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The Influence of Movement Education Lessons Enriched with Various Sports Disciplines on Early Childhood Psychomotor Development

Haşim KATRA[1], Bilgetekin Burak GÜNAR[2], Onur AKGÜN[3], Sevilay TOZYILMAZ[4], Mehmet SARUHAN[5]

ABSTRACT

Purpose: This study investigated the comparative effects of three sport-specific movement training programs on motor skill development in preschool children.

Method: Twenty-three children aged six years participated in the study. After completing a pretest, participants were randomly assigned to one of three groups: aikido (n = 8), basketball (n = 7), or tennis (n = 8). Each group received sport-specific movement instruction twice weekly over an eight-week intervention period. Gross motor skills were assessed before and after the intervention using a gross muscle group motor skill test (GMST). All data were analyzed using appropriate nonparametric statistical procedures.

Results: Pretest results indicated no significant differences among the groups ($p > 0.05$). In contrast, posttest analyzes revealed a significant advantage for the basketball group compared with the aikido group in the object control subscale (basketball: 40.42 ± 2.820; aikido: 31.62 ± 5.449; $p < 0.05$) and in the total GMST score (basketball: 85.71 ± 4.572; aikido: 74.00 ± 6.325; $p < 0.05$). All three groups demonstrated significant improvements from pretest to posttest ($p < 0.05$), indicating positive effects of the training programs. However, comparisons of pretest–posttest difference scores showed no significant differences among the groups ($p > 0.05$).

Conclusion: Overall, the findings suggest that participation in aikido, basketball, or tennis–based movement education contributes to improvements in gross motor skill performance among preschool children. Basketball training, however, may provide relatively greater enhancement in skills requiring object control.

Keywords: Early Childhood, Motor Skill, Large Muscle Group, Development

ÖZET

Çeşitli Spor Disiplinleriyle Zenginleştirilmiş Hareket Eğitimi Derslerinin Erken Çocukluk Dönemi Psikomotor Gelişimine Etkisi

Amaç: Bu çalışmada, okul öncesi çocuklarda motor beceri gelişimine yönelik üç spor branşına özgü hareket antrenman programının karşılaştırmalı etkileri araştırılmıştır.

Yöntem: Çalışmaya altı yaşında yirmi üç çocuk katılmıştır. Ön test tamamlandıktan sonra katılımcılar rastgele üç gruptan birine atanmıştır: aikido (n = 8), basketbol (n = 7) veya tenis (n = 8). Her grup, sekiz haftalık bir müdahale dönemi boyunca haftada iki kez spora özgü hareket eğitimi almıştır. Kaba motor becerileri, müdahaleden önce ve sonra kaba kas grubu motor beceri testi kullanılarak değerlendirilmiştir. Tüm veriler parametrik olmayan istatistiksel prosedürler kullanılarak analiz edilmiştir.

[1] Çanakkale Onsekiz Mart University, Ayvacık Vocational School, Çanakkale/TURKIYE. ORCID NO: 0000-0002-6271-6114, hkatra@comu.edu.tr,
[2] Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Çanakkale/TURKIYE. ORCID NO: 0000-0001-7693-4844, burakgunar@comu.edu.tr
[3] Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Çanakkale/TURKIYE. ORCID NO: 0000-0001-5459-4383, onurakgun24@gmail.com,
[4] Çanakkale Onsekiz Mart University, Ayvacık Vocational School, Çanakkale/TURKIYE. ORCID NO: 0000-0002-6161-4140, tozyilmazsevilay@gmail.com,
[5] Independent Researcher (Trainer), Çanakkale/TURKIYE, ORCID NO: 0000-0002-0038-5305 m.saruhan56@gmail.com,

Bulgular: Ön test sonuçları, gruplar arasında anlamlı bir fark olmadığını göstermiştir ($p > 0,05$). Buna karşılık, son test analizleri, basketbol grubunun nesne kontrol alt ölçeğinde (basketbol: 40,42 ± 2,820; aikido: 31,62 ± 5,449; $p < 0,05$) ve toplam büyük kas grubu beceri testi (GMST, Gross Muscle Group Motor Skill Test) puanında (basketbol: 85,71 ± 4,572; aikido: 74,00 ± 6,325; $p < 0,05$) aikido grubuna kıyasla önemli bir avantaj ortaya koymuştur. Her üç grup da ön testten son teste önemli gelişmeler göstermiştir ($p < 0,05$), bu da eğitim programlarının olumlu etkilerini göstermektedir. Ancak, ön test-son test fark puanlarının karşılaştırılması, gruplar arasında anlamlı bir fark göstermemiştir ($p > 0,05$).
Sonuç: Genel olarak, bulgular aikido, basketbol veya tenis temelli hareket eğitimine katılımın okul öncesi çocuklarda kaba motor beceri performansında iyileşmelere katkıda bulunduğunu göstermektedir. Ancak basketbol eğitimi, nesne kontrolü gerektiren becerilerde nispeten daha fazla gelişme sağlayabilir.
Anahtar Kelimeler: Erken Çocukluk, Motor Beceri, Büyük Kas Grubu, Gelişim

INTRODUCTION

Early childhood represents a foundational developmental stage during which the core elements of physical, cognitive, and socio-emotional functioning emerge. Motor experiences acquired during this period play a critical role in shaping children's bodily awareness, movement competence, and interactions with their surroundings (Goodway et al., 2019). Developmental research consistently emphasizes that early childhood is a sensitive period in which structured physical engagement and environmental stimulation exert long-term influences on growth trajectories (Stephani et al., 2019). Moreover, adoption of an active lifestyle during childhood contributes to holistic development and supports positive health outcomes across the lifespan (Kerkez, 2012).

The acquisition of gross and fine motor skills is central to the development of children's autonomy. While daily tasks such as writing, eating, and self-care rely on fine motor proficiency, locomotor and object-control skills (e.g., walking, running, catching, striking) provide the foundation for more complex sport-specific movements (Stephani et al., 2019). Empirical evidence identifies motor skill competence as a key determinant of physical activity participation and a predictor of favorable long-term health indicators (Stodden et al., 2008; Robinson et al., 2015). Engagement in traditional childhood games and organized sport activities—such as hopscotch, basketball, and tennis—has been shown to facilitate the development of fundamental motor abilities, including running, catching, and striking (Robinson et al., 2015). This is because motor development occurs throughout life, with various stages in which motor skills are learned. As new motor skills are learned, the motor repertoire expands, broadening the scope of motor development (Benda et al., 2021). Consequently, educational institutions are encouraged to offer structured opportunities that

broaden children's physical activity experiences and promote motor competence both inside and outside the school environment (McDonough et al., 2020).

Developmental milestones indicate that ages 4–6 correspond to the fundamental movement phase, during which coordination skills rapidly progress and children begin to show interest in specific sport activities (Günsel, 2004). From ages 5–6 onward, systematic training in coordination, strength, reaction time, balance, speed, and flexibility becomes increasingly important for functional performance (Topkaya, 2004). During the broader 3–7 age range, children consolidate basic movement patterns and initiate coordination skills, with notable performance differences emerging between younger and older children in areas such as speed, balance, spatial orientation, and adaptability (Kale, 2003).

Motor skills are commonly categorized as open or closed skills. Open skills are executed in dynamic, unpredictable environments that require continuous adjustment, as seen in sports such as tennis, football, and surfing (Heilmann et al., 2022). Closed skills, in contrast, are performed under stable and predictable conditions, with movement initiation under the performer's control (Gallahue et al., 2012). Given their dependence on external stimuli and environmental variability, basketball, aikido, and tennis are generally considered open-skill sports.

Concerns surrounding global physical inactivity highlight the importance of establishing active behaviors during early childhood, when foundational motor patterns are formed. Structured movement education during this stage is critical for promoting lifelong physical activity engagement. In light of this, examining how sport-based movement programs influence motor development in early childhood represents a meaningful area of inquiry.

Therefore, the present study aims to examine the effects of movement education lessons supported by three different sports disciplines—basketball, aikido, and tennis—on the psychomotor skills of 6-year-old preschool children. Additionally, the study seeks to determine whether these sports yield differential effects on specific motor skill domains. Prior to the study, it was hypothesized that children participating in tennis and basketball—sports that predominantly rely on manipulative skills—would demonstrate superior performance in object-control abilities, whereas children trained in aikido would exhibit more advanced outcomes in displacement-related skills. The findings are expected to enhance the understanding of sport-based motor development in early childhood and provide evidence to guide educational practices that support physical activity engagement during the preschool years.

METHODS

Research Model

This study was designed using a quasi-experimental research model with repeated measures.

Participants

A convenience sampling method was employed, and the initial sample consisted of 30 six-year-old children enrolled at the Çanakkale Onsekiz Mart University Children's House Nursery and Kindergarten. Due to participant attrition for various reasons, the study was completed with 23 children. Following the pretest assessments, participants were randomly assigned to one of the three intervention groups—basketball, tennis, or aikido—and group homogeneity was verified based on pretest scores.

Throughout the eight-week intervention period, children received basic instruction in basketball, tennis, or aikido from expert trainers corresponding to their assigned group. Gross motor skill assessments were administered before and after the intervention. All test evaluations were conducted by two independent researchers who were not involved as branch instructors to enhance measurement reliability. Additionally, the researchers were responsible for administering the tests were blinded to the group assignments of the children.

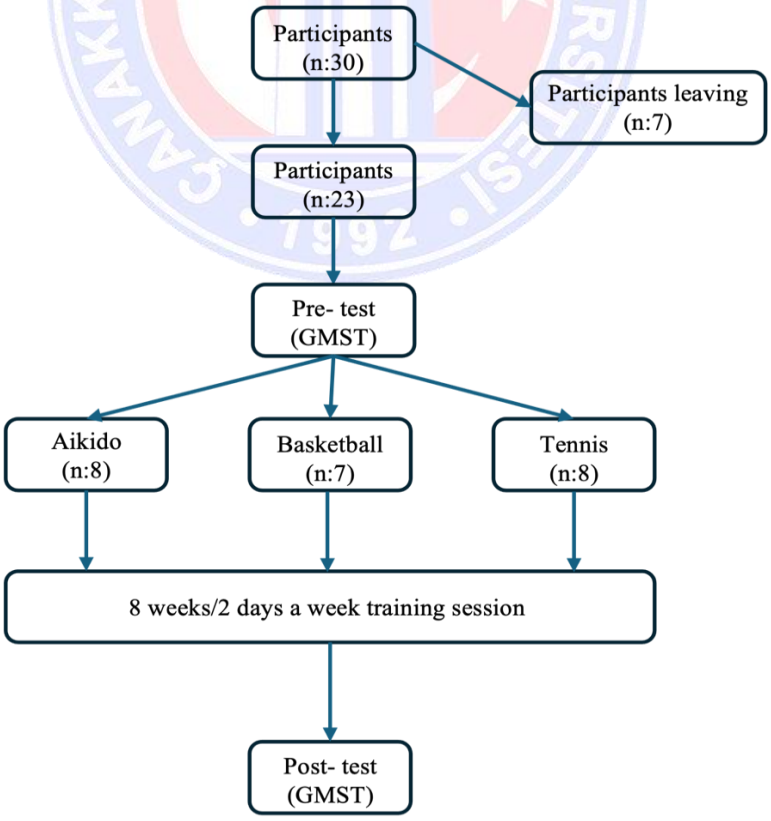


Figure 1. Schematic diagram of the study

Intervention Procedure and Data Collecting

Aikido Training Program: The aikido training was implemented indoors under the supervision of a certified aikido instructor. Sessions were conducted twice weekly for eight weeks, with each session lasting 35 minutes. The structure and content of the program are presented in Table 1. Each session included a warm-up phase, instruction in fundamental aikido techniques, parkour-based exercises designed to enhance physical development, and a cool-down component.

Table 1. Aikido training program content

Weeks	Training Content	Training period
1	• Warm-up: Animal walks (bear, frog, rabbit) • Aikido: Rei, kamae, tai sabaki • Parkour: Balance board → tunnel crossing → rolling on the mat • Cool-down: Inhale-exhale, stretching hands and feet	35 Minutes
2	• Warm-up: Hopping between colored cones, carrying the ball • Aikido: Tenkan, shikko • Parkure: Jumping rubbers → climbing stairs → touching the target • Cool-down: Cat stretch, deep breathing	35 Minutes
3	• Warm-up: Animal trots, backwalking • Aikido: Uke-nage introduction, kamae repetition • Parkour: Jump to target → crawl → ramp • Cool-down: Slow walk + seated stretch	35 Minutes
4	• Warm-up: Colorful station game • Aikido: Rolling, shikko + kamae • Parkour: Mat → obstacle crossing • Cool-down: Group sit + stretching	35 Minutes
5	• Warm-up: Mixed animal walks (bear, snake, kangaroo) • Aikido: Repetition of rei and kamae, uke-nage role reversal • Parkour: Balance board → tunnel crossing → ball target • Cool-down: Stretching + deep breathing	35 Minutes
6	• Warm-up: Walking quickly in a circle, stopping on command • Aikido: Combination of shikko and kamae, light pushing and balance exercises • Parkour: Hula hoop jumping → carrying a plush → clapping at the target • Cool-down: Seated stretching and breathing exercises	35 Minutes
7	• Warm-up: Colored stations, light competitive play • Aikido: Uke-nage practice (non-contact and contact) • Park: Mat → obstacle crossing → ball throwing at target • Cool-down: Seated stretching + breathing exercises	35 Minutes
8	• Warm-up: Mixed animal walks • Aikido: Self-confidence-building repetitions in partner training • Parkour: Jumping → crawling → reaching the target and saluting • Cool-down: Breath play + gratitude	35 Minutes

Basketball Training Program: The basketball training program was implemented indoors under the supervision of a qualified basketball coach. Sessions were conducted twice weekly over an eight-week period, with each session lasting 35 minutes. The program focused on introducing fundamental basketball skills appropriate for preschool children, utilizing a size-4 basketball suitable for this age group. The detailed session content is presented in Table 2. Height-adjustable hoops were used to facilitate proper shooting technique and to ensure that children could perform the skills with greater ease. During the intervention, the hoop height was standardized at 1.80 meters.

Table 2. Basketball training program content

Weeks	Training Content	Training period
1	• Training preparation exercises • Introducing the basketball • Rolling the ball and throwing and catching exercises • Bounce exercises • Introduction to the rules of basketball	35 Minutes
2	• Training preparation exercises • Basic ball-bounce exercises (right and left hands) • One-handed bouncing exercises, stopping on command, and bouncing exercises • Introduction to basic passing techniques • Introduction to the rules of basketball	35 Minutes
3	• Training preparation exercises • Basic ball-bounce exercises (slalom and zigzag slalom between cones) • Paired floor passing exercises • Shot preparation exercises • Introduction to the rules of basketball	35 Minutes
4	• Training preparation exercises • Basic ball-bounce exercises (slalom and zigzag slalom between cones) • Running chest passing exercises • Standing shots from close to the basket. • Course work including dribbling, passing, and shooting skills • Introduction to the rules of basketball	35 Minutes
5	• Preparatory exercises for training • Paired educational games to develop teamwork and cooperation • Jumping, balance, and coordination exercises with and without the ball • Introduction to the rules of basketball	35 Minutes
6	• Preparatory exercises for training • Paired educational games to develop teamwork and cooperation • Jumping, balance, and coordination exercises with and without the ball • Station work and shooting drills • Introduction to the rules of basketball	35 Minutes
7	• Preparatory exercises for training • Station work (balance, speed, and jumping) • Small group games • Shooting competition • Introduction to the rules of basketball	35 Minutes

8	• Preparatory exercises for training • Educational games involving balance, speed, and coordination with and without the ball • Passing, shooting, and dribbling competitions • Matches on small hoops	35 Minutes

Tennis Training Program: The tennis training program was delivered indoors by a certified tennis coach. Sessions were held twice per week for eight weeks, each lasting 35 minutes. Children used red balls (Stage 3; 36–42 cm diameter, low-pressure), which are recommended for beginners in early childhood. The structure and weekly progression of the eight-week basic tennis curriculum are shown in Table 3. The program was designed to develop motor skills, coordination, and foundational tennis techniques through age-appropriate and engaging game-based activities.

Table 3. Tennis training program content

Weeks	Training Content	Training period
1	• Animal Imitation (frog hop, penguin walk). • Running/catching game on colored markers • Ball Carrying: Balancing the ball with the racket and dropping it into the cone • Target Shooting: Hitting the ball on the ground and sending it to the designated target (ring/hoop) • Red Ball Hunt: Quickly collecting balls distributed on the court into the basket	35 Minutes
2	• Animal Imitation (frog hop, penguin walk). • Running/catching game on colored markers • Ball Carrying: Balancing the ball with the racket and dropping it into the cone • Target Shooting: Hitting the ball on the ground and sending it to the designated target (ring/hoop) • Red Ball Hunt: Quickly collecting balls distributed on the court into the basket	35 Minutes
3	• "Stop with Music" game (keeping the ball airborne when the music stops) • Wall Bounce: Slowly throw the ball against the wall with the racket and catch it. • Color Shot: Throw the ball at different colored cones (e.g., "Hit the blue!"). • Tunnel Run: Shoot the ball between the coach's legs.	35 Minutes
4	• "Stop with Music" game (keeping the ball airborne when the music stops) • Wall Bounce: Slowly throw the ball against the wall with the racket and catch it. • Color Shot: Throw the ball at different colored cones (e.g., "Hit the blue!"). • Tunnel Run: Shoot the ball between the coach's legs.	35 Minutes
5	• "Racket Dance": Free movement with the racket accompanied by music. • Bouncing Ball: Catching the ball with the racket after it bounces. • Obstacle Course: Dribbling the ball by slaloming between cones. • Target Serve: Throwing the ball to the opposite service box without touching the net. • "Rabbit and Carrot": The "carrot" that passes the ball over the net wins.	35 Minutes
6	• "Racket Dance": Free movement with the racket accompanied by music. • Bouncing Ball: Catching the ball with the racket after it bounces. • Obstacle Course: Dribbling the ball by slaloming between cones. • Target Serve: Throwing the ball to the opposite service box without touching the net.	35 Minutes

	• "Rabbit and Carrot": The "carrot" that passes the ball over the net wins.	
7	• "Catch the Ball": Running and catching a ball thrown by the coach. • Net-Front Rally: Standing close to the net and throwing balls to each other. • "3-Ball Rule": Scoring 3 successful shots scores a point. • "Gold Medal Competition": Children play mini-matches among themselves for 4 points.	35 Minutes
8	• "Catch the Ball": Running and catching a ball thrown by the coach. • Net-Front Rally: Standing close to the net and throwing balls to each other. • "3-Ball Rule": Scoring 3 successful shots scores a point. • "Gold Medal Competition": Children play mini-matches among themselves for 4 points.	35 Minutes

Gross Motor Skills Assessment Test (GMSAT): The Gross Motor Skills Assessment Test (GMSAT) was developed based on the Test of Gross Motor Development–Second Edition (TGMD-2), standardized according to American norm values by Ulrich (2000). The test is designed to assess the gross motor skills of children aged 3–10 years. It comprises two subscales: locomotor skills and object control skills. The locomotor subscale includes six skills—running, galloping, hopping, leaping, horizontal jumping, and sliding. The object control subscale also consists of six skills—striking a stationary ball, dribbling, catching, kicking, overhand throwing, and underhand rolling.

Each motor skill contains 3 to 5 observable performance criteria representing specific components of the skill. The locomotor and object control subtests each include 24 criteria. Children are given two trials for each skill, and performance is scored dichotomously: 1 point for correct execution of a criterion and 0 points for incorrect execution. Scores from the two trials are summed to obtain raw scores for each skill. Subtest scores are derived by summing the raw scores of the relevant skills, with each subtest yielding a maximum possible score of 48.

Ethical approval

Ethical approval for the study was obtained from the Çanakkale Onsekiz Mart University Graduate Education Institute Ethics Committee (Decision No. 04/35, dated March 21, 2024). In addition, informed consent was secured from the participants' families and the preschool institution.

Data Analysis

Data were analyzed using SPSS 24.0. Prior to conducting the analyses, the normality assumption of the dataset was evaluated with the Shapiro–Wilk test. The results indicated that the variables did not conform to a normal distribution ($p > 0.05$). Accordingly, non-parametric statistical methods were applied. The Wilcoxon signed-rank test was used to evaluate within-

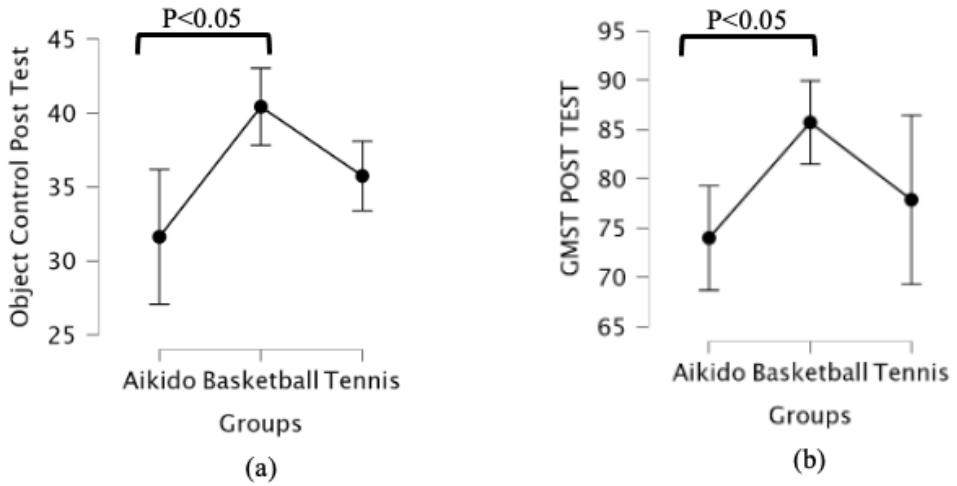
group differences between pretest and posttest results, whereas the Kruskal–Wallis test was used to compare pretest–posttest difference scores across groups. Following the identification of a significant difference in the Kruskal–Wallis analysis, the Tukey HSD (Honest Significant Difference) post hoc procedure was employed to specify which groups differed from one another. Statistical significance was determined at $p < 0.05$.

RESULTS

Table 4. Comparison of GMST scores by groups in pre-test and post-test

						95% CI			
						Upper	Lower		Post-hoc
Test	**Ability**	**Groups**	**n**	$\bar{X}$	**±**			**z**	**tukey**
Pre-Test	Displacement	Aikido	8	31.25	6.065	36.32	26.17	1.551	
		Basketball	7	35.57	6.503	41.58	29.55		
		Tennis	8	30.50	11.452	40.07	20.92		
	Object control	Aikido	8	18.87	3.944	22.17	15.57	3.199	
		Basketball	7	25.57	7.635	32.63	18.51		
		Tennis	8	24.25	7.440	30.47	18.03		
	GMST	Aikido	8	50.12	7.259	56.19	44.05	3.998	
		Basketball	7	61.14	9.771	70.18	52.10		
		Tennis	8	54.75	18.061	69.85	39.65		
Post-Test	Displacement	Aikido	8	42.37	5.290	46.79	37.95	0.887	
		Basketball	7	45.28	2.563	47.65	42.91		
		Tennis	8	42.12	8.061	48.86	35.38		
	Object control	Aikido	8	31.62	5.449	36.18	27.06	***10.869**	Basketball >aikido
		Basketball	7	40.42	2.820	43.03	37.82		
		Tennis	8	35.75	2.816	38.10	33.39		
	GMST	Aikido	8	74	6.325	79.28	68.71	***9.302**	Basketball >aikido
		Basketball	7	85.71	4.572	89.94	81.48		
		Tennis	8	77.87	10.260	86.45	69.29		

***p<0.05**



Graphic 1. Object control post-test results (a), GMST post-test results (b)

The findings of the Kruskal-Wallis test, conducted to compare the GMST test scores across the groups in both the pre-test and post-test phases, are presented in Table 4. The

analysis revealed no significant differences among the groups in the pre-test scores of GMST ($p>0.05$), indicating that the groups were homogeneous prior to the training intervention. However, in the post-test assessments, participants who received basketball training demonstrated significantly higher scores in the object control subscale and GMST scores compared to those who received aikido training (Basketball: $M = 40.42 \pm 2.820$; Aikido: $M = 74 \pm 6.325$; $p < 0.05$) (Graphic 1).

Table 5. Comparison of pre-test and post-test GMST scores of the groups

			Pre- test		**Post- test**		
Variables	**Groups**	**n**	$\bar{X}$	±	$\bar{X}$	±	**z**
Displacement	Aikido	8	31.25	6.065	42.37	5.290	***-2.366**
	Basketball	7	35.57	6.503	45.28	2.563	***-2.366**
	Tennis	8	30.50	11.452	42.12	8.061	***-2.521**
Object control	Aikido	8	18.87	3.944	31.62	5.449	***-2.521**
	Basketball	7	25.57	7.635	40.42	2.820	***-2.366**
	Tennis	8	24.25	7.440	35.75	2.816	***-2.380**
GMST	Aikido	8	50.12	7.259	74	6.325	***-2.521**
	Basketball	7	61.14	9.771	85.71	4.572	***-2.366**
	Tennis	8	54.75	18.061	77.87	10.260	***-2.366**

***p<0.05**

The results of the Wilcoxon signed-rank test, used to compare the pretest and posttest scores within each group, are presented in Table 5. The analysis indicated a significant difference between the pretest and posttest GMST scores across all groups, with higher scores observed in the posttest measurements ($p < 0.05$). These findings highlight the effectiveness of the branch-specific sports training implemented in each group.

Table 6. Comparison of GMST pre-test and post-test score differences by groups

Variables	**Groups**	**n**	**Pre- test**	**Post- test**	**Difference (Post-Pre test)**	**z**
Displacement	Aikido	8	31.25	42.37	11.12	0.248
	Basketball	7	35.57	45.28	9.714	
	Tennis	8	30.5	42.12	11.62	
Object control	Aikido	8	18.87	31.62	12.75	0.768
	Basketball	7	25.57	40.42	14.85	
	Tennis	8	24.25	35.75	11.5	
GMST	Aikido	8	50.12	74	23.87	0.121
	Basketball	7	61.14	85.71	24.57	
	Tennis	8	54.75	77.87	23.12	

***p<0.05**

The results of the Kruskal-Wallis test, conducted to compare the difference scores between pre-test and post-test measurements among the groups in the GMST, are presented in Table 6. The analysis revealed that the change scores from pre-test to post-test did not significantly differ across the groups ($p > 0.05$). Nevertheless, the greatest pre- to post-test

improvements were observed in the tennis group for the displacement subscale (Difference = 11.62), and in the basketball group for the object control subscale and GMST score (Differences = 14.85 and 24.57, respectively).

DISCUSSION and CONCLUSION

In this study, 6-year-old preschool children received basketball, aikido, and tennis training twice a week for eight weeks, and the aim was to examine changes in their gross motor skills. Analysis of the pretest and posttest scores within each sport group revealed significant improvements across all groups. This suggests that, beyond the natural developmental progression expected in children of this age, the sport-specific structures of basketball, aikido, and tennis contributed additional benefits to motor skill development. Similar findings have been reported in earlier studies involving physical activity interventions in comparable age groups. For example, Yıldırım et al. (2019) found that a six-month Long-Term Athlete Development (LTAD) based multibranch training program significantly improved both locomotor and object control skills in children aged 6–8, with notable increases in TGMD-2 scores across all groups. Vişne Yalçın (2024) also reported significant improvements in the motor development of children aged 4–6 following swimming-based training. Likewise, Mehtap (2024) demonstrated that a 12-week program incorporating educational game–supported physical activities produced substantial gains in the motor skills of 5–6-year-olds. Quan et al. (2024) observed considerable improvements in gross motor skills among 4–5-year-old children after a 15-week structured physical activity program. More broadly, findings from a meta-analysis by Sun and Chen (2024) further confirmed that sport- and game-based interventions produce meaningful enhancements in children's fundamental motor skills.

Although no statistically significant differences were found between the basketball, tennis, and aikido groups overall in GMST scores, this outcome may reflect the distinct developmental characteristics associated with each sport. Kezić et al. (2020) similarly reported no significant group differences in overall TGMD-2 scores across various sports. However, when examining pretest–posttest changes specifically in the object control subscale, the present study identified significant differences between the basketball and aikido groups, with the basketball group demonstrating superior improvement. This result is consistent with the manipulative nature of basketball, which emphasizes ball-handling skills such as passing and shooting. Supporting this notion, Kezić et al. (2020) found that although total TGMD-2 scores did not differ across groups, children participating in ball-based sports such as soccer

outperformed those in gymnastics or general sports programs in object control skills, suggesting that sport-specific demands influence manipulative skill development. Contrary to initial assumptions, the group that continued practicing tennis—recognized as one of the most influential sports for enhancing manipulative skills—did not show a significant difference from the other groups in the object control subscale. This outcome is likely attributable to the restricted sample size and the limited duration of the intervention.

In contrast to the current sample, Bastık et al. (2011) reported no significant differences in movement skills among 10-year-old male athletes across individual, team, and racket sports; However, they observed significant differences in object control and total TGMD-2 scores, highlighting the role of sport type in manipulative skill proficiency. Bayazit (2015) also demonstrated that a 12-week basketball skill program in 11-year-old girls produced significant improvements in movement, balance, and particularly manipulative skills, suggesting that basketball-specific drills can substantially enhance gross motor performance. Similarly, Fotrousi et al. (2012) found that mini-basketball training led to pronounced gains in children's fundamental movement skills, especially in ball-handling and other object control components. Meanwhile, Bojanić et al. (2018) observed that 6-year-old children participating in aikido training showed superior development in motor areas such as balance, strength, and explosive power.

In light of the findings of this study, it was concluded that six weeks of basketball, aikido, and tennis training led to meaningful improvements in the gross motor skills of preschool children. All groups demonstrated significant increases in motor skill scores from pre-test to post-test, indicating that structured and planned physical activity programs can yield measurable benefits even within a short intervention period.

Although no significant differences were detected among the groups in overall gross motor skill performance, the basketball group exhibited superior improvement in the object control subscale. This suggests that specific motor skill gains may vary depending on the inherent demands and structural characteristics of each sport.

These results highlight the importance of designing early childhood physical activity programs with careful attention to content and targeted motor skill dimensions. Tailoring training activities to the developmental needs of children and the specific skill components emphasized by each sport may enhance the effectiveness of motor skill acquisition in early childhood.

Suggestion

Planning sports training programs in early childhood should consider differences between sport branches in relation to children's motor development needs.

If the primary objective is to enhance manipulative skills, early exposure to ball-oriented sports—such as basketball, tennis, or handball—may be recommended.

If the goal is to improve balance, coordination, or related motor components, incorporating disciplines such as aikido into training programs would be appropriate.

The limited sample size and the eight-week duration of the intervention constitute notable constraints of the present study. Future investigations would benefit from implementing longer-term intervention protocols and conducting periodic evaluations to more clearly elucidate the effects of various sports on developmental trajectories.

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