



SEX DIFFERENCES AND PERFORMANCE EVALUATION IN PRESCHOOL ATHLETIC EVENTS: A STUDY FROM THE OLYMPIC FESTIVAL OF KINDERGARTENS IN CROATIA

Josip CVENIĆ¹

¹Faculty of Kinesiology Osijek, University J.J. Strossmayer Osijek, Croatia

Corresponding author:

Josip CVENIĆ

Faculty of Kinesiology Osijek, University J.J. Strossmayer, Drinska 16a, HR-31000
Osijek, Croatia

Phone: +385 31 559 300

E-mail: jcvenic@kifos.hr

ABSTRACT

*This study examined sex differences in motor performance among preschool children and proposed a preliminary, norm-referenced evaluation scale for selected athletic disciplines within the Olympic Festival of Kindergartens. The sample consisted of 120 children (60 boys and 60 girls), approximately six years of age, representing the best-performing participants from county-level competitions conducted between 2007 and 2017. Motor performance was assessed in ball throwing, standing long jump, and the 50-m sprint. Sex differences were analysed using the independent samples *t*-test with effect sizes reported as Cohen's *d*. Boys achieved significantly better results in ball throwing ($t(118) = 6.51, p < 0.001, d = 1.19$) and the 50-m sprint ($t(118) = -2.07, p = 0.041, d = -0.38$), indicating large and small-to-moderate effects, respectively. No significant sex difference was observed in the standing long jump ($t(118) = 0.64, p = 0.521, d = 0.12$). Comparisons with national datasets revealed similar performance patterns, confirming earlier findings of sex-related differences in explosive strength and speed during early childhood. The proposed five-level evaluation scale, derived from competitive performance distributions, provides a practical assessment framework for use in organized preschool sport settings. Given the selective nature of the sample and the absence of formal psychometric validation, the scale should be considered preliminary and applicable primarily to physically active preschool children participating in competitive events.*

Keywords: preschool children, motor performance, athletic events, sex differences, evaluation scale

RAZLIKE MED SPOLOMA IN OCENJEVANJE USPEŠNOSTI NA ŠPORTNIH DOGODKIH PREDŠOLSKIH OTROK: ŠTUDIJA Z OLIMPIJSKEGA FESTIVALA VRTCEV NA HRVAŠKEM

IZVLEČEK

Študija je proučevala razlike med spoloma v motoričnih sposobnostih predšolskih otrok in v njej je predlagana preliminarne, normativno utemeljena ocenjevalna lestvica za tri atletske discipline, vključene v olimpijski festival vrtcev. Vzorec je obsegal 120 otrok (60 fantov in 60 deklic), ki so bili stari približno šest let ter, izbrani na podlagi najboljših dosežkov na ravni okrožnih tekmovanj med letoma 2007 in 2017. Motorični dosežki so bili ocenjeni v metanju žoge, skoku v daljino z mesta in teku na 50 metrov. Razlike med spoloma so bile analizirane z neodvisnim *t*-testom, pri čemer so bili izračunani tudi učinki velikosti (Cohenov *d*). Fantje so dosegli statistično pomembno boljše rezultate v metanju žoge ($t(118) = 6,51$; $p < 0,001$; $d = 1,19$) in teku na 50 metrov ($t(118) = -2,07$; $p = 0,041$; $d = -0,38$), kar kaže na velik oziroma majhen do zmeren učinek. Pri skoku v daljino z mesta ni bilo ugotovljenih statistično pomembnih razlik med spoloma ($t(118) = 0,64$; $p = 0,521$; $d = 0,12$). Primerjava z nacionalnimi podatki je pokazala podobne vzorce, pri čemer fantje že v zgodnjem otroštvu izkazujejo boljše rezultate v nalogah, povezanih z eksplozivno močjo in hitrostjo. Predlagana petstopenjska ocenjevalna lestvica, oblikovana na podlagi tekmovalnih dosežkov, je praktično orodje za uporabo v organiziranih predšolskih športnih okoljih. Glede na selektivno naravo vzorca ter odsotnost formalnega preverjanja zanesljivosti in veljavnosti je treba lestvico obravnavati kot preliminarne in primerno predvsem za telesno aktivne predšolske otroke, vključene v tekmovalne športne programe.

Ključne besede: predšolski otroci, motorične sposobnosti, športni dogodki, razlike med spoloma, ocenjevalna lestvica

INTRODUCTION

Physical activity plays a crucial role in the healthy development of children, particularly during the preschool years, when fundamental motor skills and coordination are formed. Early exposure to sport and movement-based play fosters not only physical fitness but also cognitive, emotional, and social growth. Recognizing the importance of sport as a holistic educational tool, the Croatian Olympic Committee launched the Olympic Festival of Kindergartens in 2002 through its Office for Local Sport. This national event aims to promote physical activity among preschool children while transmitting key Olympic values such as friendship, respect for diversity, non-violence, and fair play.

Held annually in May, the Festival gathers over 15,000 children from across Croatia. Under the slogan “I will be an Olympian too”, it serves as both a celebration of sport and a pedagogical initiative. By engaging in various athletic and recreational activities, children develop motor and functional abilities essential for proper growth, health, and harmonious development. Through preparation and participation, children enhance physical competencies such as strength, speed, and coordination, while also developing social interaction skills, teamwork, and respect—values that extend beyond the sports field into everyday life.

Physical activity (PA) is beneficial for maintaining and enhancing health (Hawladar et al., 2023) and plays a key role in children’s growth and development (Bingham et al., 2016; Piercy et al., 2018). Although promoting a healthy lifestyle is particularly crucial during early childhood (Tran et al., 2025), children are becoming increasingly less physically active (Husu et al., 2024; Phipps et al., 2024). Despite its importance for child development, unstructured outdoor play is declining (Holt et al., 2016). For preschool-aged children, free outdoor play represents the most natural way to engage in PA and remains critical for healthy development (Caroli et al., 2011). Recent Croatian research further emphasizes that reduced movement and increased sedentary behaviour in early childhood can negatively affect the formation of lifelong healthy habits (Petricić, 2022, 2025), while long-term physical inactivity poses significant risks to both physical and mental health (Pišot, 2022).

Longitudinal studies of morphological and motor development indicate that the period between five and seven years of age is characterized by intensified development of motor abilities in both sexes. The most pronounced changes occur in repetitive strength, coordination, precision, and balance, particularly around the age of six. Sex differences have been reported, with girls showing advantages in balance and flexibility, and boys demonstrating superior

performance in explosive strength and precision tasks (De Privitellio, Marić, & Mijan, 2006; De Privitellio, Babić, & Caput-Jogunica, 2007). Neuromotor explanations are supported by findings indicating earlier maturation of coordination and movement regulation in girls, whereas boys tend to exhibit earlier advantages in strength-related motor tasks (De Privitellio et al., 2006; Lopes, Rodrigues, Maia, & Malina, 2011). International research similarly reports sex-related differences in preschool motor performance, especially in tasks involving strength and speed, while coordination-based skills show smaller differences (Lopes et al., 2011; Tomkinson et al., 2017).

Within the framework of the Croatian Olympic Committee, preschool athletic competitions include football for boys and girls, 50-m running, standing long jump, ball throwing, and the 4×25 m relay. Running and elementary games that involve fundamental movements such as walking, climbing, crawling, and jumping positively influence cardiovascular development and enhance key motor abilities, including speed, strength, coordination, and endurance. It should be emphasized that the present study is based on results achieved by top-performing preschool children participating in county-level competitions within the Olympic Festival of Kindergartens. Accordingly, the proposed evaluation scale reflects competitive finalist performance and is not intended to represent normative motor development of the general preschool population.

The main goal of this research is to examine motor performance in 50-m running, standing long jump, and ball throwing among preschool children aged five and six. The partial goals are to analyse sex differences in these disciplines and to propose a preliminary, norm-referenced evaluation scale based on competitive performance outcomes.

METHODS

Preschool boys and girls from kindergartens in Osijek-Baranja County participated in this study. Participants were approximately six years old; however, exact birth dates and indicators of biological maturation were not available. The children competed in three athletic disciplines—standing long jump, 50-m sprint, and ball throwing—within the Olympic Festival of Kindergartens over a ten-year period (2007–2017).

The sample consisted of 60 boys and 60 girls, representing the ten best results from each sex across six different county-level competitions. It should be emphasized that the sample included exclusively top-performing preschool children who qualified for county-level finals. Consequently, the sample

represents a highly selected subgroup of physically active children who were already involved in structured physical activity and competitive preparation, rather than the general preschool population.

Basic descriptive statistics (mean, standard deviation, minimum, maximum, skewness, and kurtosis) were calculated for all variables. Sex differences in performance were examined using the independent samples t-test. In addition to t-values, exact p-values, degrees of freedom, and effect sizes (Cohen's d) were reported to ensure transparent and precise statistical interpretation. Effect sizes were interpreted according to Cohen's criteria (small ≈ 0.2 , moderate ≈ 0.5 , large ≥ 0.8).

Although data were collected across multiple years, the study was not designed as a longitudinal analysis tracking the same individuals over time. Instead, repeated cross-sectional competition results were used to derive stable performance benchmarks for applied evaluation purposes.

Individual results in each discipline were further analysed using frequency tables and distribution-based categorization. Performance scores were divided into five levels, graded from poor (1) to excellent (5), forming a norm-referenced evaluation scale based on competitive performance outcomes. This scale was intended as a practical classification tool for use in preschool sport settings rather than as a fully standardized psychometric instrument.

All statistical analyses were performed using STATISTICA for Windows, version 14.1.0.8.

RESULTS

The basic descriptive statistics for boys and girls in the three disciplines are presented in Table 1. Boys achieved higher mean values than girls in ball throwing (19.78 m vs 13.08 m), standing long jump (1.41 m vs 1.39 m), and 50-m sprint (9.88 s vs 10.09 s). The largest difference was observed in ball throwing, reflecting greater upper body strength and coordination among boys.

Sex differences in performance were examined using an independent samples t-test. A statistically significant difference was found in the 50-m sprint, with boys achieving faster times than girls, $t(118) = -2.07$, $p = 0.041$, Cohen's $d = -0.38$, indicating a small-to-moderate effect size. A large and statistically significant sex difference was observed in ball throwing, where boys achieved substantially higher results than girls, $t(118) = 6.51$, $p < 0.001$, Cohen's $d = 1.19$, reflecting a large effect size. In contrast, no statistically significant sex difference was found in the standing long jump, $t(118) = 0.64$, $p = 0.521$,

Table 1. Descriptive Statistics and t-values for Boys and Girls

Discipline	Sex	N	Mean	SD	Min	Max	Skew	Kurt	K-S D	t(df)	p	Cohen's d
50-m sprint (s)	F	60	10.09	0.53	8.57	11.08	-0.75	0.33	0.10			
	M	60	9.88	0.58	8.36	11.00	-0.07	-0.25	0.07	-2.07 (118)	0.0406	-0.38
Ball throw (m)	F	60	13.08	4.00	8.35	23.60	1.02	0.02	0.20			
	M	60	19.78	6.89	9.00	39.33	1.02	0.37	0.16	6.51 (118)	<0.001*	1.19
Standing long jump (m)	F	60	1.39	0.17	1.05	1.98	1.11	2.14	0.11			
	M	60	1.41	0.17	1.20	1.96	1.08	0.45	0.15	0.64 (118)	0.5206	0.12

Legend: N = number of participants; SD = standard deviation; Min = minimum; Max = maximum; Skew = skewness; Kurt = kurtosis; K-S D = Kolmogorov-Smirnov test statistic; t = t-test value; df = degrees of freedom; p = significance level; d = Cohen's d (effect size).

Table 2. Evaluation Marks for Preschool Children

Ball Throw Boys (m)	Ball Throw Girls (m)	Long Jump Boys (cm)	Long Jump Girls (cm)	50-m Sprint Boys (s)	50-m Sprint Girls (s)	Mark
≤12.79	≤10.25	≤129	≤116	≥10.68	≥10.77	1
12.80–20.37	10.26–14.06	130–148	117–139	10.67–10.02	10.76–10.14	2
20.38–27.95	14.07–17.88	149–167	140–163	10.01–9.36	10.13–9.52	3
27.96–35.53	17.89–21.69	168–186	164–186	9.35–8.70	9.51–8.89	4
>35.53	>21.70	>186	>186	<8.69	<8.88	5

Cohen's $d = 0.12$, suggesting a trivial effect size and comparable performance between boys and girls in this discipline. According to Cohen's criteria, the observed sex differences ranged from trivial (standing long jump), through small-to-moderate (50-m sprint), to large (ball throwing), indicating that sex-related performance differences were discipline-specific.

Table 2 presents a preliminary, norm-referenced evaluation scale based on competitive performance results obtained within the Olympic Festival of Kindergartens. The scale categorizes performance into five levels (from poor to excellent) and is intended primarily as a practical assessment tool rather than a fully standardized psychometric instrument. It is evident that boys achieved higher marks more frequently than girls in ball throwing and sprinting, reflecting their greater upper body strength and speed at this age.

The cut-off points for the five performance categories were determined using a distribution-based approach derived from the observed range of competition results. Performance intervals were constructed to ensure practical applicability and balanced classification rather than strict psychometric optimization. The scale is therefore norm-referenced to competitive performance and should be regarded as a preliminary classification tool rather than a validated assessment instrument.

DISCUSSION

The results of this study demonstrate clear sex differences in motor performance among preschool children, with boys outperforming girls in ball throwing and the 50-m sprint, while standing long jump performance remained largely comparable. The lower performance of girls in ball throwing may be attributed to the greater neuromotor complexity of the task, which requires coordinated involvement of the entire kinetic chain. At this age, girls may rely more on neuromotor control than on strength-based mechanisms, resulting in lower throwing efficiency. In contrast, standing long jump, which primarily depends on bilateral explosive leg action and involves less complex coordination, produced more balanced results between the sexes.

When county-level results are compared with performance indicators from the final competition of the 6th National Olympic Festival of Kindergartens (Cvenić, 2009), similar performance patterns emerge. In the 50-m sprint, boys' top ten times ranged between 8.51 and 9.08 seconds, while the best-performing girl achieved 8.47 seconds, outperforming all boys in that year's national final. In ball throwing, boys reached distances of 24.28–28.34 m, whereas girls achieved 13.34–17.27 m, further illustrating pronounced sex-related differences in

explosive upper-body performance. Standing long jump results again showed substantial overlap between sexes, with boys jumping 1.48–1.68 m and girls 1.49–1.57 m. These findings highlight both consistent sex-related trends and considerable inter-individual variability among high-performing preschool children.

Further comparison with the national dataset of 512 girls and 548 boys reported by Babić, Caput-Jogunica, Jelovčić, and De Privitellio (2008) supports the observed tendencies. In their large-scale sample, boys outperformed girls in ball throwing (16.48 m vs 10.44 m), standing long jump (1.42 m vs 1.33 m), and the 50-m sprint (9.80 s vs 10.14 s). The greatest difference was again observed in ball throwing, whereas differences in standing long jump were relatively small. Together with the present findings, these results confirm that sex differences in explosive strength and speed tend to emerge early in childhood, while coordination-based tasks show more uniform development between the sexes.

Differences in evaluation approaches also influence how performance distributions are interpreted. Babić et al. (2008) proposed a detailed ten-point classification system, later grouped into five marks, allowing fine discrimination of small performance differences. In contrast, the evaluation scale developed in the present study assigns broader performance ranges to each category, prioritizing practical usability over detailed differentiation. Despite these methodological differences, both approaches identify comparable developmental patterns, with boys more frequently occupying higher performance categories in ball throwing and sprinting, and overlapping distributions in standing long jump.

Although data were collected over a ten-year period, the present analysis was not designed as a longitudinal study following the same individuals over time. Instead, the aim was to derive stable performance benchmarks from repeated competitive events. Therefore, descriptive statistics, group comparisons, and effect size estimates were considered methodologically appropriate for the applied purpose of the study.

Taken together, comparisons across local, national, and historical datasets suggest that early engagement in physical activity—both structured and unstructured—supports motor development, while sex-based performance differences remain evident across competitive contexts. The proposed evaluation scale represents a practical and accessible tool for kindergarten educators and sports practitioners, enabling identification of motor strengths and areas requiring additional support within organized preschool sport settings. Given the absence of formal reliability and validity testing, the scale should be regarded as a preliminary, norm-referenced evaluative framework, intended for applied use in competitive preschool contexts rather than as a population-based developmental standard. In addition to biological factors, pedagogical and environmental

influences—such as encouragement, activity preferences, opportunities for movement practice, and instructional approaches in early childhood education—may also contribute to observed sex differences and should be considered alongside biological explanations.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

An important limitation of this study is the selective nature of the sample. The analysed results are based on the top-performing preschool children from county-level competitions and therefore do not represent the general preschool population. Consequently, the proposed evaluation scale should be interpreted as applicable primarily to physically active children participating in organized sport events, rather than as a normative reference for all preschool children.

Another limitation relates to age-related factors. Although participants were approximately six years old, exact age ranges, relative age effects, and indicators of biological maturation were not controlled for. Given the rapid developmental changes characteristic of early childhood, these factors may have influenced individual performance outcomes.

Furthermore, although the evaluation scale is based on a large set of competition results, no formal psychometric testing was conducted. Reliability and validity indicators were not assessed, and the scale should therefore be considered preliminary. Future research should examine test–retest reliability, construct validity, and applicability of the scale in non-competitive preschool settings.

Future studies should also aim to include broader and more heterogeneous samples, incorporate longitudinal designs, and explore the combined influence of biological, pedagogical, and environmental factors on motor development in early childhood.

CONCLUSIONS

This study highlights clear sex differences in motor performance among preschool children participating in athletic disciplines at the Olympic Festival of Kindergartens. Boys demonstrated superior results in ball throwing and sprinting, while performance in standing long jump was largely comparable between sexes. These findings are consistent with established developmental patterns, indicating that boys' advantage in explosive and upper-body strength emerges

early in childhood, whereas coordination-based abilities tend to develop more uniformly across the sexes.

Early engagement in structured physical activity, together with playful and inclusive programmes such as the Olympic Festival of Kindergartens, plays a crucial role in fostering motor competence, intrinsic motivation, and positive attitudes toward lifelong physical activity. By combining educational, health, and developmental objectives, such initiatives contribute substantially to the holistic growth and well-being of preschool children.

The proposed evaluation scale provides a practical and accessible tool for kindergarten educators and sports professionals to monitor children's progress in basic athletic skills. Systematic assessment and constructive feedback can help identify children who may benefit from additional support, encourage parental involvement in physical development, and promote the early adoption of healthy movement habits. The findings should therefore be interpreted primarily within the context of organized preschool sport, while future research is encouraged to validate the proposed evaluation scale in broader and more diverse preschool populations.

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