The Predictive Role of age, Gender, and Body Mass Index on Motor Proficiency of Preschool Children

El Papel Predictivo de la Edad, el Género y el Índice de Masa Corporal en la Competencia Motora de los Niños en Edad Preescolar

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Abstract

It is expected that basic motor skills will be able to perform correctly at the end of the preschool period. The fundamental motor skills that children masterfully perform will lead them to an active life & will increase their likelihood of participating in physical activity in their lifetime. It is known that motor skills are influenced by many factors such as age, gender, & BMI. The purposes of this study were to determine the motor proficiency level of preschool children & to examine the role of age, gender, & BMI. Participants of this study were 103 preschool children (MAge=61.10±8.75month) from a public preschool of Denizli in Turkey. The Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) was used to assess children's motor proficiency. A multiple linear regression was conducted to test whether the participant's age, gender, & BMI predicted the participant's motor proficiency levels. The results of the study show that all the sub-tests & BOT-2 total scores have significant increases with age. In addition, the results indicated that girls have significantly higher scores than boys on the fine-motor precision, the fine-motor integration, manual dexterity, & BOT-total scores. When the sub-tests, which girls had a higher score, were examined, it can be realized that all are related to fine motor skills. Future studies are needed to determine whether these explanations are to generalize.

Keywords: Motor Proficiency, preschool, age, gender, BMI.

Resumen

Se espera que las habilidades motoras básicas puedan desempeñarse correctamente al finalizar el periodo preescolar. Las habilidades motoras fundamentales que los niños desempeñan con maestría los llevarán a una vida activa y aumentarán su probabilidad de participar en actividades físicas a lo largo de su vida. Se sabe que las habilidades motoras están influenciadas por muchos factores, como la edad, el sexo y el IMC. Los objetivos de este estudio fueron determinar el nivel de competencia motora de los niños en edad preescolar y examinar el papel de la edad, el sexo y el IMC. Los participantes de este estudio fueron 103 niños en edad preescolar (Medad=61,10±8,75meses) de una escuela preescolar pública de Denizli en Turquía. Se utilizó la prueba de competencia motora Bruininks-Oseretsky, segunda edición (BOT-2) para evaluar la competencia motora de los niños. Se realizó una regresión lineal múltiple para probar si la edad, el sexo y el IMC del participante predecían los niveles de competencia motora del participante. Los resultados del estudio muestran que todas las subpruebas y las puntuaciones totales de BOT-2 tienen aumentos significativos con la edad. Además, los resultados indicaron que las niñas tienen puntuaciones significativamente más altas que los niños en precisión motora fina, integración motora fina, destreza manual y puntuaciones totales BOT. Cuando se examinaron las subpruebas en las que las niñas obtuvieron una puntuación más alta, se pudo comprobar que todas están relacionadas con la motricidad fina. Se necesitan estudios futuros para determinar si estas explicaciones deben generalizarse.

Palabras clave: Competencia motora, preescolar, edad, género, IMC

Introduction

A child's motor skill development is important aspects of their growth and maturity. Not only do they contribute to the child's overall physical and cognitive development, but they also foster self-confidence and social interaction. Motor skill development is influenced by a variety of factors that can be categorized as requirements of the movement task (e.g., a target's height or the size of a ball), the biology of the child (e.g., sex and heredity), and the environment (e.g., the surfaces of floors and walls, or socioeconomic status) (Iivonen, & Sääkslahti, 2014). These factors shape the movements individually and/or mutually either encouraging or discouraging skill achievement (Gallahue et al., 2012). Fundamental motor skills (FMS), which constitute motor development milestones for children from kindergarten to 2nd grade and include locomotor, manipulative and stability movements that children skillfully perform (Gallahue et al., 2012), will lead them to active development. It will increase their chances of living and participating in physical activity (Stodden et al. 2008).

The effects of age, gender, and BMI on motor skill have been studied extensively. A study by Bruininks, (1978), well-renowned for developing the Bruininks-Oseretsky Test of Motor Proficiency, revealed that older children performed better on tests of motor proficiency than younger children, clearly highlighting the role of age. Similarly, Livesey et al (2006) found that older children performed motor skills better than younger children. Bellows et al. (2013) reported a positive correlation between age and motor proficiency during the early childhood years. In their study investigating age and balance skills in preschool children, Venetsanou and Kambas (2011) found that age had a significant effect on both sub-test and item scores on balance skills. More recently, Venetsanou and Kambas (2016) found that age significantly affected motor proficeincy in children before the age of 6, with older children performing better in motor tests than their younger peers. Additionally, studies have found that older children had better balance, motor coordination, locomotor, and object control skills than their younger peers (Smits-Engelsman, & Hill 2012; Westendorp et al. 2012). Therefore, age plays a pivotal role in the development of motor proficiency as it influences the biological and environmental aspects of growth in children.

Also, gender plays a significant role in the child motor development. It seems that there are different opinions regarding the evaluation of biological factors in motor problems in terms of gender. Among the studies examining the gender relationship, an Australian study conducted with preschool students revealed the gender difference in locomotor and manipulative skills (Hardy et al., 2010). Boys generally had higher mastery of object control skills, while girls generally had higher mastery of locomotor skills. However, Piek et al. (2008) reported that girls had better hand-eye coordination and fine motor dexterity than boys. This aptitude often manifests in tasks that require precision and detail, such as drawing, writing, or manipulating small objects. In addition, Morley et al. (2015) stated that boys were often more proficient in gross motor skills, like running and jumping. On the other hand, Chow and Lily (2011) found that there was no gender difference in Hong Kong preschool children's gross motor skills when adjusted for the age effect. However, when analyzes were performed without adjusting for age, gender differences in favor of boys were found in all motor skill measurements. These different findings indicate that the effects of gender on motor skills should continue to be investigated.

Body Mass Index (BMI), an indicator of body fatness calculated from an individual's weight and height, can influence a child's motor proficiency. The findings of studies on the relationship between motor competence and BMI in preschool children report different results. Some studies show a negative correlation between children's motor skill proficiency and BMI (D'Hondt et al., 2009; Graf et al., 2004; Lopes et al., 2012; Siahkouhian et al., 2011). For instance, a study by Nervik et al. (2011) showed that increased BMI could lead to decreased physical performance, including functional tasks such as hopping, jumping, and balance. Another study found that excess body weight may negatively impact a child's ability to perform certain physical tasks, potentially due to reduced balance, flexibility, and coordination (D'Hondt et al., 2013). On the other hand, other studies have found no significant relationship between BMI and preschool children's motor proficiency level (Chow, & Lily, 2011; Logan, Scrabis-Fletcher, Modlesky, & Getchell, 2011). Logan et al. (2011) discussed the relationship between preschool children's motor skill proficiency and BMI in two different ways. First, no significant relationship was found between BMI and motor skill proficiency percentile rankings. Second, it was found that preschool children classified as overweight or obese had lower motor competence than their normal weight and thin peers. These equivocal results indicate that the effects of age, gender and BMI on motor skills should continue to be investigated.

Developing fundamental motor skills in preschool age helps to lay the foundation for a physically active lifestyle. Studies have shown that children who possess greater motor skills tend to engage in more physical activity and have better physical fitness levels later in life (Barnett at al., 2016; Stodden et al., 2008). It is expected that children will have properly attained the fundamental motor skills (locomotor, manipulative, and stability skills) by the end of the preschool education period, which is a critical and sensitive period for learning fundamental movement skills. In addition, fundamental motor skills provide a repertoire of movements that empower children to engage in various physical activities and sports. Research suggests that

children who are proficient in fundamental motor skills are more likely to participate in organized sports and recreational activities as they age (Clark, and Metcalfe, 2002; Holfelder, and Schott, 2014). Although the literature generally states that mastering motor competence increases with age, there are different results regarding the relationship between gender, BMI and motor competence. The existence of different results regarding the relationship between motor competence and age and gender, and especially the scarcity of studies conducted with preschool children in the national literature, brought the following questions to mind in this study. First, how are the motor proficiency levels of preschool children and secondly what is the role of age, gender and BMI in children's motor proficiency levels?*

Method

Participants

Participants were 103 preschool children (MAge = 61.10 ± 8.75 months) from a public preschool in Denizli, Turkey. Of this sample, forty five (43.7%) were girls (M_{Age} = 61.60±8.22 months) and 58 (56.3%) were boys (M_{Age} = 60.71. ± 9.19 months). Twenty-eight were 4 years old classes (M_{Age} = 50.25 ± 2.49month), 40 in 5 years old classes (M_{Age} = 59.95 ± 3.43) and 35 in 6 years old classes (M_{Age} = 71.09 ± 3.18month). The preschool's management approved the objectives and procedure of the study. Each child's parents and/or guardians were required to give permission for their child to participate. Children were informed that they could end the study at any time during the implementation.

Instruments

Motor Proficiency Measurement: To assess children's motor proficiency, the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) was used. Individually administered BOT-2 uses engaging, goal-directed activities to measure a wide array of motor skills in children aged 4 through 21 (Bruininks & Bruininks, 2005). The BOT-2 has 8 subtests with 53 items, which are categorized into four motor domains: fine motor control, manual coordination, body coordination, and strength and agility. The fine-motor-control domain comprises the fine-motor-precision (FMP, 7 items, 41 points) and fine-motor-integration (FMI, 8 items, 40 points) subtests. Manual coordination includes manual dexterity (MD, 5 items, 45 points) and upper-limb coordination (ULC, 7 items, 39 points) subtests. Body coordination includes bilateral coordination (BLC, 7 items, 24 points) and balance (BAL, 9 items, 37 points) subtests. Strength and agility include running speed and agility (RSA, 5 items, 52 points) and strength (STR, 5 items, 42 points) subtests. The scores of these four motor domains are combined into total composite score of motor proficiency (320 points). BOT-2 for the subtests, motor domains, and total composite score internal consistency (for 5, 6 & 7 years old) ranged from 0.73–0.90, test–retest coefficients over an interval of 7–42 days (for 4–7 ages) ranged from 0.47 to 0.91, and inter-rater reliability coefficients (for 4–7 ages) ranged from 0.84 to 0.99 (Bruininks & Bruininks, 2005).

The raw scores for each of the BOT-2 test items were converted into point scores according to procedure described in the the BOT-2 test manual. These point scores allow a participant's item performances to be evaluated on a graded scale. Adding these individual point scores together, a subtest total point score is obtained. Point scores from all subtest items are added to obtain the total point score (total BOT-2).

Body Mass Index: Body mass index (BMI) is a widely utilized and reliable indicator of body fat percentage for most children and teens. It is determined based on body weight and height based on using the following formula: BMI = Weight (kg) / Height^2 (m) (Centers for Disease Control and Prevention, 2014). The participants' height in meters and weight in kilograms were measured using standardized procedures (Malina et al., 2004).

Procedure

Receiving approval from the school administration for the study, written permission was obtained from each child's parents. All participants were tested individually in a quiet room and completed the tests in one session. The participants were advised at the beginning of the testing session that they could opt out of participating for any reason. First, the participants' height and weight measurements were taken by researcher. After that, BOT-2 application started, which takes approximately 40-60 minutes. Before each test item was administered, the researcher explained verbally how it would be done using the visual materials of the test. It was then demonstrated by the researcher and participants were given a trial opportunity before the actual application. For each of the BOT-2 items, the researcher observed the child's performance and determined a raw score according to the procedure described in the test manual.

Statistical Analysis

Using the G*Power program, the total number of samples to be taken was determined as 99 according to the 95% confidence (1-α), 90% test power (1-β), f2=0.5 effect size, two-tailed and 3-predictor multiple linear regression analysis. For each subtest and total BOT-2 scores, descriptive statistics, Pearson correlations, and a multiple linear regression were conducted to test whether the participants' age, gender, and BMI predicted motor proficiency. The univariate

and multivariate normal distributions of the data were examined by calculating the skewness and kurtosis values and the Mahalonobis distance. In correlation and regression analyses, it was decided whether the relationship between the variables showed a linear relationship or not by examining the scatter diagram. In the study, type 1 error rate was set at .05.

Results

Table 1 provides descriptive statistics for the BOT-2 subtests and BOT-2 total score, by gender.

Table 1
Descriptive statistics for BOT-2 subtests, BOT-2 total score, and BMI, by gender

Variables	Girl (*n* = 45)		Boy (*n* = 58)		Total (*n* = 103)	
	M	***SD***	***M***	***SD***	***M***	***SD***
Fine motor precision (range: 0–41)	25.53	8.32	20.83	7.91	22.88	8.39
Fine motor integration (range: 0–40)	21.09	9.64	15.91	10.16	18.17	10.22
Manual dexterity (range: 0–45)	12.04	3.61	9.33	3.17	10.51	3.61
Bilateral coordination (range: 0–24)	11.59	4.64	10.68	4.64	11.08	4.64
Balance (range: 0–37)	24.78	7.91	23.28	7.46	23.93	7.66
Running Speed and Agility (range: 0–52)	19.13	6.97	17.95	7.17	18.47	7.07
Upper-Limb Coordination (range: 0–39)	9.89	5.61	11.59	8.27	10.85	7.26
Strength (range: 0–42)	8.53	3.29	8.47	4.04	8.50	3.72
BOT2 Total (range: 0–320)	132.11	37.88	117.66	40.95	123.97	40.10
BMI	15.82	1.93	15.63	1.82	15.71	1.86

Note: Range refers to the lowest to highest possible score for each test.

Nine separate multiple linear regressions were conducted to see if age, gender, and BMI predicted the eight BOT-2 subtest scores and the BOT-2 total scores. Model assumptions were checked including normality, linearity, and multicollinearity. No violations in model assumptions were diagnosed. The results of the multiple linear regression analyses are shown in Table 2.

The results of the multiple linear regression analyses revealed that the three-predictor (age, gender and BMI) model explain a significant amount of the variance in the fine motor precision scores ($F_{(3, 99)}$ = 25.132, p < .001, R^2 = .432) equation of FMP = -15.665 + .575Age + 4.172Gender + .103BMI, fine motor integration scores ($F_{(3, 99)}$ = 28.214, p < .001, R^2 = .461) equation of FMI = -33.889 + .745Age + 4.452Gender + .291BMI, manual dexterity scores ($F_{(3, 99)}$ = .271, p < .001, R^2 = .237) equation of MD = -.325 + .131Age + 2.579Gender + .110BMI, bilateral coordination scores ($F_{(3, 99)}$ = 10.185, p < .001, R^2 = .241) equation of BC = -10.650 + .261Age + .572Gender + .352BMI, balance scores ($F_{(3, 99)}$ = 22.025, p < .001, R^2 = .400) equation of B = -12.761 + .553Age + .977Gender + .159BMI, running speed and agility scores ($F_{(3, 99)}$ = 17.102, p < .001, R^2 = .341) equation of RSA = -9.368 + .466Age + .781Gender + -.061BMI, upper-limb coordination scores ($F_{(3, 99)}$ = 17.558, p < .001, R^2 = .350) equation of ULC = -11.494 + .464Age + -2.117Gender + -.324BMI, strength scores ($F_{(3, 99)}$ = 7.276, p < .001, R^2 = .181) equation of S = -.995+ .177Age + -.074Gender + -.082BMI, and BOT-2 total scores ($F_{(3, 99)}$ = 43.404, p < .001, R^2 = .568) equation of BOT-2 total = -95.327 + 3.377Age + 11.340Gender + .512BMI.

Age was found to be the major determinant of children's motor proficiency. As shown in Table 2, age was a significant predictor in all the regression analyses, with older participants having higher motor proficiency scores. Gender was a significant predictor only in the fine motor precision, fine motor integration, manual dexterity, and BOT-2 total score analyses. The predicted fine motor precision scores for girls are 4.172 points higher than for boys, after controlling for age and BMI. The predicted fine motor integration scores for girls are 4.452 points higher than for boys, after controlling for age and BMI. The predicted fine manual dexterity scores for girls are 2.579 points higher than for boys, after controlling for age and BMI. Finally, the predicted BOT-2 total scores for girls are 11.340 points higher than for boys, after controlling for age and BMI. However, BMI has no significant effect on any of the subtests and BOT-2 total scores.

Table 2
Multiple Linear Regression Results

Variables:	Predictors:	*B*	*SE*	*β*	*t*	*p*
Fine motor precision:	Constant	-15.665	7.662		-2.044	.044
	Age	.575	.074	.599	7.785	.000
	Gender	4.172	1.278	.248	3.264	.002
	BMI	.103	.347	.023	.297	.767
Fine motor integration:	Constant	-33.889	9.099		-3.724	.000
	Age	.745	.088	.638	8.505	.000
	Gender	4.452	1.518	.217	2.933	.004
	BMI	.291	.413	.053	.705	.482
Manual dexterity:	Constant	-.325	3.826		-.085	.932
	Age	.131	.037	.317	3.547	.001
	Gender	2.579	.638	.356	4.040	.000
	BMI	.110	.173	.057	.633	.528
Bilateral coordination:	Constant	-10.650	5.008		-2.126	.036
	Age	.261	.048	.489	5.388	.000
	Gender	.572	.831	.061	.688	.493
	BMI	.352	.224	.143	1.571	.119
Balance:	Constant	-12.761	7.190		-1.775	.079
	Age	.553	.069	.631	7.979	.000
	Gender	.977	1.200	.064	.815	.417
	BMI	.159	.326	.039	.488	.627
Running speed & agility:	Constant	-9.368	6.958		-1.346	.181
	Age	.466	.067	.576	6.945	.000
	Gender	.781	1.161	.055	.673	.503
	BMI	-.061	.315	-.016	-.192	.848
Upper-limb coordination:	Constant	-11.494	7.117		-1.615	.110
	Age	.464	.069	.560	6.757	.000
	Gender	-2.117	1.193	-.145	-1.775	.079
	BMI	-.324	.322	-.083	-1.007	.317
Strength:	Constant	-.995	4.080		-.244	.808
	Age	.177	.039	.416	4.502	.000
	Gender	-.074	.681	-.010	-.109	.913
	BMI	-.082	.185	-.041	-.444	.658
BOT-2 total:	Constant	-95.327	31.954		-2.983	.004
	Age	3.377	.308	.737	10.969	.000
	Gender	11.340	5.331	.141	2.127	.036
	BMI	.512	1.449	.024	.354	.724

Note: The boy gender was coded as 0, and the girl gender was coded as 1.

Discussion

The present study examined the role of age, gender, and BMI on the motor competence level of preschool children. Results indicate that age has a significant effect on all subtests and total BOT-2 scores. Consistent with previous research (Livesey et al., 2006; Smits-Engelsman, & Hill 2012; Westendorp et al. 2012), age plays an important role in the development of motor proficiency. Age has been found to correlate positively with motor proficiency. This association is demonstrated in a study by Luze et al. (2010), where older children tended to demonstrate better gross and fine motor skills than their younger counterparts. This is largely attributed to the physical and neurological maturation that comes with age. Iivonen, and Sääkslahti (2014) compiled the findings of eight studies examining children's motor competencies and found that

developments in motor skills follow an age trend: older children demonstrate greater proficiency in motor skills compared to younger children. The findings of the current study are also consistent with evidence cited in well-known literature suggesting that preschool-age increases in children's FMS proficiency occur to a point during maturational processes with age (Gallahue et al., 2012; Malina et al., 2004). However, no studies reported that the highest level of FMS competence was achieved solely with age; all noted the importance of environmental opportunities provided by education and/or home and community life (Iivonen, & Sääkslahti, 2014).

The current study found that girls performed better than boys in terms of fine-motor precision, fine-motor integration, manual dexterity, and BOT-2 total scores. Similarly, Piek et al. (2008) reported that girls have better hand-eye coordination and fine motor dexterity than boys, this ability often manifests itself in tasks that require precision and detail, such as drawing, writing, or manipulating small objects. Additionally, Morley et al. (2015) specified that boys were generally more skilled in gross motor skills such as running and jumping. However, Hardy et al. (2010) found that preschool girls generally had higher mastery of locomotor skills, while boys had higher mastery of object control skills. In addition, some review studies also indicated that boys tend to have more developed manipulative skills than girls, and that girls achieve better results than boys in balancing and locomotor skills (Iivonen, & Sääkslahti, 2014; Thomas, & French, 1985; Toole, & Kretzschmar, 1993;). Furthermore, a study that examined the relationship between balance performance and gender in preschool children reported that although there were differences, the low values for gender showed that these differences were not very important (Venetsanou & Kambas, 2011). On the other hand, in a study that found a difference in favor of boy preschool children in all motor skills, no gender difference was found in children's gross motor skills when the analyses were adjusted for the age effect (Chow & Lily, 2011).

It has been suggested that gender differences in motor skills in early childhood are affected by more by environmental factors rather than biological factors. For example, McKenzie et al. (2002) stated that boys are better at skills requiring object control because they play more ball games, while girls are better at balancing and locomotor skills because of the games they prefer. Studies also highlight the importance of opportunity and practice in motor proficiency. It remains crucial not to limit children's activities based on gender, but rather encourage a comprehensive development of both fine and gross motor skills. Although these physiological and developmental differences exist, sociocultural factors can also contribute to these disparities in motor proficiency. Social and environmental factors may also influence these gender differences. Pitchford et al. (2016) described how social norms and expectations may influence differences in FMS performance. For example, boys may be more encouraged to participate in sports and outdoor games, which can facilitate the development of gross motor skills. However, Okely and Booth (2004) suggested that if girls are provided with equal opportunities to these skills, differences in FMS proficiency between girls and boys could be decreased.

Unlike age and gender, BMI had no significant effect on any BOT-2 subtests or the BOT-2 total score. This is consistent with other studies that found no relationship between preschool children's BMI and motor proficiency level (Chow and Lily, 2011; Logan et al., 2011). On the contrary, studies indicate that increasing BMI may cause a decrease in physical performance as well as a decrease in hopping, jumping, flexibility, balance, and coordination skills (D'Hondt et al., 2013; Nervik et al., 2011). Interestingly, Cattuzzo, et al. (2016) found that it is not only obesity that is a concern: Underweight or malnourished children demonstrated inferior motor skills compared to their adequately nourished peers. Therefore, maintaining a healthy BMI might be crucial for optimized motor proficiency in children. Moreover, Nervik, et al. (2011) showed that increased BMI could lead to decreased physical performance, including functional tasks such as hopping, jumping, and balance. However, it is important to remember that while a correlation exists, BMI is not the sole determinant of motor proficiency and physical fitness. Factors such as physical activity level, opportunities for skill development, and genetics also play significant roles. In addition to that, Ferreira et al. (2019) concluded that sports participation plays an important role in the development of motor competence in school-age children, but this association is not generally mediated by weight status.

There were some limitations of the study. The sample for this study was taken from a preschool in western Turkey, so caution should be taken when generalizing the results. Another limiting factor is that BOT-2 can be applied to a limited number of children because it takes too much time to apply to a child. On the other hand, the contribution of the findings in the literature, especially considering the scarcity of studies conducted to determine the motor proficiency level of Turkish preschool children & to examine the role of age, gender, & BMI is the strength of the study.

Conclusions

This study found that all BOT-2 sub-test scores and the BOT-2 total score increase significantly with age. These findings are consistent with the motor development literature. In addition, the results indicated that girls have significantly higher scores than boys on fine-motor precision (4.172 points higher), fine-motor integration (4.452 points higher), manual dexterity (2.579 points higher), and the BOT-total scores (11.340 points higher). The subtests in which girls performed better were all related to fine motor skills. Future studies are needed to determine whether these explanations are to generalize.

In conclusion, the findings suggest age and gender as significant predictors of motor proficiency in preschool children. However, more comprehensive studies considering other potential contributing factors including socio-economic status, physical activity levels, and parental influence are needed to have a clearer understanding of the development of motor skills in preschool children. It is therefore imperative to investigate these factors as predictors for motor proficiency in preschool children for targeted interventions. Such research could not only provide insights into individual differences in motor development but also devise strategies to promote motor skills among preschoolers effectively. Special attention must be paid to high-risk groups, like overweight or obese children, those with delayed motor skills, and children with less opportunity for physical activities. Tangible efforts are therefore important to instill motor activities from a young age, fostering an active lifestyle from the early developmental stages. This could lead to better overall health, cognitive function, and academic achievements, thereby significantly enhancing the quality of life in the long term.

Ultimately, while age and gender play predictive roles in children's motor proficiency, they are not rigid determinants, and each child's unique developmental trajectory must be considered. The results from the study showed a significant positive correlation between age and motor proficiency, indicating that as children grow older, their motor proficiency tends to improve. The findings of the study suggest that gender plays an integral part in preschool children's motor proficiency. The role of BMI was not significant in predicting motor proficiency, suggesting that it changes as children grow and develop and thus might not be the best predictor of motor proficiency. In conclusion, the study highlighted that age and gender are strong predictors of motor proficiency in preschool children. These findings could have implications in early childhood education and intervention programs, helping teachers and caregivers to promote physical activities that are appropriate for their age and gender. It also underscores the need to monitor children's motor skills from a young age to detect and address any potential developmental delays.

Ethics Committee Statement

The study was conducted in accordance with the Declaration of Helsinki. However, since there was no ethics committee approval required at the time the study was conducted, the study was conducted only by obtaining parental approval.

Conflict of Interest Statement

Since there is no institution providing funding for the study, no institution or organization has any influence on the design of the study, the analysis of the data or the interpretation of the results.

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No funding source was used in the study. The researcher carried out the study with his own means.

Data Availability Statement

The data supporting the findings of this study are available in the personal database of the corresponding author (omballi@pau.edu.tr).

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Note

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