1%). In financial terms, according to the Institute the monthly income per family unit was: up to €1,000 (18.6%); from €1,001 to €2,000 (31.6%); from €2,001 to €3,000 (25.1%); more than €3,001 (24.7%). The schools' education plans showed that less than 5% of all the students enrolled came from abroad.

The research team interviewed the teachers at each school to learn about the conditions in which the participants' motor education was conducted. In two of the schools, the preschool teachers themselves were in charge of motor activities, while in the other school it was the primary school physical education specialist. The specific time devoted to motor development was one lesson of between 45 and 60 minutes a week. These lessons were mainly geared towards developing perceptive motor abilities and fundamental motor skills. The teaching resources normally used were motor circuits, motor games, traditional games and free play. The number of students per teacher and classroom ranged from 21 to 25. Generally, the lessons were held in indoor sports venues with surface areas ranging from 420 to 730 m^2. Exceptionally, and weather permitting, the sessions were held in the schools' playgrounds (2,100-2,700 m^2).

Instruments

The fundamental motor skills were assessed using the TGMD-2 (Ulrich, 2000). This instrument consists of two subtests, one for six locomotor skills (Figure 1) and the other for six object control skills (Figure 2).

The material needed to administer the test consists of two cones, a 12-cm bag, a batting tee, a 10-cm softball, a baseball bat, a 20-cm basketball and soccer ball, a 10-cm foam ball, a tennis ball and tape.

The test provides a gross motor coefficient based on the scores achieved in the twelve skills assessed; a score for the locomotor skills, a score for the object control skills and an independent score for each skill. The theoretical age of motor development and the percentiles can also be estimated on the basis of these scores. The reliability of the instrument (Cronbach's α) calculated by Ulrich (2000) for locomotor skills, object control skills and gross motor coefficient was 0.85, 0.88 and 0.91, respectively.

Procedure

The study was conducted in compliance with the rules and ethical principles of the Declaration of Helsinki for research involving human participants. The schools' permission and the informed consent of the participants' legal guardians were also secured.

To guarantee measurement reliability, the two test examiners conducted two training sessions in which they assessed ten preschoolers who were not in the sample but were the same age.

Subsequently, inter- and intra-examiner agreement was calculated with the Kappa coefficient. For this purpose, other schoolchildren were evaluated on two occasions at a two-week interval. The reliability achieved in all the tests was greater than 0.82.

To administer the test, the examiners called the participants in individually. Firstly, they were given a verbal description and a technical demonstration of the skill. Then they were given time to do the test. Each motor skill was evaluated twice in a row. In each attempt, the motor patterns that were performed correctly were given 1 point and the incorrect ones 0 points. All the participants were examined by the two assessors who agreed on the record at the end of each test.

Statistical analysis

The means and standard deviations were calculated for gross motor coefficient, the locomotor skills scale, the object control skills scale, each one of the independent

Figure 1
TGMD-2 locomotor skills.

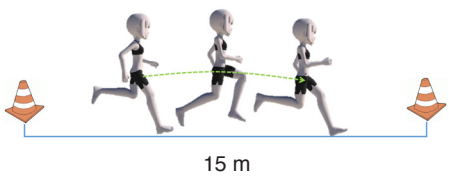
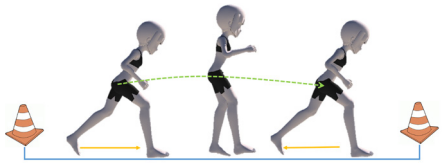
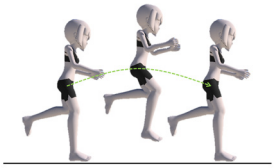
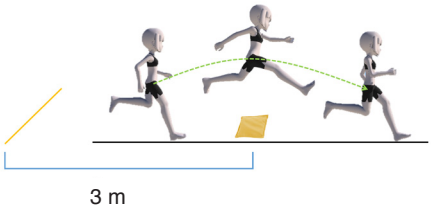
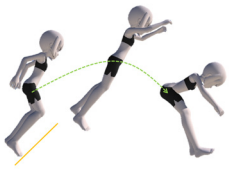
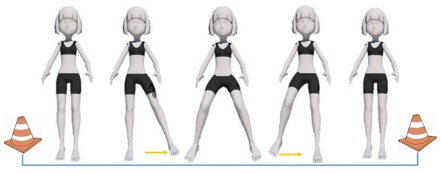
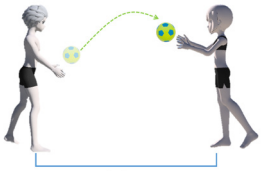
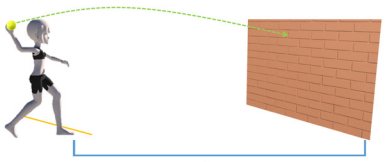
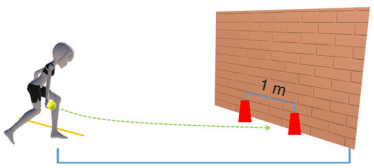
Run as fast as possible over a distance of 15 m marked by two cones.	 15 m	• Arms move in opposition to legs, elbows bent. • Brief period when both feet are off the ground. • Narrow foot placement landing on heel or toe. • Non-support leg bent approximately 90º.
Gallop a distance of 8 m marked by two cones.	 8 m	• Arms bent and lifted to waist level. • A step forward with the lead foot followed by a step with the trailing foot which lands next to or just behind the first one. • Brief period where both feet are off the ground. • Maintain a rhythmic pattern for four consecutive gallops.
Hop three times on the preferred leg and three more on the non-prefe-rred leg.		• The non-support leg swings forward in pendulum fashion to generate force. • The foot of the non-support leg remains behind the body. • Arms are bent and swing forward to generate force. • Take off and land three consecutive times on dominant foot. • Take off and land three consecutive times on non-preferred foot.
Leap over a 12-cm bag with takeoff on one foot and a 3-m run-up.	 3 m	• Take off on one foot and land on the opposite foot. • Period where both feet are off the ground longer than in running. • Forward reach with the arm opposite the lead foot.
Jump horizontally with feet together as far as possible using a line painted on the floor as a guideline.		• Preparatory movement includes bending both knees with arms stretched out behind body. • Arms extended forcefully forward and upward reaching full extension above the head. • Take off and land on both feet simultaneously. • Arms are thrust downward during landing
Slide sideways a distance of 15 m marked by two cones and taking as a guideline a straight line painted on the ground.	 15 m	• Body turned sideways so shoulders are aligned with the line on the floor. • A step sideways with lead foot followed by a slide of the trailing foot until it reaches the lead foot. • At least four continuous step-slides to the right. • At least four continuous step-slides to the left.

Figure 2
TGMD-2 object control skills.

Strike a 10-cm stationary ball at waist height.		• Dominant hand grips bat above non dominant hand. • Non-preferred side of body faces the imaginary thrower with feet parallel. • Hip and shoulder rotation during swing. • Transfer body weight to front foot. • The bat hits the ball.
Dribble a 20-cm ball four times in a row while stationary. Catch the ball with both hands when at the end of bouncing.		• Contact ball with one hand at waist level. • Push ball with fingertips (not a slap). • Ball contacts floor in front of or to the outside of foot on the preferred side. • Maintain control of ball for four consecutive bounces without having to move the feet to retrieve it.
Catch a 10-cm ball with both hands tossed by a person 5 m away. Only tosses between the catcher's shoulders and waist are valid.	 5 m	• In the preparation phase hands are in front of the body and elbows are bent. • Arms extend while reaching for the ball as it arrives. • Ball is caught by hands only.
Run up and kick a 20-cm ball against the wall. The ball is placed 6 m from the wall and the child starts their run-up 3 m from it.	 3 m 6 m	• Rapid continuous approach to the ball. • An elongated stride immediately prior to ball contact. • Non-kicking foot placed even with or slightly behind the ball. • Kicks ball with instep or toe of preferred foot.
Overhand throw a tennis ball as hard as possible against the wall 6 m away.	 6 m	• Windup begins with downward movement of hand and arm. • Rotate hip and shoulders to a point where the non-throwing side is facing the wall. • Weight is transferred by stepping with the foot opposite the throwing hand. • Follow-through beyond ball release diagonally across the body toward the non-preferred side.
Underhand roll a tennis ball as hard as possible against the wall 6 m away and sending the ball between two cones that are 1 m apart.	 1 m 6 m	• Preferred hand swings down and back, reaching behind the trunk while the chest faces the cones. • Stride forward with foot opposite the preferred hand toward the cones. • Bend knees to lower body. • Release ball close to the floor so ball does not bounce more than 10 cm high

motor skills and performance criteria. A comparative analysis by gender was conducted. The analysis of variance (ANOVA) was used for the quantitative variables which met the assumption of normality with the Kolmogorov-Smirnov test and the Mann–Whitney U test was used for those that did not. The Chi-square test was applied in the performance criteria and the intensity of the association was estimated by means of Cramér's V. The performance criteria most difficult to master were identified by choosing the ones yielding a competence percentage of less than 10% with respect to Ulrich (2000). The significance level in all the tests was $p \leq .05$. The entire analysis was performed with the SPSS software package, version 20.0 (SPSS Inc., Chicago, IL, USA).

Results

The gross motor coefficient achieved by the participants was 93.3±13.1 (37.3±25.9 percentile). No difference was found between the two genders (female = 92.6±11.6; percentile 35.1±24.3; male = 93.7±14.2; percentile 38.9±27.2; $F_{1.78} = .148$; $p = .701$). Figure 3 shows the levels of motor development achieved following Ulrich's reference values (2000). The percentage of preschoolers who did not reach the average equivalent to their age was 37.5% (female: 39.1%; male: 35.3%).

The score achieved in the locomotor skills subtest was 9.2±2.3 (percentile 41.7±23.5) and in the object control skills subtest 8.6±2.5 (percentile 36.1±24.7). No differences by gender were found in the locomotor skills subtest (female: 8.9±1.7; percentile 37.4±19.1; male: 9.4±2.7; percentile 44.8±26.0; F1.78: .926; p: .339) or in the object control skills subtest (female: 8.6±2.7; percentile 37.8±25.7; male: 8.5±2.4; percentile 34.8±24.2; $F_{1.78,}$ 050; p: .824).

Male preschoolers had significantly higher locomotor skill scores than in object control (t: 3,196; df: 45; p: .003). In female preschoolers, no differences were found between the two subtests (t: .635; df: 33; p: .530).

Of all the motor skills analysed, significant differences were only found by gender in striking (female: 4.9±2.2; male: 6.3±2.0; $F_{1.78}$: 8.718; p: .004) and dribbling (female: 2.9±2.3; male: 4.3±1.8; Z: -2.931; p: .003) (Table 1).

The percentages of preschoolers who demonstrated competence in the performance criteria for locomotor and object control skills are shown in Tables 2 and 3, together with differences by gender.

Figure 3.
GMS development levels for each gender

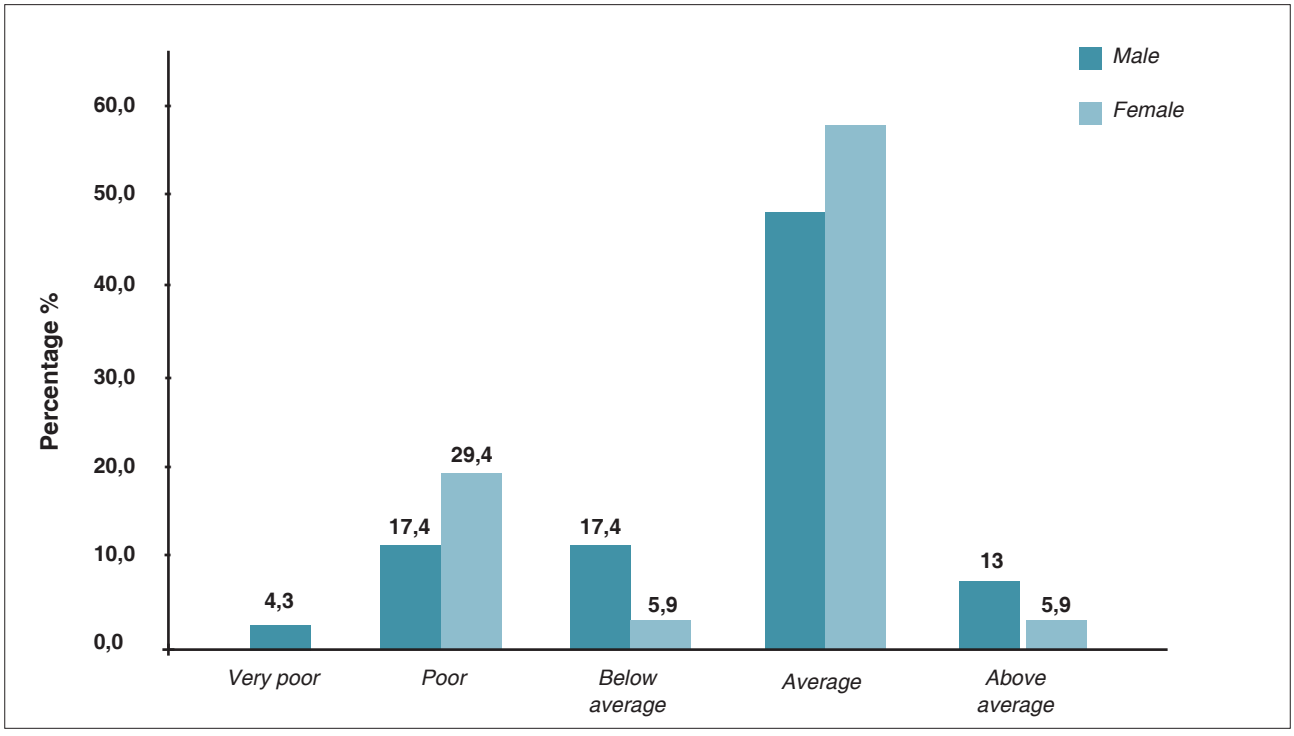


Table 1
Comparison of non-standardised motor skills scores by gender.

Scale	Motor skill	Male	Female	Z	F	*p*
Locomotor s.	Run	5,6±1,9	5,6±2,1	-,059	-	,953
	Gallop	6,2±1,1	5,9±1,5	-,514	-	,608
	Hop	5,9±2,1	5,9±1,7	-,416	-	,677
	Leap	4,0±1,7	3,9±1,3	-,539	-	,590
	Horizontal jump	5,3±1,7	4,8±1,6		1,714	,194
	Slide	6,4±2,0	6,8±1,2	-,203	-	,839
Object control s.	Striking a stationary ball	6,3±2,0	4,9±2,2	-	8,718	,004*
	Stationary dribble	4,3±1,8	2,9±2,3	-2,931	-	,003*
	Catch	4,1±1,3	4,5±1,4	-	1,245	,268
	Kick	5,3±1,8	4,7±1,4	-	2,567	,113
	Overhand throw	3,9±1,5	4,3±2,0	-	,928	,338
	Underhand roll	5,3±1,6	4,9±1,5	-	1,398	,241

** Significant differences p ≤ ,05.*

Discussion

The gross motor coefficient achieved by the participants in this study was low, consistent with LeGear et al. (2012) and Spessato et al. (2012), and 37.5% of the preschoolers evaluated did not achieve age-appropriate theoretical motor development.

The poor performance of the sample might be explained by several factors. Firstly, the preschools analysed spent devoted one 45-60-minute lesson per week to motor classes. Considering the impact of engaging in physical activity on motor skill competence (Adamo et al., 2016), it might be questioned whether such a weekly frequency and time would be sufficient to produce good motor development. Indeed, despite the importance of motor skills in preschoolers, the legislation on preschool education does not specify the number of hours and lessons which should be dedicated to this subject area. As a result, each school decides for itself and there is no guarantee that there will be sufficient minimum provision to promote their students' motor skills.

The second reason could be to do with the teachers who taught the motor skills lessons. This is because in one case they were led by the primary school physical education specialist with no training in the preschool stage and in the other two by preschool education graduates. Since the level of achievement of motor skills in preschoolers is influenced by teacher proficiency (Adamo et al., 2016; Stock et al., 2014), it would be more appropriate for the classes to be led by preschool teachers with extensive specialised training in motor skills. Therefore, the importance of training in motivational teaching methodologies and strategies should be underscored. Previous studies have shown that teachers' ability to implement personal responsibility and autonomy strategies has a positive impact on students' participation, effort, commitment and leadership by improving their decision-making capacity and promoting a constructive view of a more active lifestyle (Camerino et al., 2019; Prat et al., 2019).

Another possible explanation might be the over-use of free play during lessons. Preschoolers are known to use skills such as running and some types of jumping in this type of play quite often. However, others such as dribbling a ball, galloping and sliding sideways are not part of their regular play. Accordingly, the predecessors of this study found better results in motor competence when the activities were supervised by a specialist who diversified skill performance (Bardid et al., 2013; Bardid et al., 2017; Robinson et al., 2016; Stock et al., 2014; Veldman et al., 2017).

The high number of students in the class and the relationship between the performance area and the student-teacher ratio should be added to the above reasons. True et al. (2017) argue that the number of preschoolers in a 3-5 year-old class should not exceed 12. In addition, the recommended student-teacher ratio would be 8:1, while the optimal area for motor performance would be 13 m2 per student indoors and 23 m2 per student outdoors. Based on these reference values, it follows that the space available to the preschoolers in the sample (16.4 m2 per student in the worst case of indoor space) was more than sufficient. However, in all the preschools, the maximum

Table 2
Percentage of male and female preschoolers demonstrating competence in performance criteria for locomotor skills, chi-square value and Cramer's V.

LS performance criteria	Male	Female	Total	Dif.	X^2	*p*	*V*
Running (R)							
1. Arms move in opposition to legs, elbows bent	52,2	35,3	45,0	28,0	2,251	,134	
2. Brief period when both feet are off the ground	87,0	88,2			,029	,864	
3. Narrow foot placement landing on heel or toe (not on the whole area of the sole)	60,9	70,6	65,0	28,0	,812	,368	
4. Non-support leg bent approximately 90º (e.g. near the buttocks)	34,8	47,1	40,0	42,0	1,228	,268	
Galloping (G)							
1. Arms bent and lifted to waist level	17,4	23,5	20,0	12,0	,460	,497	
2. A step forward with the lead foot followed by a step with the trailing foot which lands next to or just behind the first one	100	94,1			2,775	,096	
3. Brief period when both feet are off the ground	91,3	76,5			3,374	,066	
4. Maintain a rhythmic pattern for four consecutive gallops	82,6	70,6			1,620	,203	
Hopping (H)							
1. The non-support leg swings forward in pendulum fashion to generate force	13,0	17,6	15,0	39,0	,325	,569	
2. The foot of the non-support leg remains behind the body	47,8	17,6	35,0	26,0	7,827	,005	,313
3. Arms are bent and swing forward to generate force	26,1	41,2	32,5	17,5	2,029	,154	
4. Take off and land three consecutive times on preferred foot	82,6	82,4			,001	,976	
5. Take off and land on three consecutive times on non-preferred foot	69,6	64,7			,210	,646	
Leap over an object with run-up (L)							
1. Take off on one foot and land on the opposite foot	47,8	58,8			,948	,330	
2. Period when both feet are off the ground longer than in running	73,9	76,5			,068	,794	
3. Forward reach with the arm opposite the lead foot	39,1	23,5			2,169	,141	
Horizontal jump from standing start (HJ)							
1. Preparatory movement includes bending both knees with arms stretched out behind body	56,5	35,3			3,533	,060	
2. Arms extended forcefully forward and upward reaching full extension above the head	56,5	41,2			1,841	,175	
3. Take off and land on both feet simultaneously	43,5	41,2	42,5	31,5	,042	,837	
4. Arms are thrust downward during landing	52,2	47,1			,205	,651	
Slide sideways (S)							
1. Body turned sideways so shoulders are aligned with the line on the floor	65,2	52,9			1,228	,268	
2. A step sideways with lead foot followed by a slide of the trailing foot until it reaches the lead foot	78,3	88,2			1,347	,246	
3. At least four continuous step-slides to the right	73,9	82,4			,799	,372	
4. At least four continuous step-slides to the left	60,9	70,6			,812	,368	

Diff.: Difference with Ulrich (2000) in the percentage of participants demonstrating competence.

Table 3
Percentage of male and female preschoolers demonstrating competence in performance criteria for object control skills, chi-square value and Cramer's V.

OCS performance criteria	Male	Female	Total	Dif.	X^2	*p*	*V*
Striking (ST)							
1. Dominant hand grips bat above non-preferred hand	39,1	17,6	30,0	50,0	4,297	,038	,232
2. Non-preferred side of body faces the imaginary thrower with feet parallel	34,8	23,5	30,0	29,0	1,179	,278	
3. Hip and shoulder rotation during swing	73,9	41,2			8,730	,003	,330
4. Transfers body weight to front foot	47,8	23,5			4,924	,026	,248
5. The bat hits the ball	39,1	35,3	37,5	25,5	,123	,726	
Stationary dribble (SD)							
1. Contacts ball with one hand at waist level	52,2	35,3			2,251	,134	
2. Pushes ball with fingertips (not a slap)	23,1	17,6			,799	,372	
3. Ball contacts floor in front of or to the outside of foot on the preferred side	47,8	23,5	37,5	25,5	4,924	,026	,248
4. Maintains control of ball for four consecutive bounces without having to move the feet to retrieve it	21,7	23,5	22,5	10,5	,036	,850	
Catching (C)							
1. In the preparation phase hands are in front of the body and elbows are bent	56,5	64,7	60,0	23,0	,546	,460	
2. Arms extend while reaching for the ball as it arrives	60,9	76,5			2,169	,141	
3. Ball is caught by hands only	47,8	41,2			,349	,555	
Kicking (K)							
1. Rapid continuous approach to the ball	73,9	47,1	62,5	14,5	6,015	,014	,274
2. An elongated stride immediately prior to ball contact	43,5	23,5			3,420	,064	
3. Non-kicking foot placed even with or slightly behind the ball	34,8	47,1	40,0	47,0	1,228	,268	
4. Kick ball with instep or toe of preferred foot	60,9	41,2	52,5	31,5	3,040	,081	
Overhand throw (OT)							
1. Windup begins with downward movement of hand and arm	30,4	29,4			,010	,921	
2. Rotate hip and shoulders to a point where the non-throwing side is facing the wall	30,4	17,6			1,705	,192	
3. Weight is transferred by stepping with the foot opposite the throwing hand	43,5	70,6			5,805	,016	,269
4. Follow-through beyond ball release diagonally across the body toward the non-preferred side	21,7	41,2	30	23	3,517	,061	
Underhand roll (UR)							
1. Preferred hand swings down and back, reaching behind the trunk while the chest faces the cones	43,5	41,2	42,5	15,5	,042	,837	
2. Stride forward with foot opposite the preferred hand toward the cones	52,2	29,4			4,145	,042	,228
3. Bend knees to lower body	82,6	76,5			,460	,497	
4. Release ball close to the floor so ball does not bounce more than 10 cm high	43,5	52,9			,702	,402	

Diff: Difference with Ulrich (2000) in the percentage of participants demonstrating competence.

number of students per class and the student-teacher ratio were far exceeded, thereby affecting quality of practice.

The findings of this study are consistent with others which found no differences in gross motor coefficient by gender (Foulkes et al., 2015; Hardy et al., 2010; Stock et al., 2014). It therefore coincides with Foulkes et al. (2015) and Hardy et al. (2010) who ascribe these data to the similarity in physical and physiological characteristics of both genders at these ages.

As in Stock et al. (2014), no gender differences were found in the analysis of the locomotor and object control skills subtests. However, as in other studies, a comparison of each motor skill independently showed a greater proficiency of male preschoolers in striking and dribbling (Foulkes et al., 2015; Hardy et al., 2010). Furthermore, the analysis of the performance criteria revealed that all the differences were in object control skills. Thus, the percentage of male preschoolers demonstrating competence was higher for almost all performance criteria except for weight transfer in throwing. In locomotor skills, the only difference was in the non-support leg position in hopping.

The main reason accounting for the differences in object control skills based on gender is linked to the specificity of the stimuli and participation in activities which stimulate one type of skill or another. Thus, Kit et al. (2017) explained the better performance of male preschoolers by their greater engagement in activities that involve the use of balls, such as football or basketball. Meanwhile, Barnett et al. (2013) found an inverse relationship between the level of competence in object control skills and participation in dance classes, an activity with greater involvement of female preschoolers. In addition, Bardid et al. (2017) noted that male preschoolers received more feedback and technical corrections during object control skills, thus helping them to progress in mastering these skills. In this paper, the sports played and the type of feedback received by the students were not known, which is a limitation that means the above arguments cannot be discussed and will have to be addressed in future research.

The qualitative evaluation using the TGMD-2 made it possible to identify the performance criteria which the preschoolers analysed found most difficult to master. To improve their competence in locomotor skills, activities should be directed toward arm-leg coordination to generate more force in running and jumping (hopping and horizontally). In running, they would also need increased hip joint mobility when in the air and also landing on the heel or toe. In galloping, the only factor to be improved would be arm position. In hopping, the action of the non-support leg should be improved by swinging it forward to increase the force exerted on the other one. Finally, in horizontal jumps, leg coordination exercises should be addressed to land on both feet at the same time.

With regard to object control skills, it was found that participants would need to strengthen their perceptual-motor skills to better coordinate their movements with the objects in striking, dribbling and kicking. An immature pattern was also identified in the preparation positions in striking, catching, kicking and underhand rolling, and several points in these actions revealed shortcomings in the movements and positions which allow the skill to be executed with balance.

By identifying the performance criteria that have not yet been mastered, teaching and learning processes can be planned to meet students' specific needs. In order to improve the participants' level of motor skills, it is recommended to expand the teaching resources used in the sessions by introducing short motor activities, motor stories, motor songs and learning environments. All these resources make it possible to encourage varied experimentation with motor skills in a recreational and global way, thereby linking motor development to the three curricular areas (1. Self-knowledge and personal autonomy; 2. Knowledge & Understanding of the World, and 3. Languages: communication and representation). Similarly, motor stimulation through the use of interactive technological environments with immersive experiences which simulate different feelings of presence (exergames) is an innovative and effective resource that can be used to develop fundamental motor skills (Castañer et al., 2011).

Conclusions

The analysis of fundamental motor skills competence evinced a poor level of performance by the preschoolers in the sample analysed. Given the benefits of a good level of motor development for perceptual, cognitive, psychological, affective and social skills, as well as its impact on academic performance, it would be advisable to expand practice opportunities in preschools. To this end, the guidelines below should be followed:

- Activities should be led by preschool teachers with extensive training in body expression teaching and the ability to introduce active and innovative methodologies and motivating teaching strategies.
- The specificity of the stimuli in motor competence calls for the introduction of both locomotor and object control skills in teaching approaches while bearing in mind that object control skills are more complex.

• When the intention is to improve competence in fundamental motor skills, organised activities should predominate over free play. This does not mean that free play should be excluded from lessons, since it can be very helpful, for example, in fostering motor creativity.
• Feedback and communication from teachers to students should enhance their motivation and facilitate the progression of their motor skills, regardless of gender and type of activity.
• Addressing students' needs calls for a qualitative assessment of the state of their fundamental motor skills development.
• Education legislation should be updated and specify a sufficient length of time to ensure motor development in preschools. It would also be advisable to reduce the student-teacher ratio.

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Conflict of Interests: No conflict of interest was reported by the authors.