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EVALUATING BASIC MOTOR COMPETENCE IN ITALIAN CHILDREN POST-COVID-19 PANDEMIC: IMPLICATIONS FOR MOTOR DEVELOPMENT

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ABSTRACT

Motor competence assessment represents one of the most important topics in the field of motor development and physical education. The present cross-sectional study aims to assess basic motor competence, self-perception and enjoyment during physical activity (PA) in a sample of normal weight, and overweight or obese children post-COVID-19 pandemic. The participants (N = 107, age = 8-9 years old) were recruited from an experimental project conducted in Lecce (Italy). The motor competence assessment was undertaken using MOBAK 3-4 protocol, and self-perception and enjoyment were evaluated with two validated questionnaires. A multivariate analysis of variance (MANOVA) was performed to assess the effect of gender and BMI on the variables considered. Despite the MANOVA results indicating no significant interaction effects between variables, a significant main effect was found for gender [$F(10,93) = 2.353$, $p = .013$, $\eta^2 = 0,218$] and BMI cutoff [$F(10,93) = 2.351$, $p = .013$, $\eta^2 = 0,218$]. Moreover, an independent t-test highlighted significant differences in catching, dribbling, balancing and object movement according to gender ($p < .05$), and in balancing, rolling and self-movement according to BMI cutoff ($p < .05$). Self-efficacy differed significantly between males and females, while no significant effect was found for enjoyment. Further

studies should investigate the effect of BMI and factors related to physical activity on motor competence development.

***Keywords**: basic motor competence, motor development, self-efficacy, obesity.*

OCENA OSNOVNIH MOTORIČNIH SPOSOBNOSTI PRI ITALIJANSKIH OTROCIH PO PANDEMIJI COVIDA-19: KAKŠNI SO UČINKI PANDEMIJE NA MOTORIČNI RAZVOJ?

IZVLEČEK

Ocenjevanje motoričnih sposobnosti je eden najpomembnejših vidikov na področju gibalnega razvoja in telesne vzgoje otrok. S to presečno študijo smo želeli oceniti osnovne motorične sposobnosti, samopodobo in užitek ob telesni dejavnosti na vzorcu otrok z normalno telesno težo in otrok s prekomerno telesno težo po pandemiji covida-19. Udeleženci (N = 107, starost = 8–9 let) so bili izbrani v okviru projekta, ki je bil izveden v mestu Lecce v deželi Apulija. Motorične sposobnosti smo ocenili s pomočjo protokola MOBAK 3-4, medtem ko so otroci samopodobo in užitek ob telesni dejavnosti ocenili z dvema potrjenima vprašalnikoma. Vpliv spola in indeksa telesne mase (BMI) na obravnavane spremenljivke smo ocenili z multivariatno analizo variance (MANOVA). Čeprav rezultati analize MANOVA niso pokazali pomembnega medsebojnega vpliva med spremenljivkami, smo ugotovili, da imajo pomemben glavni vpliv spol [Ž(10,93) = 2.353, p = .013, η² = 0.218] in mejne vrednosti indeksa telesne mase [Ž(10.93) = 2.351, p = .013, η² = 0,218]. Poleg tega je neodvisni t-test pokazal pomembne razlike v lovljenju, preigravanju, ohranjanju predmeta v ravnotežju in premikanju predmeta glede na spol (p < .05) ter v lovljenju ravnotežja, kotaljenju in samostojnem gibanju glede na mejne vrednosti indeksa telesne mase (p < .05). Ugotovili smo pomembne razlike pri samoučinkovitosti otrok moškega in ženskega spola. Zaznali nismo nobenega učinka na užitek ob športni dejavnosti. V nadaljnjih raziskavah bi bilo treba raziskati vpliv indeksa telesne mase in dejavnikov, povezanih s telesno dejavnostjo, na razvoj motoričnih sposobnosti.

***Ključne besede:** osnovne motorične sposobnosti, motorični razvoj, samoučinkovitost, debelost*

INTRODUCTION

New theoretical frameworks (Herrmann & Seelig, 2017a; Herrmann, Gerlach & Seelig, 2016; Legarra-Gorgoñon et al., 2023; Strotmeyer, Kehne, & Herrmann, 2021) posit that motor competence is not merely the observable performance of skills itself (e.g., dribbling, bouncing, catching, rolling), which are considered *basic motor qualifications*. Instead, *basic motor competence* is defined by a child's ability to engage and manage their own resources to solve motor tasks (e.g., the ability to dribble, bounce, catch, roll).

This construct refers to a result-oriented and functional response to a specific motor task, representing an evolution and addition to the concepts of capabilities, defined as person's genetic potential for success in a specific task (Goodway, Ozmun, & Gallahue, 2021) and motor skills, as experientially based action (Goodway et al., 2021), respectively. Moreover, research has demonstrated a positive association between competence in fundamental movement skills (e.g., kicking, jumping) and physical activity in young people (Hulteen, Morgan, Barnett, Stodden, & Lubans, 2018). Fundamental Motor Skills (FMS), citing Stodden et al. (2008), "are the equivalent of the ABCs in the world of physical activity", composed of locomotor skills and object control skills. The first class of movement includes moving the body through space and includes skills such as running, galloping, skipping, hopping, sliding and leaping; the second one consists of manipulating and projecting objects and includes skills such as throwing, catching, bouncing, kicking, striking and rolling. These skills represent the basis for future movement and physical activity.

Stodden et al. (2008) proposed a theoretical model explaining the potential role of motor competence (i.e., Ulrich, 2000; Henderson, Sugden & Barnett, 2007) in promoting positive or negative trajectories of physical activity (i.e., ActiGraph GT3X-BT accelerometer; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) health related-fitness (i.e., Council of Europe, 1993; Morrow, Mood, Disch, & Kang, 2015) and weight status, during infancy, adolescence and adulthood. In this concept, motor competence (MC) is a precursor to physical activity and learning to move is necessary for participation in physical activity (PA) and subsequent healthy weight. In this view, motor competence is a key factor promoting engagement in motor activity for health. Perceived motor competence plays a key role in the educational process, as it promotes children's engagement in motor activity and sport (Estevan & Barnett, 2018) and is directly related to physical activity levels and inversely to body weight (De Meester et al., 2016). Robinson et al. (2015) suggest that healthy lifestyles

and motor competence development early in life promote physical activity and other positive health trajectories across the lifespan.

Faigenbaum, Rebullido and MacDonald (2018), in developing their model of the "Pediatric Inactivity Triad", describe three interrelated factors that contribute to physical inactivity: exercise deficit disorders, pediatric dynapenia and physical illiteracy: (a) exercise deficit disorder is a condition characterized by low levels of moderate to vigorous physical activity (MVPA; '<60 mins daily), including active transportation, free play, recreation, sport and structured exercise; (b) pediatric dynapenia is a loss of muscular strength and power and the consequent functional limitations, activity-related injuries and adverse health outcomes in children; (c) physical illiteracy is a lack of confidence, competence and motivation to move proficiently when engaged in any type of physical activity. The interaction between these factors lead to the progressive decline of physical activity levels (PAL) and physical fitness levels during the developmental age, with negative effects on global health status (Wyszyńska et al., 2020; Santana et al., 2017). These negative trends not only contribute significantly to the increase in the prevalence of overweight and obesity in children and adolescents, but are also among the main determinants of the decline of physical activity levels, with negative repercussions on the development of motor competence.

In the light of this evidence, the aim of the present study is to assess motor competence levels in primary school children according to gender and BMI cutoff following the COVID-19 pandemic.

MATERIALS AND METHODS

Sample

The sample comprises 107 primary schoolchildren (male = 52, female = 55) aged 8-9 years old, who were recruited from three schools joined an experimental project in the Province of Lecce (Italy). The project, promoted by the University of Salento Didactic Laboratory of Motor Activities was aimed at studying motor development of primary school children highlighting psychopedagogical and methodological implications for physical education (PE) teachers' training. According to this study's purpose, both normal weight and overweight or obese children were included. Consecutive sampling was applied using BMI cutoffs – normal weight and overweight or obese children according

to Cole's Scale (2000) – and an age range of 8-9 years as eligibility criteria to ensure better representation of the target population.

Procedure and Assessment

After reaching an agreement between the University of Salento and the participating schools, motor evaluations were conducted from October to December 2023 for a total of 8 weeks. Prior to starting the motor assessments, the children's age, weight and height were reported, and they were asked if they engaged in extracurricular physical activity (or sports) following the COVID-19 pandemic. Children were then classified into categories of normal weight, overweight and obese according to Cole's Scale (Cole, Bellizzi, Flegal, & Dietz, 2000).

The motor competence assessment was conducted using the MOBAK 3-4 protocol, a test instrument designed for children aged 8-9 years old that investigates two areas of basic motor qualifications (BMQ): object movement and self-movement. Moreover, according to Herrmann & Seelig (2019), each basic motor qualifications encompasses four latent factors or basic motor competencies (BMC). These include throwing, catching, bouncing and dribbling for object movement, and balancing, rolling, jumping and running for self-movement qualifications. The children were asked to perform two attempts of each MOBAK test item, reporting results as follows: 0 points for 2 attempts failed, 1 point for 1 successful attempt, and 2 points for 1 both successful attempts. Moreover, the protocol provides 6 attempts only for the throwing and catching BMC, changing results interpretations (0-2 hits = 0 points, 3-4 hits = 1 pints, 5-6 hits = 2 points). The MOBAK total score can be obtained by adding the score of each BMQ, with a maximum 8 points for each BMQ and 16 as the MOBAK total score. The test instrument showed good factors of reliability (from 0.54 to 0.72), structure for the latent factors (BMQ) and content validity as confirmed by other studies (Herrmann & Seelig, 2017a; Carcamo-Oyarzun & Herrmann, 2020).

Self-efficacy was assessed with the Perceived Physical Ability Scale (Colella, Morano, Bortoli, & Robazza, 2008), a six-item questionnaire assessing strength, speed and coordinative abilities in primary school children. Item responses were based on a 4-point Likert scale (1 = run very slowly, 4 = run very fast), so the total score ranged from 1 to 24 points. High scores reflect better self-perception during physical activity, while lower scores indicate worst self-perception.

Enjoyment during physical activity was assessed with the Physical Activity Enjoyment Scale (PACES) (Carraro, Young, & Robazza, 2008), comprising 16 items rated on a 5-point Likert scale with two subscales (positive and negative). Children were asked to indicate their agreement (or disagreement) with sentences investigating how they feel during physical activity. As with the Physical Ability Scale, higher scores on the positive scale and lower scores on the negative scale indicate greater enjoyment during PA. In this study, negative items were reversed, and total PACES score were calculated ranging from 16 to 80 points.

As confirmed by validation studies, both questionnaires showed good reliability and content validity for target population (Carraro et al., 2008; Colella et al., 2008).

The assessment was conducted in the schools' gymnasiums by PE teachers and ten graduates in Sports Sciences – recruited by the Didactic Laboratory of Motor Activities – during curricular PE lessons. Before starting the evaluation, five training meetings were held to standardize the assessment procedure. To ensure that the assessment of motor competence did not have an effect (positive or negative) on self-efficacy and enjoyment, the MOBAK was carried out before the self-reports. In addition, based on the number of students, two or three evaluation tests were proposed at a time in each lesson of MOBAK (object movement at first and then self-movement qualifications).

Statistical Analysis

A priori power calculation was conducted using G*Power, setting parameters as follows: medium effect size f^2 (V) = 0.15 (Cohen, 2013), and α level at 0.05. Results suggested a sample size of 100, which is consistent with the 107 participants involved in the present study. In addition to descriptive statistics (mean ± standard deviation), a two-way factorial MANOVA was performed to assess MOBAK basic motor competencies' items based on gender, BMI cutoff and their interaction. Levene's test was performed to assess the multivariate homogeneity of variance-covariance matrix assumption, while factorial MANOVA was robust (with more than 10 participants per group) against deviations from multivariate normality. Due to the small and unequal sample size, Pillai's *F* statistic was used to evaluate the main effects of gender and BMI cutoff on the dependent variables to control for type I error rate. The effect of gender was analyzed using separate MANOVAs for each BMI cutoff, and vice versa. Partial eta squared was used to estimate effect size, interpreting results as

follows: 0.01 = small effect, 0.06 = medium effect, and 0.14 or higher = large effect (Cohen, 2013). Furthermore, two independent t-tests were performed to assess significant differences according to gender and BMI cutoff, respectively. Bonferroni correction was applied for multiple-comparison adjustment. Cohen's *d* was used as the effect size measure, with value: 0.2 = small effect, 0.5 = medium effect and 0.8 = large effect (Cohen, 2013). All significant indexes were determined at $p < .05$. SPSS (ver. 26) was used to perform all statistical analyses.

RESULTS

The sample's descriptive anthropometric characteristics, measures of basic motor competences, self-efficacy and enjoyment are presented in Table 1 and Table 2, according to gender and BMI cutoff. The number of observations in each group exceeds the number of dependent variables assessed, indicating sample size adequacy for conducting the analysis. Moreover, as fewer than 5% of children reported engaging in physical or sport activities outside of school, sports participation was not included in subsequent analyses.

A multivariate analysis of variance (MANOVA) was used to assess the effect of gender and BMI cutoff on MOBAK items, self-efficacy and enjoyment in children aged 8-9 years old. Univariate normality was confirmed by the Shapiro-Wilk test, and no multivariate outliers were found in the data, thereby assuming multivariate normality. Moreover, the correlation between variables (Table 3) was below the recommended threshold of 0.9.

Pillai's Trace (Table 4) indicated a statistically significant difference in MOBAK items and questionnaires between gender [$F(10,93) = 2.353$, $p = .013$] and cutoff [$F(10,93) = 2.351$, $p = .013$] with a substantial effect size ($\eta^2 = 0.218$). However, the interaction effect was not significant [$F(10,93) = .791$, $p = .648$].

To investigate how gender can affect the variables, two independent t-tests were performed to assess significant difference among the male and female sample (Table 5), as well as between normal weight and overweight or obese children (Table 6). Pairwise comparisons according to gender revealed that males exhibited better performance in catching ($p = .011$, $d = 0.199$), dribbling ($p = .020$, $d = 0.197$), total object control score ($p = .004$, $d = 0.201$), balancing ($p = .002$, $d = 0.204$) and self-efficacy ($p = .024$ $d = 0.197$). Moreover, normal weight children performed significantly better in balancing ($p = .029$, $d = 0.200$), rolling ($p < .001$, $d = 0.209$) and total self-movement ($p = .001$, $d = 0.205$).

Table 1. Sample Anthropometric Characteristics.

Gender	Group	Measures	Mean	SD	Min	Max	Range
Female							
	Nw (32)	Age	8,28	0,46	8	9	1
		Height	1,34	0,067	1,24	1,50	0,26
		Weight	28,96	4,76	20,00	41,00	21,00
		BMI	16,12	1,59	13,00	18,37	5,37
	Ow-Ob (23)	Age	8,48	0,511	8	9	1
		Height	1,37	0,12	1,14	1,58	0,44
		Weight	39,93	8,16	28,50	57,00	28,50
		BMI	21,16	2,84	18,60	30,00	11,40
Male							
	Nw (21)	Age	8,19	0,40	8	9	1
		Height	1,33	,05	1,20	1,42	0,22
		Weight	28,95	4,45	21,00	36,00	15,00
		BMI	16,34	1,60	13,22	18,37	5,15
	Ow-Ob (31)	Age	8,32	0,47	8	9	1
		Height	1,36	0,074	1,15	1,50	0,35
		Weight	40,15	7,26	28,40	63,00	34,60
		BMI	21,75	3,38	18,44	32,60	14,17

Legend: Nw = normal weight; Ow-Ob = Overweight and Obese.

Table 2. Basic Motor Competence and Questionnaires assessment

		BMI Cutoff									
		Nw					Ow-Ob				
Gender		**N**	**Min**	**Max**	**M**	**SD**	**N**	**Min**	**Max**	**M**	**SD**
Female											
	Throwing	32	0	1	0,25	,440	23	0	2	0,30	0,559
	Catching	32	0	6	2,16	2,034	23	0	6	1,43	1,805
	Bouncing	32	0	2	0,53	,842	23	0	2	0,52	0,846
	Dribbling	32	0	2	0,34	,545	23	0	2	0,26	0,541
	Object Mov.	32	0	10	3,28	2,932	23	0	8	2,52	2,937
	Balancing	32	0	2	1,06	,878	23	0	2	0,57	0,896
	Rolling	32	0	2	1,06	1,014	23	0	2	0,39	0,783
	Jumping	32	0	2	0,41	,756	23	0	2	0,17	0,576
	Running	32	0	2	1,03	,897	23	0	2	0,78	0,902
	Self Mov.	32	1	8	5,22	2,310	23	0	8	3,17	2,640
	Self-Efficacy	32	16	24	20,34	2,119	23	11	24	19,43	3,245
	Enjoyment	32	52	72	63,41	4,478	23	35	68	60,57	6,721
Male											
	Throwing	21	0	2	0,48	,680	31	0	2	0,52	0,677
	Catching	21	0	6	2,86	2,308	31	0	6	2,84	2,131
	Bouncing	21	0	2	0,67	,856	31	0	2	0,87	0,806
	Dribbling	21	0	2	0,71	,644	31	0	2	0,42	0,564
	Object Mov.	21	0	10	4,71	3,437	31	0	10	4,65	3,104
	Balancing	21	0	2	0,43	,676	31	0	2	0,26	0,575
	Rolling	21	0	2	1,14	,964	31	0	2	0,35	0,755
	Jumping	21	0	2	0,19	,512	31	0	2	0,16	0,523
	Running	21	0	2	0,81	,928	31	0	2	0,90	0,908
	Self Mov.	21	0	8	4,10	2,119	31	0	10	3,06	2,279
	Self-Efficacy	21	18	24	21,19	2,040	31	15	24	20,81	2,358
	Enjoyment	21	44	69	61,29	5,524	31	57	67	62,06	2,792

Table 3. Correlation Matrix.

	Catch	Boun	Drib	Obj Mov.	Bal	Roll	Jump	Run	Self Mov	SE	Enjoy
Throw	0,309**	0,327**	0,157	0,508**	0,029	0,119	0,027	0,004	0,081	0,017	-0,015
Catch	1	0,455**	0,411**	0,921**	0,143	0,365**	0,067	0,073	0,294**	0,217*	-0,058
Boun		1	0,359**	0,694**	0,125	0,178	0,110	0,140	0,248*	0,116	0,059
Drib			1	0,582**	-0,057	0,225*	0,107	-0,115	0,097	0,148	-0,025
Object Mov.				1	0,123	0,355**	0,099	0,065	0,295**	0,206*	-0,031
Bal					1	0,355**	0,308**	0,224*	0,758**	-0,003	-0,008
Roll						1	0,164	0,056	0,626**	0,104	0,088
Jump							1	0,131	0,495**	0,008	0,179
Run								1	0,533**	-0,025	0,097
Self Mov.									1	0,067	0,137
SE										1	-0,129

* = $p < 0,05$; ** = $p < 0,01$.

Table 4. Multivariate Test

Multivariate Tests[a]							
Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**	**η^2**
Gender	Pillai's Trace	0,218	2,353[b]	10,000	93,000	0,013	0,218
BMI Cutoff	Pillai's Trace	0,218	2,351[b]	10,000	93,000	0,013	0,218
Gender*BMI Cutoff	Pillai's Trace	0,086	0,791[b]	10,000	93,000	0,648	0,086

Table 5. Differences in Basic Motor Competence based on Gender

Measures	Gender	Mean	Mean Difference	p	Std. Error	C.I. 95%		
						LLIC	ULIC	Cohen's d
Throwing	Female	0,277	-0,219	0,062	0,081	-0,449	0,011	0,197
	Male	0,496	0,219	0,062	0,083	-0,011	0,449	
Catching	Female	1,796	-1,052*	0,011	0,283	-1,861	-0,244	0,199
	Male	2,848	1,052*	0,011	0,293	0,244	1,861	
Bouncing	Female	0,526	-0,242	0,143	0,114	-0,568	0,083	0,196
	Male	0,769	0,242	0,143	0,118	-0,083	0,568	
Dribbling	Female	0,302	-0,265*	0,020	0,078	-0,487	-0,042	0,197
	Male	0,567	0,265*	0,020	0,081	0,042	0,487	
Object Mov.	Female	2,901	-1,778*	0,004	0,422	-2,982	-0,575	0,201
	Male	4,680	1,778*	0,004	0,436	0,575	2,982	
Balancing	Female	0,814	0,471*	0,002	0,105	0,171	0,770	0,204
	Male	0,343	-0,471*	0,002	0,108	-0,770	-0,171	
Rolling	Female	0,727	-0,022	0,900	0,121	-0,368	0,324	0,194
	Male	0,749	0,022	0,900	0,125	-0,324	0,368	
Jumping	Female	0,290	0,114	0,344	0,084	-0,124	0,352	0,195
	Male	0,176	-0,114	0,344	0,086	-0,352	0,124	

Measures	Gender	Mean	Mean Difference	p	Std. Error	C.I. 95%		
						LLIC	ULIC	Cohen's d
Running	Female	0,907	0,051	0,777	0,124	-0,303	0,404	0.194
	Male	0,856	-0,051	0,777	0,128	-0,404	0,303	
Self Mov.	Female	4,196	0,616	0,183	0,320	-0,296	1,529	0,196
	Male	3,580	-0,616	0,183	0,331	-01,529	0,296	
Self-Efficacy	Female	19,889	-1,109*	0,024	0,336	-2,067	-0,152	0,197
	Male	20,998	1,109*	0,024	0,347	0,152	2,067	
Enjoyment	Female	61,986	,311	0,747	0,668	-1,595	2,216	0,194
	Male	61,675	-,311	0,747	0,691	-2,216	1,595	

Table 6. Differences in Basic Motor Competence based on BMI Cutoff

Dependent Variable	(I) CUTOFF	(J) CUTOFF	Mean Difference	Std. Error	p	C.I. 95%		
						LLIC	ULIC	Cohen's d
Throwing	Nw	Ow-Ob	-0,047	0,116	0,685	-0,277	0,183	0,194
	Ow-Ob	Nw	0,047	0,116	0,685	-0,183	0,277	
Catching	Nw	Ow-Ob	0,370	0,408	0,366	-0,438	1,178	0,194
	Ow-Ob	Nw	-0,370	0,408	0,366	-1,178	0,438	
Bouncing	Nw	Ow-Ob	-0,097	0,164	0,554	-0,423	0,228	0,194
	Ow-Ob	Nw	0,097	0,164	0,554	-0,228	0,423	
Dribbling	Nw	Ow-Ob	0,189	0,112	0,095	-0,033	0,411	0,195
	Ow-Ob	Nw	-0,189	0,112	0,095	-0,411	0,033	
Object Mov.	Nw	Ow-Ob	0,414	0,607	0,496	-0,789	1,618	0,193
	Ow-Ob	Nw	-0,414	0,607	0,496	-1,618	0,789	
Balancing	Nw	Ow-Ob	0,334*	0,151	0,029	0,035	0,633	0,200
	Ow-Ob	Nw	-0,334*	0,151	0,029	-0,633	-0,035	
Rolling	Nw	Ow-Ob	0,730*	0,174	0,000	0,384	1,075	0,209
	Ow-Ob	Nw	-0,730*	0,174	0,000	-1,075	-0,384	
Jumping	Nw	Ow-Ob	0,131	0,120	0,279	-0,107	0,369	0,195
	Ow-Ob	Nw	-0,131	0,120	0,279	-0,369	0,107	

Dependent Variable	(I) CUTOFF	(J) CUTOFF	Mean Difference	Std. Error	p	C.I. 95%		
						LLIC	ULIC	Cohen's d
Running	Nw	Ow-Ob	0,077	0,178	0,665	-0,276	0,431	0,194
	Ow-Ob	Nw	-0,077	0,178	0,665	-0,431	0,276	
Self Mov.	Nw	Ow-Ob	1,538*	0,460	0,001	0,625	2,451	0,205
	Ow-Ob	Nw	-1,538*	0,460	0,001	-2,451	-0,625	
Self-Efficacy	Nw	Ow-Ob	0,646	0,483	0,183	-0,311	1,604	0,194
	Ow-Ob	Nw	-0,646	0,483	0,183	-1,604	0,311	
Enjoyment	Nw	Ow-Ob	1,031	0,961	0,286	-0,874	2,936	0,195
	Ow-Ob	Nw	-1,031	0,961	0,286	-2,936	0,874	

DISCUSSION

The results of the present study revealed significant effects of gender and BMI cutoff on basic motor competencies. The observation of MOBAK motor tasks indicated that males performed significantly better than females in catching, dribbling and total object movement qualification, but not in balancing. Considering BMI differences, the statistical analysis revealed significant differences in only two MOBAK test scores (balancing and rolling) and in total self-movement qualification, favouring normal weight compared to overweight or obese children. Moreover, males exhibited significantly higher self-efficacy compared to females, whereas no statistically significant differences were observed in enjoyment and self-efficacy when comparing BMI groups. These results align closely with findings reported in similar studies within the field.

According to Carcamo-Oyarzun, & Herrmann (2020), gender has small to moderate relationship with object movement and self-movement competencies, and BMI was inversely related to self-movement, indicating that children with lower BMI achieved better results in MOBAK tests. Similar results were also reported in a cross-sectional study assessing basic motor competencies in children aged 6-8 years, according to which (a) boys performed significantly better than girls in object movement, (b) girls achieved higher scores in self-movement qualification, and (c) a small significant negative correlation between BMI and self-movement emerged (Wälti et al., 2022).

However, the effect of body composition on locomotor and object manipulation skills remain a topic of debate in this research field, strictly related to assessment methods and measures (Webster, Sur, Stevens, & Robinson, 2021; Herrmann & Seelig, 2017b; Vega-Ramirez, Pérez-Cañaveras, & De Juan Herrero, 2021; Wood, McMillan, Imai, Swift, & DuBose, 2022).

Self-efficacy and enjoyment did not exhibit significant differences among groups in this study (except for self-efficacy in males and females) and showed no significant correlation with other variables investigated. Contrary to the results obtained from this study, several findings have highlighted the mediation role of self-efficacy and enjoyment in enhancing basic motor competence development (Ensrud-Skraastad & Haga, 2020; Peers, Issartel, Behan, O'Connor, & Belton, 2020; Morales-Sánchez et al., 2021 Barnett et al., 2022; Greule et al., 2024). These results may be related to poor practice of physical activity declared by children (< 5% of total sample).

Prior to the COVID-19 pandemic, epidemiological studies indicated that a large percentage of young boys (78%) and girls (85%) aged 11 to 17 did not meet international guidelines and recommendations for physical activity

(Guthold, Stevens, Riley, & Bull, 2020), and since 2016 the American Academy of Pediatrics (AAP) has advised that children, adolescents and, especially parents, limit the time spent in front of monitors, smartphones, TV and game consoles.

However, while some studies have highlighted a significant reduction in motor competence development during and after COVID-19 pandemic (Cheng, Tai, & Wang, 2023; Carballo-Fazanes, Rodrigues, Silva, Lopes, & Abelairas-Gómez, 2022), not all authors have reported the same results (den Uil et al., 2023a). This is probably due to the complexity of factors involved by lockdown measures in each country, as well as specific regional and local variables that impact motor competence development in children.

Furthermore, recent findings have highlighted the fundamental role of physical activity in mediating and moderating the relationship between BMI and motor competence acquisition (Burton et al., 2023; Dapp, Gashaj, & Roebers, 2021; Herrmann, Heim, & Seelig, 2019). Studies suggest that the relationship between BMI, engagement in physical activity, and both motor and perceived motor competence begins to manifest from ages 6 to 9 years (den Uil et al., 2023b). This underscores the inference that sedentary lifestyles and the decreased practice of physical activity post-pandemic may further hinder motor development, especially in children who are not physically literate or have poor physical literacy.

In fact, poor engagement in physical or sports activity has been found to negatively with both object and self-movement qualifications, while high engagement (particularly, individual and team sports) has shown a medium to high correlation with BMQ (Herrmann & Seelig, 2017a; Herrmann & Seelig, 2017b; Wälti et al., 2022).

The COVID-19 pandemic drastically changed the already low levels of physical activity among children and adolescents, leading to a significant increase in time spent in sedentary behavior and screen time (Paterson et al., 2021; Neville et al., 2022).

Another important consideration relates to the type and accessibility of physical activity opportunities. As suggested by Walker et al. (2023), new physical activity trends are characterized by a growing dependence on structured and organized physical activity, leaving out spontaneous play and unstructured physical activity, promoting barriers in participation for lower socio-economic status children.

These data are highly significant for informing the development of interventions and policies aimed at promoting opportunities for physical activity and fostering healthy eating habits in primary school children. Moreover, in

addition to quantitative data on physical activity (i.e., time of motor engagement, intensity, % of MVPA, etc.) even the quality of motor experiences plays a fundamental role in motor competence development (Schmutz et al., 2020).

CONCLUSIONS

The assessment of motor competencies during childhood is crucial to ensure the quality of the teaching process and monitor the stages of children's motor development. The present results show poor levels of motor competencies in both boys and girls, as well as a negative impact of BMI on basic motor qualifications.

Considering the growing prevalence of overweight and obesity during developmental age, coupled with declining levels of daily physical activity among children and adolescents, the interpretation of these findings raises significant methodological and pedagogical considerations for the future directions of physical education (PE) teachers' training and motor activities. On the one hand, there is a need to enhance qualitative opportunities for motor learning at school. On the other hand, it is essential to engage institutions and families in developing physical activity interventions outside of school.

Further research should assess the effects of experimental interventions on motor competence development, evaluating the mediating role of structured and unstructured physical activity between BMI and motor competence.

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