Journal Sport Area
http://journal.uir.ac.id/index.php/JSP
Vol. 11. No. 2. August, (2026)

Effect of a hand–eye coordination-based small-sided games method on basketball passing accuracy

Hasna Tri Oktavia[abcde,*], Harry Pramono[abc], Ipang Setiawan[cde], & Hermawan Pamot Raharjo[cd]

Universitas Negeri Semarang, Indonesia

Received 02 June 2025; Accepted 12 August 2026; Published 30 August 2026
Ed 2026; *11*(2): 266-281

ABSTRACT

Background: Small-sided games (SSGs) provide a practical approach for developing basketball skills under game-like conditions. However, evidence comparing different SSG formats while considering players' hand–eye coordination remains limited. **Objectives:** This study aimed to examine the effects of 2v2 and 4v4 SSGs on basketball passing accuracy according to players' hand–eye coordination levels. **Methods:** A quantitative experimental study using a 2 × 2 factorial design was conducted. Thirty-two male adolescent basketball players (14.00 ± 1.05 years) participated in a six-week training program consisting of 16 sessions, including a pretest, 14 treatment sessions, and a posttest. The participants were categorized according to high and low hand–eye coordination and assigned to 2v2 or 4v4 SSG training groups. Passing accuracy was assessed before and after the intervention. Data were analyzed using two-way analysis of variance (ANOVA). **Results:** SSG format significantly affected passing accuracy ($p = .043$), as did hand–eye coordination level ($p = .029$). A significant interaction was found between SSG format and hand–eye coordination ($p = .006$). Among players with high hand–eye coordination, passing accuracy differed significantly between the 2v2 and 4v4 groups ($p = .001$), whereas no significant difference was found among players with low hand–eye coordination ($p = .540$). Within the 2v2 format, passing accuracy differed significantly between players with high and low hand–eye coordination ($p = .001$), whereas no significant difference was observed within the 4v4 format ($p = .630$). **Conclusion:** The effects of SSG format on passing accuracy varied according to hand–eye coordination level. The 2v2 format may provide greater opportunities for passing and ball involvement, whereas the 4v4 format may be more suitable for players with lower hand–eye coordination.

Keywords: Basketball; hand–eye coordination; passing accuracy; small-sided games; training method

https://doi.org/10.25299/sportarea.2026.vol11(2).22807

Hasna Tri Oktavia, Department of Physical Education, Faculty of Sport and Science, Universitas Negeri Semarang, Semarang, Indonesia
chasnatrie@students.unnes.ac.id

How to Cite: Oktavia, H. T., Pramono, H., Setiawan, I., Raharjo, H. P., & Kusuma, D. W. Y. (2026). Effect of a hand–eye coordination-based small-sided games method on basketball passing accuracy. *Journal Sport Area*, *11*(2), 266-282. https://doi.org/10.25299/sportarea.2026.vol11(2).22807

Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Basketball is a dynamic team sport that requires the integration of technical execution, tactical decision-making, and physical performance. Among fundamental basketball skills, passing is essential for maintaining ball circulation, creating scoring opportunities, and coordinating offensive and defensive transitions (Hasyim

& Saharullah, 2019). Effective passing requires not only technical proficiency but also the ability to perceive game situations, respond rapidly to environmental stimuli, and execute precise movements under pressure (Epure & Badau, 2021). Previous studies have reported inadequate passing proficiency among youth basketball players, which may be related to limited repetition of fundamental skills and insufficient exposure to game-based learning environments (Hardiansyah et al., 2022; Ramadhan et al., 2023; Ito, 2019). Similar conditions were observed during preliminary observations at the Ball High Basketball Club, where approximately 38% of passes during competitive games were unsuccessful or intercepted. Training sessions also emphasized tactical preparation more frequently than fundamental skill development, potentially limiting opportunities for athletes to practice passing under representative game conditions.

Conventional basketball training methods, including circuit training (CT), high-intensity interval training (HIIT), and basic drill training (BDT), can contribute to the development of physical and technical performance (Mallesh & T. N, 2018). However, these approaches differ in their capacity to reproduce the perceptual, decision-making, and interactional demands of competitive play. CT primarily emphasizes physical conditioning and may provide fewer opportunities for technical decision-making in game-like situations (Zanada, 2024). HIIT can improve cardiovascular and neuromuscular fitness but is not specifically designed to develop basketball-specific technical execution under dynamic game conditions (Coretti et al., 2024; Bendo et al., 2025). Similarly, BDT emphasizes repetitive practice of fundamental skills but may provide limited opportunities for players to apply those skills within dynamically changing tactical situations (Conte et al., 2017; Maggioni et al., 2019; Karahan, 2020). These limitations highlight the need for training approaches that integrate technical execution, tactical decision-making, and physical demands within representative game environments (Hasan, 2020; Hidayatullah et al., 2024; Klusemann et al., 2012).

Small-sided games (SSG) have emerged as a game-based training approach that can integrate technical skills, tactical awareness, decision-making, and physical demands within modified game situations (Amiruddin & Sartono, 2024; Supola et al., 2022). By manipulating the number of players and playing area, SSG can increase player involvement, ball contacts, and opportunities to execute technical skills under contextualized game conditions. This approach allows athletes to perform technical actions while simultaneously responding to teammates, opponents, space, and changing tactical situations (Hidayatullah et al., 2024). Consequently, SSG may provide a more representative training environment than isolated technical drills for developing skills that must be executed under competitive conditions.

Different SSG formats provide different task demands and learning opportunities. The 2v2 format generally increases individual involvement, ball possession, interpersonal interactions, and opportunities for repeated passing, whereas the 4v4 format more closely resembles the organizational demands of formal basketball by requiring greater attention to spatial positioning, off-ball movement, tactical organization, and collective coordination (Clemente & Sarmento, 2020; Delextrat & Martinez, 2014). Although both formats can support player development, previous research has reported differences in the technical and tactical demands generated by smaller and larger game formats (Candra, 2020; Sylvayoga & Prayoga, 2021). Smaller formats may increase technical involvement, whereas larger formats may provide greater opportunities for tactical organization and collective play. However, it remains unclear whether 2v2 or 4v4 SSG provides greater benefits for passing accuracy among adolescent basketball players.

The effect of SSG may also depend on individual perceptual-motor characteristics, particularly hand–eye coordination (HEC). Accurate passing requires the integration of visual information with upper-limb movement to determine the direction, timing, and force of ball release in response to changing game situations (Magill & Anderson, 2017; Tarigan & Wahjoedi, 2025; Hasan, 2020). Players with higher levels of HEC may be better able to process visual information, coordinate movement execution, and adjust passing direction and timing during dynamic play (Mendelson et al., 2022; Pasaribu, 2020; Buscemi et al., 2024). Therefore, differences in HEC may influence how athletes respond to different SSG formats. Rather than functioning solely as an individual performance characteristic, HEC may modify the extent to which a particular SSG format facilitates improvements in passing accuracy (Muhammad et al., 2023; Kusuma et al., 2020).

Despite evidence supporting the use of SSG and the relevance of HEC to basketball skill performance, limited research has simultaneously compared 2v2 and 4v4 SSG formats according to HEC level when

examining passing accuracy. Previous studies have generally examined SSG formats or coordination characteristics separately, leaving uncertainty regarding whether the effectiveness of a particular SSG format differs between athletes with high and low HEC. This issue is particularly relevant for adolescent players, whose technical performance may be influenced by both the characteristics of the training environment and individual perceptual-motor abilities. Clarifying this interaction may provide a more individualized basis for selecting game-based training formats.

Therefore, this study aimed to examine the effects of 2v2 and 4v4 small-sided games on basketball passing accuracy according to athletes' hand–eye coordination levels. Specifically, the study examined (i) the effect of SSG format on passing accuracy, (ii) the effect of HEC level on passing accuracy, and (iii) the interaction between SSG format and HEC level. The findings are expected to provide evidence to support the selection of game-based basketball training formats according to athletes' individual perceptual-motor characteristics.

METHODS

Study Design

This study employed a quantitative experimental design using a 2 × 2 factorial design to examine the effects of small-sided games (SSG) and hand-eye coordination (HEC) on basketball passing accuracy. The independent variable was the SSG format, consisting of 2v2 and 4v4, while HEC was classified into high and low levels. The dependent variable was basketball passing accuracy. The research was conducted over 6 weeks, comprising 16 sessions: one pretest, 14 treatment sessions, and one posttest.

Participants

The participants were 32 male adolescent basketball players from Ball High Basketball Club. Their mean age was 14.00 ± 1.05 years, mean height was 162.39 ± 4.81 cm, and mean body mass was 58.08 ± 9.12 kg. Participants were recruited using a non-probability sampling technique according to the predetermined inclusion criteria. Before participation, the athletes and their legal guardians were informed about the study procedures and their rights as research participants. Participation was voluntary, and informed consent was obtained before data collection.

Group Allocation

Participants were classified according to their hand-eye coordination (HEC) level and assigned to the SSG intervention conditions. The 2 × 2 factorial design resulted in four experimental groups: 2 × 2 with high HEC (HHEC), 2 × 2 with low HEC (LHEC), 4 × 4 with high HEC (HHEC), and 4 × 4 with low HEC (LHEC). The allocation of participants across the four experimental conditions is illustrated in **Figure 1**.

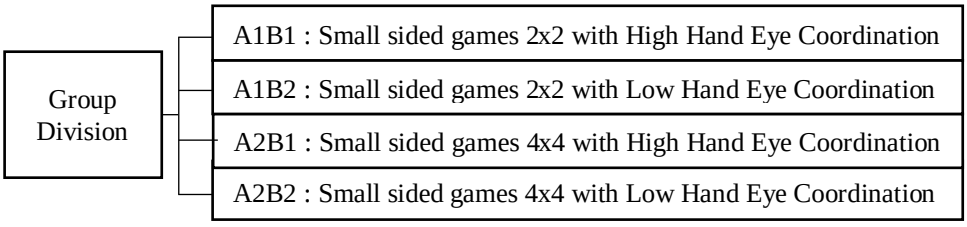

Figure 1. Group Division

Intervention Procedure

The intervention was conducted over 14 training sessions (Sessions 2–15) using two small-sided game (SSG) formats: 2 × 2 and 4 × 4. Both groups trained under identical environmental conditions on a half basketball court measuring 15 × 14 m, using one basketball hoop and a size 7 basketball. The intervention differed primarily in the number of players involved in each game format.

Each session consisted of repeated game sets with 5 min of active play and 2 min of passive recovery between sets. Players were limited to a maximum of three dribbles per possession to encourage ball circulation and passing frequency. The training load was progressively adjusted through the base-load duration, minimum

number of passes, prescribed overhead and baseball passes, number of sets, intensity, and time in possession. These parameters were progressively modified across the intervention while maintaining consistent environmental conditions and recovery procedures. The detailed progression of the training load for both SSG formats is presented in **Table 1**.

The game configuration and operational rules are presented in **Figure 2**. Each game began with a check ball between the attacking and defending players. The attacking team was required to meet the prescribed passing requirement before attempting to score, while the maximum number of dribbles was limited to three per possession. The attacking and defending roles were exchanged following a successful score or when the prescribed possession time elapsed without a score. These rules were applied consistently across the intervention to promote passing frequency, decision-making, and active player involvement.

Table 1. Progression of the Small-Sided Game Training Programme

Meeting	Activity	SSG 2 × 2				SSG 4 × 4				Training Load	
		Base Load (min)	Minimum Passes	OH/BB Passes	Sets	Base Load (min)	Minimum Passes	OH/BB Passes	Sets	Intensity	Time in Possession (s)
1	Pretest/baseline assessment	—	—	—	—	—	—	—	—	—	—
2	Intervention	5	3	5	8	5	7	5	7	Low	20
3	Intervention	6	4	6	11	6	9	5	9	Medium	20
4	Intervention	7	5	7	13	7	11	5	11	High	20
5	Intervention	5	3	5	9	5	8	5	8	Low	20
6	Intervention	7	4	7	12	7	10	5	10	Medium	20
7	Intervention	8	5	8	14	8	12	5	12	High	20
8	Intervention	6	4	6	10	6	9	5	9	Low	25
9	Intervention	7	5	7	13	7	11	5	11	Medium	25
10	Intervention	9	5	9	15	9	13	5	13	High	25
11	Intervention	7	4	7	12	7	11	5	11	Low	25
12	Intervention	8	5	8	14	8	12	5	12	Medium	25
13	Intervention	10	6	10	17	10	14	5	14	High	25
14	Intervention	7	4	7	12	7	11	5	11	Low	30
15	Intervention	9	5	9	15	9	13	5	13	Medium	30
16	Posttest/final assessment	—	—	—	—	—	—	—	—	—	—

Note. SSG = small-sided game; OH = overhead pass; BB = baseball pass; min = minutes; s = seconds. Meeting 1 consisted of baseline (pretest) assessments, Meetings 2–15 comprised the intervention sessions, and Meeting 16 consisted of the posttest/final assessment

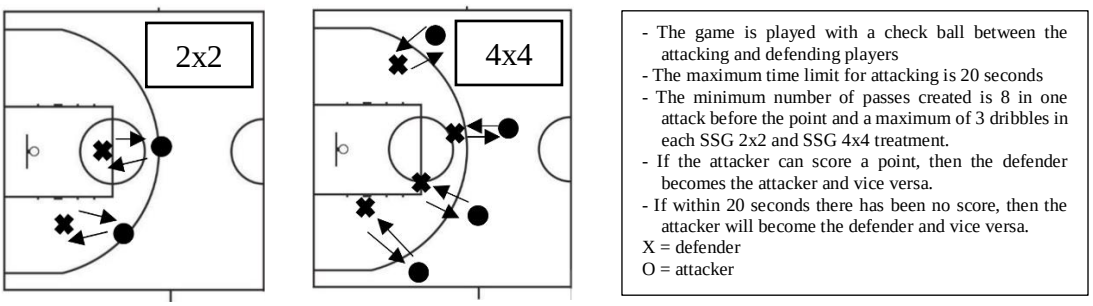

Figure 2. SSG 2x2 and SSG 4x4 Intervention

Data Measurement

Hand-Eye Coordination Test

Hand-eye coordination (HEC) was assessed using the Alternate Wall Toss Test. The test was administered before the intervention (pretest) and after completion of the intervention (posttest). The test has reported validity and reliability coefficients of 0.85 and 0.75, respectively (Cho et al., 2020). Based on the test results, participants were classified into high hand-eye coordination (HHEC) and low hand-eye coordination (LHEC) groups according to the predetermined classification criteria.

Passing Accuracy Test

Passing accuracy (PA) was assessed using the Basketball Throw for Accuracy item of the Johnson Basketball Test. The Johnson Basketball Test is a basketball skill test battery comprising three basic skill items: the Field Goal Speed Test, Basketball Throw for Accuracy, and Basketball Dribble Test. For the Basketball Throw for Accuracy test, participants stand 40 feet from a designated target and perform 10 attempts using an overhead or hook pass technique. The basic basketball ability battery has reported reliability and validity coefficients of 0.89 and 0.88, respectively (Clarke & Clarke, 1987). The test was administered at baseline (pretest) and after completion of the intervention (posttest). The resulting PA scores were used as the dependent variable in the statistical analysis to examine differences according to SSG format and HEC level.

Statistical Analysis

Data were analysed using IBM SPSS Statistics version 25. Descriptive statistics were presented as means and standard deviations. The assumptions of normality and homogeneity of variance were assessed using the Shapiro–Wilk test and Levene's test, respectively. A two-way analysis of variance (ANOVA) was conducted to examine the main effects of SSG format (2 × 2 vs. 4 × 4), HEC level (HHEC vs. LHEC), and their interaction on passing accuracy. When significant effects were identified, Tukey's honestly significant difference (HSD) test and pairwise comparisons were used to determine specific between-group differences. Statistical significance was set at $p < .05$.

Ethical Approval

Prior to data collection, permission to conduct the study was obtained from the management of Ball High Basketball Academy. All participants and their parents or legal guardians were provided with information about the study objectives, procedures, potential benefits, and possible risks before participation. Written informed assent was obtained from the participants, and written informed consent was obtained from their parents or legal guardians because all participants were minors. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time without penalty. All personal information and research data were kept confidential and used solely for research purposes. The study received ethical approval under Approval No. B/7864/UN37.3.1/KEP.00/2026.

RESULTS AND DISCUSSION

Results

Participant Characteristics

A total of 32 male adolescent basketball players participated in the study. The participants had a mean age of 14.00 ± 1.05 years, mean body weight of 58.08 ± 9.12 kg, and mean body height of 162.39 ± 4.81 cm. The participant characteristics are presented in **Table 2**.

Table 2. Participant Characteristics

Characteristic	Mean ± SD	n
Age (years)	14.00 ± 1.05	32
Body weight (kg)	58.08 ± 9.12	32
Body height (cm)	162.39 ± 4.81	32

Note. Values are presented as mean ± standard deviation (SD).

Descriptive Statistics

Descriptive statistics were calculated for hand-eye coordination (HEC) and passing accuracy (PA) at pretest and posttest. As shown in **Table 3**, mean PA increased from 9.94 ± 3.95 at pretest to 15.31 ± 4.51 at posttest. Mean HEC also increased from 41.97 ± 10.42 to 52.16 ± 10.22. These descriptive changes provide an overview of the pretest and posttest scores before the inferential analysis.

Table 3. Descriptive Statistics of Hand-Eye Coordination and Passing Accuracy

Variable	Pretest, Mean ± SD	Posttest, Mean ± SD
Passing accuracy	9.94 ± 3.95	15.31 ± 4.51
Hand-eye coordination	41.97 ± 10.42	52.16 ± 10.22

Note. SD = standard deviation.

Testing Tests of Statistical Assumptions

Before conducting the two-way ANOVA, the assumptions of normality and homogeneity of variance were assessed. As presented in **Table 4**, the Shapiro–Wilk test indicated that posttest passing accuracy was normally distributed ($W = 0.961$, $p = .285$). Levene's test indicated that the variances of posttest passing accuracy were homogeneous across the four experimental groups ($F = 1.247$, $p = .309$). Both tests yielded p values greater than .05, indicating that the assumptions of normality and homogeneity of variance were satisfied. Accordingly, the data were considered appropriate for the subsequent two-way ANOVA.

Table 4. Tests of Normality and Homogeneity

Test	Variable/Comparison	Statistic	*p*	Interpretation
Shapiro–Wilk	Posttest passing accuracy	0.961	.285	Normality assumption satisfied
Levene's test	Posttest passing accuracy across four groups	1.247	.309	Homogeneity assumption satisfied

Note. W = Shapiro–Wilk statistic; F = Levene's test statistic. Statistical significance was set at $p < .05$.

Main and Interaction Effects of SSG and Hand-Eye Coordination

A two-way ANOVA was conducted to examine the main effects of SSG format (2 × 2 vs. 4 × 4), HEC level (HHEC vs. LHEC), and their interaction on passing accuracy. As shown in **Table 5**, SSG format had a significant main effect on passing accuracy, $F = 4.479$, $p = .043$, partial $\eta^2 = .146$. HEC level also had a significant main effect, $F = 5.330$, $p = .029$, partial $\eta^2 = .159$.

Importantly, a significant interaction was observed between SSG format and HEC level, $F = 8.892$, $p = .006$, partial $\eta^2 = .242$. This interaction indicates that the effect of SSG format on passing accuracy differed according to the participants' level of hand-eye coordination.

Table 5. Two-Way ANOVA of Passing Accuracy

Effect	F	p	Partial η²
SSG format	4.479	.043*	.146
HEC level	5.330	.029*	.159
SSG format × HEC level	8.892	.006**	.242

Note. $p < .05$; *$p < .01$. SSG = small-sided game; HEC = hand-eye coordination; η^2 = eta squared.

Simple-Effects Comparisons

Because the SSG format × HEC level interaction was statistically significant, simple-effects comparisons were conducted to examine differences among the four experimental conditions. As shown in **Table 6**, passing accuracy differed significantly between the 2 × 2 and 4 × 4 SSG formats among participants with high HEC (p = .001). In contrast, no significant difference was observed between the two SSG formats among participants with low HEC (p = .540).

Within the 2 × 2 SSG condition, passing accuracy also differed significantly between the HHEC and LHEC groups (p = .001). However, no significant difference was observed between the HHEC and LHEC groups within the 4 × 4 SSG condition (p = .630). These findings indicate that differences in passing accuracy between SSG formats depended on HEC level.

Table 6. Simple-Effects Comparisons of Passing Accuracy

Comparison	*p*	Interpretation
2 × 2 vs. 4 × 4 among HHEC	.001	Significant
2 × 2 vs. 4 × 4 among LHEC	.540	Not significant
HHEC vs. LHEC within 2 × 2	.001	Significant
HHEC vs. LHEC within 4 × 4	.630	Not significant

Note. HHEC = high hand-eye coordination; LHEC = low hand-eye coordination. Statistical significance was set at $p < .05$.

Interaction Pattern

The interaction pattern is presented in **Figure 3**. The figure shows different patterns of passing accuracy across SSG formats according to HEC level. Among participants with high HEC, the 2 × 2 format showed higher passing accuracy than the 4 × 4 format, whereas the difference between the two formats was not statistically significant among participants with low HEC. Within the 2 × 2 format, passing accuracy differed between HHEC and LHEC groups, whereas no significant difference was observed between HHEC and LHEC within the 4 × 4 format.

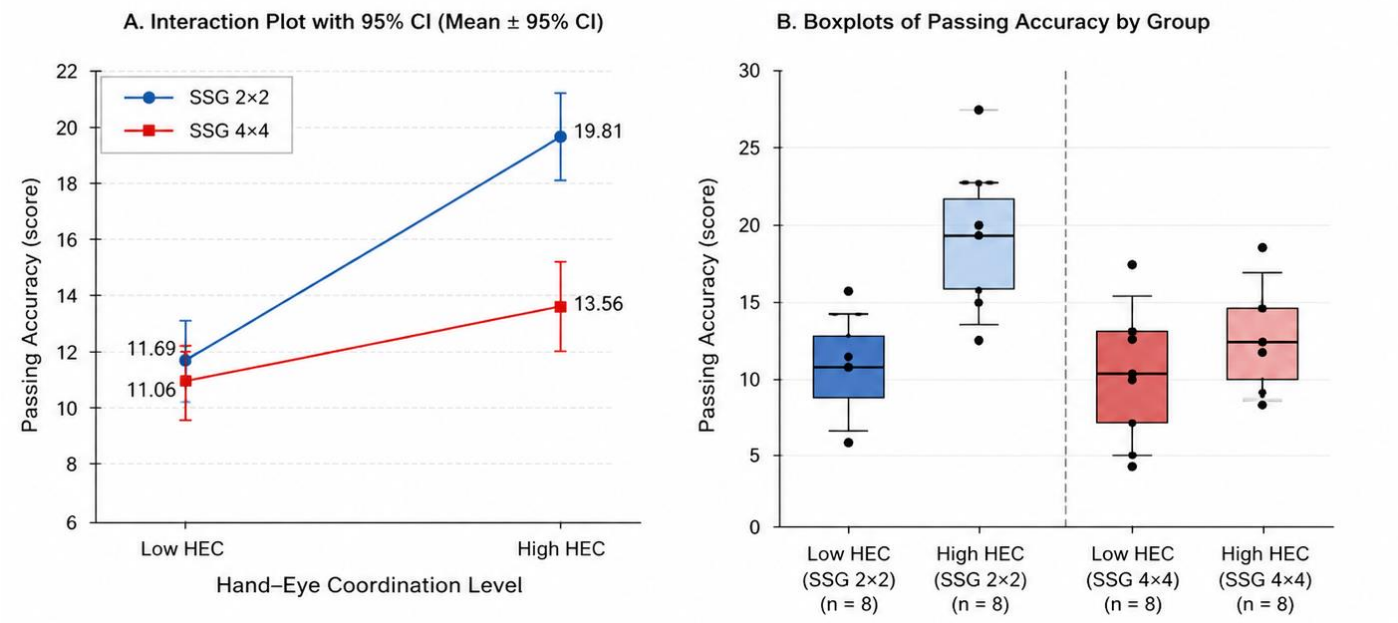

Figure 3. Interaction Between SSG Format and Hand-Eye Coordination Level in Passing Accuracy

Discussion

The 2x2 and 4x4 Small-Sided Games Method Influences PA

The research results indicate that the *F* value is 4.479 and the significance is 0.043 < 0.05, indicating that there is an effect of the small-sided-games model 2x2 and 4x4 on passing accuracy. The average calculation of small-sided games 4x4 results in a greater improvement score than 2x2, with a difference of 80 points. The 2x2 group has a difference in increase of 126. In addition to statistical significance, the effect size analysis showed a large practical effect of the SSG format on passing accuracy (partial $\eta^2 = 0.146$). This indicates that the difference between the 2x2 and 4x4 SSG formats was not only statistically significant but also practically meaningful in explaining variations in passing accuracy. Therefore, the findings suggest that selecting an appropriate SSG format may have substantial practical value for developing passing performance in youth basketball players.

SSG is a training method that simulates real conditions on the field (Souza et al., 2024). This method is applied using modification concepts such as format (number of players), size (field, relative area of each player, and restriction area), task conditioning (touch limitations, strategies, rules, scores, and floor types), age (age group, experience, and ability or knowledge), and training organisation (training rules and programmes) (Clemente & Sarmento, 2020). Several studies apply the concept of modification based on the presence or absence of targets in training (Cao et al., 2024). This study uses setting exercises on format, task conditioning, age, experience, and size.

SSG provides significant development of technical skills, especially in passing. Because SSG provides fun training for young basketball players (Arslsan et al., 2022). Delextrat and Martinez stated that SSG significantly increases PA compared to HIIT (high-intensity interval training). SSG optimises both lower body capabilities, such as HEC and legs, and upper body capabilities due to the repetition of increasing numbers of

passes during the game (Delextrat & Martinez, 2014). The increase is triggered by the number of players, the size of the field, the rules of the game, and the characteristics of the exercise itself (Alamsyah et al., 2023; Mccormick et al., 2012; Sansone et al., 2023). Alamsyah in 2023 explained that SSG can significantly increase PA in terms of the characteristics of the exercise, which provides many possible touches, ease of decision-making, facilitating opportunities for taking points, increasing space, and player involvement (Alamsyah et al., 2023). Training using this method also improves coordination, sensory acuity, mastery of technique, feeling, and accuracy (Hasyim & Saharullah, 2019).

This method fulfills the way of developing accuracy, such as repeated frequency as much as possible, target distance from near to far, slow to accelerated movement, and movement with precision and accuracy. This is used to produce automatic movement when the technique has been mastered (Hasyim & Saharullah, 2019). This exercise is considered more enjoyable and less boring than the drill method exercises. Because SSG training allows players to interact more with their teammates (Amiruddin & Sartono, 2024). This is in line with Thorndike's theory of behaviourism, in the law of effect, stating that actions followed by pleasant consequences tend to be repeated and improved (Tarigan & Wahjoedi, 2025).

The increase occurred more in the 2x2 SSG training format compared to 4x4. Research by Castagna states that modifying the number of players during SSG treatment affects the contact time with the ball. The fewer players, the greater the demand for participation during the game is running (Castagna et al., 2020; Ferioli et al., 2020). Fewer players reduce passing options, increase movement space, and require quick coordination responses. Larger players increase passing options, decrease movement space, and provide more movement time without the ball (Figueira et al., 2022). In addition to passing, the percentage of other technical skills, such as shooting and rebounding, also increases with the smaller format (Ferioli et al., 2020; Souza et al., 2024).

The space for movement due to the reduction in the number of players is expanded so that the movement options are more flexible and allow for various technical responses. The small game format will increase the space for movement and the percentage of passing created (Souza et al., 2024). The reduced number of players increases the repetition of passing, shooting, dribbling, and player involvement due to the lack of passing options (Sansone et al., 2019). Research by Castagna in 2020 also explained that implementing changes in the number of players can increase the demand for participation during the game (Castagna et al., 2020). This exercise also produces passing repetitions that resemble real matches (Alamsyah et al., 2023).

The smaller field size affects the AP because the player has more contact time with a longer ball (Mccormick et al., 2012). The small field's size requires players to move and constantly carry out technical skills such as passing (Conte et al., 2016; Gomes et al., 2021). In addition, there are restrictions on the task in this exercise, such as the number of dribbles, and the ball's possession time increases the amount of passing produced. These demands require players to have a good HEC (Sansone et al., 2019). This opinion is based on the theory that the exercise must be carried out continuously (Iqbal et al., 2021). Strengthened again using a study by Conte in 2016, which stated that restrictions on the number of dribbles can increase passing results, and decreasing the number of players can increase technical outcomes (Conte et al., 2016). In several studies, it is stated that SSG can improve technical and tactical skills. This is based on the movement and interaction between players and smaller groups (Conte et al., 2016; Köklü et al., 2017; Stojanovic et al., 2024).

HHEC and LHEC Influence PA

The research results indicate that the *F* value is 5.330 and the significance is 0.029 < 0.05. Thus, indicating an effect of high and low hand-eye coordination on passing accuracy. The average calculation of high hand-eye coordination yields a greater improvement score than low hand-eye coordination, with a difference of 48 points. The difference between pre- and post-high hand-eye coordination is 92 points. The effect size analysis further demonstrated a large effect of hand-eye coordination on passing accuracy (partial $\eta^2 = 0.159$). This finding suggests that hand-eye coordination accounted for a substantial proportion of the variance in passing accuracy, emphasising that coordination ability represents an important performance-related characteristic in youth basketball. Consequently, players with higher hand-eye coordination tended to achieve better passing performance throughout the intervention.

HEC is the ability to carry out movements or work quickly, precisely, and efficiently (Rosti, 2023). This competence is included in the biomotor component as a basis and is fundamental in improving and developing technical abilities (Syahruddin et al., 2023). This ability is the basis for combining different nervous system components or movements to produce effective and efficient movements (Saril et al., 2023). The game of basketball requires good HEC. Because the game of basketball has the characteristics of running quickly and suddenly, and movements that combine several parts of the body (Oktavia et al., 2025). SSG training also meets these characteristics. Moreover, the number of players, the size of the field, and the modified rules of the game modified (Mandić et al., 2019; Montgomery & Maloney, 2018). So SSG requires good coordination skills (Zeng et al., 2022). SSG also fulfills coordination elements such as combined movements, the presence of countermovements, and harmonious work between muscle nerves (Hasyim & Saharullah, 2019).

HEC is a fundamental biometric component. Coordination influences accuracy because the game's complex characteristics require sensory cooperation. Optimal HEC allows individuals to process visual information quickly and provide responses in hand movements that match the desired target. Sudden changes in the situation require rapid adaptation, and coordination plays a role in accelerating this response (Jyasaputra & Maliki, 2023). Coordination influences precision and control optimisation. Players direct and adjust target conditions. During dynamic activities, quick decision-making is needed to react. So coordination plays an important role in deciding the appropriate response (Susmita et al., 2023). Coordination also plays a role in minimising passing errors due to late responses and technical errors (Ikadarny & Karim, 2020).

There is an Interaction between the 2x2 and 4x4 SSG Methods and High and Low HEC on PA

The study's hypothesis test results show that SSG training and HEC (both high and low) impact PA. 0.006 < 0.05 is the significance value. Therefore, increasing PA is the common objective of both the 2x2 and 4x4 SSG groups, and both can be trained to help people with high and low HEC. According to the study, athletes with high HEC benefit more from the 2x2 SSG training method group. On the other hand, athletes with low HEC benefit more from the 4x4 SSG group.

Moreover, the interaction effect between SSG format and hand-eye coordination showed a large effect size (partial $\eta^2 = 0.242$), indicating that the effectiveness of the SSG intervention varied considerably according to players' hand-eye coordination level. This finding suggests that the influence of the training format should not be interpreted independently of players' coordination ability, as the benefits of each SSG format differed between athletes with high and low hand-eye coordination.

There is a Significant difference in Results in the HHEC Group between the 2x2 SSG and 4x4 SSG Groups on PA

The research results show that the 2x2 SSG group significantly differs from the 4x4 group in high eye-hand coordination. The sig is 0.001 < 0.05. The difference between the 2x2 SSG and 4x4 in high eye-hand coordination is 6.63 points, with a higher score in the small-sided-games 2x2 group.

Subjects with HHEC have a greater score increase in the 2x2 game format. This is because the characteristics of the 2x2 SSG game tend to be fast-paced, have limited passing options, and allow for broader movement than 4x4 (Cao et al., 2024). This format is better at increasing PA in players with HHEC (Pratama et al., 2024). Players with HHEC can carry out movement automation so that cognitive processes and information processing are dashed. The number of passes created is greater in the 2x2 format than in the 4x4, in line with the theory of behavioristic movement learning, especially Thorndike's connectionist opinion. In the law of practice, repeating specific responses will strengthen the connection between stimulus and response (Prawata, 2021). Other theories that strengthen this include schema theory Fitts and Posner's motor learning theory, which states that responses that are not repeated or reduced in portion will reduce motor skills. Conversely, if done often, it will strengthen skills (Schmidt & Lee, 2014). In line with this, the characteristics of the fast 2x2 format game by players with HHEC are by the principle of readiness in Thorndike's theory, that teaching skills to ready individuals will increase the success of the motor learning transfer process (Haibach et al., 2018).

There is no Significant difference in Results in the LHEC Group between the 2x2 SSG and 4x4 SSG Groups for PA

The research results indicate that the SSG 4x4 group has no significant difference with a significance level of 0.545 > 0.05. The difference between SSG 2x2 and 4x4 in hand-eye coordination is high at 1.13 points, with a greater increase in the small-sided games 4x4 group.

The increase was greater in the 4x4 SSG group. This is because the LHEC's ability has not been able to perfectly combine eye and hand stimuli due to the characteristics of the fast-paced, sudden training method and movements that combine several body parts (Oktavia et al., 2025). LHEC needs time to adjust movements to visualisations in the game (Mccormick et al., 2012). Participants with low coordination take longer to process information (Bredt et al., 2018; Gomes et al., 2021; Klusemann et al., 2012). In line with Hurlock's law of readiness theory, skills learned with the same time and effort by ready people will be superior to those not ready to learn (Magill & Anderson, 2017). The best improvement was seen in the 4x4 format. This is because the game's reaction is slower than 2x2, allowing more time to respond. LHEC requires time to adjust the movement to the visualization in the game (McCormick et al., 2012). The pressure generated from the game using the 4x4 format is lower than that of 2x2. So it takes more time to observe the game and passing potential. Players with LHEC can adjust involvement in certain positions more easily (Pratama et al., 2024).

There is a Significant difference in Results in the 2x2 SSG Group between the HHEC and LHEC Groups

The research results indicate that the small SSG 2x2 group has a significant difference with a significance level of 0.001 < 0.05. The difference between SSG 2x2 and 4x4 in hand-eye coordination is high at 6.88 points.

The 2x2 format improves passing accuracy in players with high hand-eye coordination (Pratama et al., 2024). This is because high hand-eye coordination makes it easier to adapt and move under heavy pressure. A wider movement area allows movement to find a position. However, because of the small number of players, more effort is needed to get a position without guarding (situational response and strategy adjustment)—more intensive player participation. SSG 2v2 requires high technical skills and fast passing. High coordination will speed up reaction time and multitasking ability in seeing teammates and passing reactions. Participants with low hand-eye coordination have difficulty implementing 2x2 due to the game's fast pace, requiring quick decision-making, high game pressure, and difficulty anticipating possible movements. Participants with low coordination need more time to process information (Bredt et al., 2018; Gomes et al., 2021; Klusemann et al., 2012).

There is no Significant difference in Results in the 4x4 SSG Group between the HHEC and LHEC Groups

The research results indicate that the SSG 4x4 group shows a significant difference with a sig of 0.638 > 0.05. The difference between SSG 2x2 and 4x4 in hand-eye coordination is as high as 0.88 points. Training using 4x4 SSG on HHEC and LHEC has no significant effect. This is because HHEC is too easy to implement the 4x4 SSG game, and LHEC has not been able to adapt to the game. In addition, the many player options for passing targets and low game pressure make players less forced to make complex and high-precision passes (Boros et al., 2022). In line with Hurlock's law of readiness, skills learned with the same time and effort by ready people will be superior to those not ready to learn. In addition, in line with Thorndike, if the stimulus given is weak or stopped, the motor skills possessed will (Tarigan & Wahjoedi, 2025). Training using SSG 4x4 provided greater improvement in the LHEC group. This is because the game reaction is slower than 2x2, allowing more time to respond. LHEC takes time to adjust movements to visualisations in the game (McCormick et al., 2012). The pressure the game generates using the 4x4 format is lower than that of 2x2. So that they have more time to observe the game and its passing potential, players with LHEC can also adjust their involvement in certain positions more easily (Pratama et al., 2024).

This finding shows that the SSG training models 2x2 and 4x4 can improve PA according to the biomotor capacity of HEC. This research contributes to the understanding of appropriate training according to the HEC of players in enhancing shooting accuracy based on SSG. This research is limited by the lack of variation in

the variables on biometric components (HEC), training methods (SSG 2x2 and 4x4), and techniques (shooting accuracy).

Practical Implications

The present findings provide several practical implications for basketball coaches and practitioners. The results suggest that the selection of small-sided game (SSG) formats should be adjusted according to players' hand-eye coordination levels rather than applying the same training format to all athletes. For players with high hand-eye coordination, the 2x2 SSG format may be more appropriate because it promotes greater ball involvement, more frequent passing repetitions, quicker decision-making, and higher technical demands. In contrast, the 4x4 SSG format may be more suitable for players with lower hand-eye coordination, as the increased number of teammates provides additional passing options and reduces game pressure, allowing players more time to perceive game situations and execute accurate passes. Therefore, coaches are encouraged to consider players' coordination abilities when designing SSG-based training programmes to maximise improvements in passing accuracy.

Limitations and Recommendations for Future Research

This study has several limitations that should be considered when interpreting the findings. First, the study examined only two SSG formats (2×2 and 4×4) and classified players into high and low hand-eye coordination groups. Consequently, the findings may not be generalisable to other SSG formats, coordination levels, or player characteristics. Second, the intervention focused specifically on passing accuracy and did not examine other important technical, tactical, physical, or perceptual-cognitive outcomes that may be influenced by SSG training. Third, the study did not quantify potentially relevant SSG characteristics, such as individual playing area, number of ball possessions, passing frequency, decision-making demands, movement intensity, and actual player involvement. Therefore, the mechanisms underlying the differential effects of the 2×2 and 4×4 formats cannot be established definitively. Fourth, the study involved a specific group of youth basketball players, which may limit the transferability of the findings to players of different ages, competitive levels, skill levels, or playing experience. Finally, the study assessed outcomes immediately following the intervention and therefore did not determine whether the observed improvements in passing accuracy were retained over time.

Future research should address these limitations by comparing a wider range of SSG formats and manipulating additional task constraints, including playing area, player-to-area ratio, possession duration, dribbling restrictions, scoring rules, and defensive pressure. Researchers should also examine the underlying mechanisms of SSG training by recording passing frequency, ball contacts, decision-making, movement demands, and player involvement during training. In addition, future studies should consider hand-eye coordination as a continuous characteristic rather than relying solely on high- and low-level group classifications. Longitudinal and follow-up assessments are also recommended to determine the retention and transfer of improvements to formal game performance. Finally, research involving larger and more diverse samples, including different age groups, competitive levels, and skill levels, would improve the generalisability of the findings and provide stronger evidence for individualised SSG prescription in basketball training.

CONCLUSION

The findings demonstrate significant differences in the effects of 2×2 and 4×4 small-sided games (SSGs) on passing accuracy, with the 2×2 format producing greater improvements than the 4×4 format. In addition, players with high hand-eye coordination demonstrated greater improvements in passing accuracy than those with low hand-eye coordination. A significant interaction was also observed between SSG format and hand-eye coordination level (partial $\eta^2 = 0.242$). Specifically, the 2×2 format was more effective for players with high hand-eye coordination, whereas the 4×4 format produced greater improvements among players with low hand-eye coordination. These findings indicate that the effectiveness of SSGs in improving passing accuracy is not determined solely by the game format but also depends on players' individual hand-eye coordination

levels. Therefore, SSG training should consider both task structure and individual coordination characteristics when designing training programs to optimize passing performance.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Faculty of Sports Science, Universitas Negeri Semarang, for providing academic support throughout this research. The authors also thank the athletes of BallHigh Basketball Club for their participation, cooperation, and contribution to the successful completion of this study.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

AI DISCLOSURE STATEMENT

The authors used QuillBot, an AI-assisted writing tool, solely for language editing, grammar checking, paraphrasing, and improving the clarity and readability of the manuscript. The authors reviewed and critically evaluated all AI-assisted outputs and retained full responsibility for the accuracy, originality, and integrity of the manuscript, including the study design, data analysis, interpretation of findings, and conclusions.

REFERENCES

Alamsyah, Hadasari, F. P., & Gustian, U. (2023). Pengaruh Latihan Small Sided Games terhadap Ketepatan Chest Pass pada Peserta Ekstrakulikuler Bola Basket. *JPPK: Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, *12*(2), 333–341. https://doi.org/10.26418/jppk.v12i2.62089

Amiruddin, S., & Sartono, S. (2024). Pengaruh Latihan Small Sided Game Terhadap Akurasi Passing Mendatar Siswa Ekstrakurikuler Sepakbola SMP Negeri 4 Ciawigebang. *Jurnal Pendidikan Jasmani Kesehatan dan Rekreasi (Penjaskesrek)*, *11*(2), 183–192. https://doi.org/10.46368/jpjkr.v11i2.2474

Arslan, E., Kilit, B., Clemente, F. M., Murawska-Ciałowicz, E., Soylu, Y., Sogut, M., Akca, F., Gokkaya, M., & Silva, A. F. (2022). Effects of Small-Sided Games Training versus High-Intensity Interval Training Approaches in Young Basketball Players. *International Journal of Environmental Research and Public Health*, *19*(5), 1–11. https://doi.org/10.3390/ijerph19052931

Beach, P. S., Reid, G., & Collier, D. H. (2017). *Motor Learning and Develoment*. Human Kinetics.

Bendo, A., Brovina, F., Bushati, S., Sallaku, D., Bushati, M., & Papa, E. (2025). The Effect Of High Interval Intensity Training (HITT) on The Performance of Basketball Players 10-15 Years Old. *Retos, 62,* 627-636. https://doi.org/10.47197/retos.v62.109315

Boros, Z., Toth, K., Csurilla, G., & Sterbenz, T. (2022). A Comparison of 5v5 and 3x3 Men's Basketball Regarding Shot Selection and Efficiency. *International Journal of Environmental Research and Public Health*, *19*(22), 1–12. https://doi.org/10.3390/ijerph192215137

Bredt, S. G. T., Morales, J. C. P., Andrade, A. G. P., Torres, J. O., Peixoto, G. H., Greco, P. J., Praça, G. M., & Chagas, M. H. (2018). Space Creation Dynamics in Basketball Small-Sided Games. *Perceptual and Motor Skills*, *125*(1), 162–176. https://doi.org/10.1177/0031512517725445

Buscemi, A., Mondelli, F., Biagini, I., Gueli, S., D'Agostino, A., & Coco, M. (2024). Role of Sport Vision in Performance: Systematic Review. *Journal of Functional Morphology and Kinesiology*, *9*(2), 1–17. https://doi.org/10.3390/jfmk9020092

Candra, O. (2020). The Contribution of Eye-Hand Coordination to Basketball Lay Up Shoot Skills. *Conference: 1st Progress in Social Science, Humanities and Education Research Symposium (PSSHERS 2019)*, 864–869. https://doi.org/10.2991/assehr.k.200824.192

Cao, J., Eakronnarongchai, W., & Duangkam, J. (2024). Small-Sided Games with Baskets Are Significantly More Effective at Enhancing Neuromuscular Force Parameters Compared to Ball Possession Games: A Randomized Controlled Study in Young Male Basketball Players. *Journal of Sports Science and Medicine*, *23*(3), 638–646. https://doi.org/10.52082/jssm.2024.638

Castagna, C., Krustrup, P., & Póvoas, S. (2020). Cardiovascular Fitness and Health Effects of Various Types of Team Sports for Adult and Elderly Inactive Individuals - a Brief Narrative Review. *Progress in Cardiovascular Diseases*, *63*(6), 709–722. https://doi.org/10.1016/j.pcad.2020.11.005

Cho, E. H., Yun, H. J., & So, W. Y. (2020). THE Validity of Alternative Hand Wall Toss Tests in Korean Children. *Journal Of Men's Health, 16*(1), e10–e18. https://doi.org/10.15586/jomh.v16i1.166

Clarke, H. H., & Clarke, D. H. (1987). *Application of measurement to physical education* (6th ed.). Prentice-Hall.

Clemente, F. M., & Sarmento, H. (2020). The Effects of Small-Sided Soccer Games on Technical Actions and Skills: A Systematic Review. *Human Movement*, *21*(3), 100–119. https://doi.org/10.5114/hm.2020.93014

Conte, D., Favero, T. G., Niederhausen, M., Capranica, L., & Tessitore, A. (2016). Effect of Different Number of Players and Training Regimes on Physiological and Technical Demands of Ball-Drills in Basketball. *Journal of Sports Sciences*, *34*(8), 780–786. https://doi.org/10.1080/02640414.2015.1069384

Conte, D., Favero, T., Niederhausen, M., Capranica, L., & Tessitore, A. (2017). Effect of Number of Players and Maturity on Ball-Drills Training Load in Youth Basketball. *Sports*, *5*(1). https://doi.org/10.3390/sports5010003

Coretti, M., Donatello, N. N., Bianco, G., & Cidral-Filho, F. J. (2024). An Integrative Review of the Effects of High-Intensity Interval Training on the Autonomic Nervous System. *Sports Medicine and Health Science*, *7*(2), 77–84. https://doi.org/10.1016/j.smhs.2024.08.002

Delextrat, A., & Martinez, A. (2014). Small-Sided Game Training Improves Aerobic Capacity and Technical Skills in Basketball Players. *International Journal of Sports Medicine*, *35*(5), 385–391. https://doi.org/10.1055/s-0033-1349107

Epure, M., & Badau, D. (2021). Study on Improving Coordination Skills in Women's Basketball Game. *Discobolul Physical Education, Sport and Kinetotherapy Journal*, *60*(2), 93–106. https://doi.org/10.35189/dpeskj.2021.60.2.2

Ferioli, D., Rucco, D., Rampinini, E., la Torre, A., Manfredi, M. M., & Conte, D. (2020). Combined Effect of Number of Players and Dribbling on Game-Based-Drill Demands in Basketball. *International Journal of Sports Physiology and Performance*, *15*(6), 825–832. https://doi.org/10.1123/ijspp.2019-0645

Figueira, B., Mateus, N., Esteves, P., Dadelienė, R., & Paulauskas, R. (2022). Physiological Responses and Technical-Tactical Performance of Youth Basketball Players: A Brief Comparison between 3x3 and 5x5 Basketball. *Journal of Sports Science and Medicine*, *21*(2), 332–340. https://doi.org/10.52082/jssm.2022.332

Fikri, F. B. R., Sofyan, D., & Yudha, B. A. R. . (2023). Analysis of Basketball Passing Basic Movement Skills in Extracurricular Students. *Journal Metrics Studies and Social Science*, *2*(1), 10–16. https://doi.org/10.56916/jmsss.v2i1.395

Gomes, J. H., Mendes, R. R., Delextrat, A., de Almeida, M. B., & Figueira Júnior, A. J. (2021). Small-Sided Games as Additional Training in Elite Basketball Nonstarters Players. *Revista Brasileira de Medicina Do Esporte*, *27*(2), 225–230. https://doi.org/10.1590/1517-8692202127022019_0003

Haibach, P. and Reid, G. and Collier, D. (2018). *Motor Learning and Development 2nd Edition*. Human Kinetics

Hidayatullah, M., Yaslindo, Y., Yulifri, Y., & Putra, A. (2024). Hubungan Koordinasi Mata Kaki dan Keseimbangan dengan Kemampuan Akurasi Shooting pada Pemain Futsal L.a Junior Muara Bungo. *Jurnal JPDO, 7*(1), 33-39.

Hardiansyah, A. N., Januarto, O. B., Darmawan, A., & Heynoek, F. P. (2022). Basketball Basic Skills Levels of Students in East Java, Indonesia. *Proceedings of the International Conference on Sports Science and Health (ICSSH 2022)*, 229–235. https://doi.org/10.2991/978-94-6463-072-5_23

Hasan, M. S. (2020). Sports Training and Performance. *Journal of Sports and Games*, *2*(1), 28–30. https://doi.org/10.22259/2642-8466.0201004

Hasyim & Saharullah. (2019). *Dasar Ilmu Kepelatihan Olahraga*. Badan Penerbit UNM

Ihsan, A., Tenine, M., & Syahruddin. (2023). Analisis Manajemen Pembinaan Prestasi Sepakbola PPLP Maluku. *Jurnal Penjakora*, *10*(2), 100–109. https://doi.org/10.23887/jurnalpenjakora.v10i2.66552

Ikadarny, & Karim, A. (2020). Kontribusi Koordinasi Mata Tangan, Kekuatan Otot Lengan, dan Keseimbangan Terhadap Kemampuan Passing Bawah pada Permainan Bola Voli. *Jendela Olahraga*, *5*(1), 59–66. https://doi.org/10.26877/jo.v5i1.4299

Iqbal, M., Syamsuramel, S., & Destriani, D. (2021). Pengaruh Latihan Lempar Tangkap Bola Menggunakan Sasaran terhadap Ketepatan Chest Pass Basket SMA. *EDUKATIF: Jurnal Ilmu Pendidikan*, *3*(4), 1945–1952. https://doi.org/10.31004/edukatif.v3i4.971

Ito, S. (2019). High-Intensity Interval Training for Health Benefits and Care of Cardiac Diseases-The Key to an Efficient Exercise Protocol. *World journal of cardiology*, *11*(7), 171–188. https://doi.org/10.4330/wjc.v11.i7.171

Jyasaputra, A. N., & Maliki, O. (2023). Hubungan koordinasi mata-tangan dengan ketepatan passing bawah voli SMAN 1 Mranggen. *Jurnal Spirit Edukasia*, *3*(2), 361–365.

Karahan, M. (2020). Effect of Skill-Based Training vs. Small-Sided Games on Physical Performance Improvement in Young Soccer Players. *Biology of Sport*, *37*(3), 305–312. https://doi.org/10.5114/biolsport.2020.96319

Klusemann, M. J., Pyne, D. B., Foster, C., & Drinkwater, E. J. (2012). Optimising Technical Skills and Physical Loading in Small-Sided Basketball Games. *Journal of Sports Sciences*, *30*(14), 1463–1471. https://doi.org/10.1080/02640414.2012.712714

Köklü, Y., Alemdaroğlu, U., Aksoy, & Gürmen. (2017). Comparaison Des Réponses Physiologiques Et Des Actions Techniques Sur Un Terrain Complet Chez Les Jeunes Joueurs De Basket-Ball. *Science and Sports*, *32*(6), e215–e220. https://doi.org/10.1016/j.scispo.2017.05.005

Kusuma, K. C. H., Nasuka, N., & Irawan, F. A. (2020). Effects of Shots Under The Basket Shoot and Eye-Hand Coordination on Shot Results in Basketball Extracurricular Students at MAN 1 Semarang. *Journal of Physical Education and Sports*, *9*(2), 131-137. https://doi.org/10.15294/jpes.v9i2.33985

Maggioni, M. A., Bonato, M., Stahn, A., Torre, A. La, Agnello, L., Vernillo, G., Castagna, C., & Merati, G. (2019). Effects of Ball Drills and Repeated-Sprint-Ability Training in Basketball Players. *International Journal of Sports Physiology and Performance*, *14*(6), 757–764. https://doi.org/10.1123/ijspp.2018-0433

Magill, R. A. ., & Anderson, D. I. (2017). *Motor Learning and Control: Concepts and Applications*. McGraw-Hill Education.

Mallesh, A., & T.N, S. (2018). Effectiveness of Sports Specific Circuit Training and High Intensity Interval Training on Aerobic Capacity in Male Basketball Players. *International Journal of Pharma and Bio Sciences*, *9*(2), 340–347. https://doi.org/10.22376/ijpbs.2018.9.2.b340-347

Mandić, R., Jakovljević S., S., Erèulj, F., & Štrumbelj, E. (2019). Trends in NBA and Euroleague Basketball: Analysis and Comparison of Statistical Data from 2000 to 2017. *PloS One, 14*(10), e0223524. https://doi.org/10.1371/journal.pone.0223524

McCormick, B. T., Hannon, J. C., Newton, M., Shultz, B., Miller, N., Young, W., Arias, J., & Jenkins, D. (2012). Comparison of Physical Activity in Small-Sided Basketball Games versus Full-Sided Games. *International Journal of Sports Science & Coaching*, *7*(4), 689–697. https://doi.org/10.1260/1747-9541.7.4.689

Mendelson, M., Chacaroun, S., Baillieul, S., Doutreleau, S., Guinot, M., Wuyam, B., Tamisier, R., Pépin, J. L., Estève, F., Tessier, D., Vergès, S., & Flore, P. (2022). Effects of High-Intensity Interval Training on Sustained Reduction in Cardiometabolic Risk Associated with Overweight/Obesity. A Randomized Trial. *Journal of Exercise Science and Fitness*, *20*(2), 172–181. https://doi.org/10.1016/j.jesf.2022.03.001

Montgomery, P. G., & Maloney, B. D. (2018). Three-By-Three Basketball: Inertial Movement and Physiological Demands during Elite Games. *International Journal of Sports Physiology and Performance*, *13*(9), 1169–1174. https://doi.org/10.1123/ijspp.2018-0031

Muhammad, G., Nirwandi, N., Neldi, H., & Martha, I. (2023). Kontribusi Kekuatan Otot Lengan dan Koordinasi Mata Tangan terhadap Kemampuan Chest Pass Siswa Ekstrakurikuler Putra Permainan Bola Basket SMAN 6 Kerinci. *Jurnal JPDO*, *6*(11), 39-45.

Oktavia, H. T., Setianingsih, M. R. Y., Assidiqi, M., & Raharjo, H. P. (2025). Studi Komparasi Pembelajaran Pendekatan Tarl Gaya Belajar, CRT dan Integrasi falam Peningkatan Keterampilan Bola Basket. *Gelanggang Olahraga: Jurnal Pendidikan Jasmani dan Olahraga (JPJO)*, *8*(3), 838–847. https://doi.org/10.31539/jpjo.v8i3.13111

Pasaribu, A. M. N. (2020). *Tes dan Pengukuran Olahraga*. Yayasan Pendidikan dan Sosial Indonesia Maju (YPSIM). Banten

Pratama, R. R., Fikri, A., Lubis, J., Samsudin, S., Widiastuti, W., Arisman, A., & Muslimin, M. (2024). The Effectiveness of Small Side Games in Increasing the Vo_2Max Ability of Football Athletes. *International Journal of Human Movement and Sports Sciences*, *12*(1), 1–8. https://doi.org/10.13189/saj.2024.120101

Prawata, I. M. Y. (2021). Pembelajaran Gerak dalam Pendidikan Jasmani dari Perespektif Merdeka Belajar. *Indonesian Journal of Educational Development*, *2*(2), 219–228. https://doi.org/10.5281/zenodo.5233331

Ramadhan, M. G., Ma'mun, A. Nuryadi, N., & Juliantine, T. (2023). Sports Policy on The Scope of Educational Sports Development Patterns: An Analysis Study. *JUARA: Jurnal Olahraga*. *8*(1), 443-457. https://doi.org/10.33222/juara.v8i1.2420

Rosti, R. (2023). Hubungan Kekuatan Otot Lengan dan Koordinasi Mata Tangan dengan Ketepatan Passing Chest Pass Bola Basket Siswa SMP Negeri 13 Kolaka Utara. *Jurnal Pedagogik Olahraga* 9(1), 8–17. https://doi.org/10.24114/jpor.v9i1.46526

Sansone, P., Tessitore, A., Paulauskas, H., Lukonaitiene, I., Tschan, H., Pliauga, V., & Conte, D. (2019). Physical and Physiological Demands and Hormonal Responses in Basketball Small-Sided Games with Different Tactical Tasks and Training Regimes. *Journal of Science and Medicine in Sport*, *22*(5), 602–606. https://doi.org/10.1016/j.jsams.2018.11.017

Sansone, P., Gasperi, L., Makivic, B., Gomez-Ruano, M. A., Tessitore, A., & Conte, D. (2023). An Ecological Investigation of Average and Peak External Load Intensities of Basketball Skills and Game-Based Training Drills. *Biology of Sport*, *40*(3), 649–656. https://doi.org/10.5114/biolsport.2023.119291

Saril, S., Dahrial, D., & Antoni, P. (2023). Kontribusi Kekuatan Otot Lengan dan Kelentukan Pergelangan Tangan Terhadap Ketepatan Shooting Petanque. *Integrated Sport Journal (ISJ)*, *1*(2), 78–88. https://doi.org/10.58707/isj.v1i2.550

Souza, W., Clemente, F., Goulart, K., Costa, G., Cunha, P., Figueiredo, L., Laporta, L., Reverdito, R., Leonardi, T., & Castro, H. (2024). Tactical and Technical Performance in Basketball Small-Sided Games: A Systematic Review. *Retos*, *56*, 554–566. https://doi.org/10.47197/retos.v56.104564

Schmidt, R. A., & Lee, T. D. (2014). *Motor Learning and Performance: From Principles to Application*. Human Kinetics.

Stojanovic, S., İlbak, İ., Lilić, A., & Kurhan, S. (2024). Heart Rate of Soccer Referees during Matches: A Systematic Review. *Turkish Journal of Kinesiology*, *10*(2), 131-137. https://doi.org/10.31459/turkjkin.1462145

Supola, B., Hoch, T., & Baca, A. (2022). The Role of Secondary Assists in Basketball–An Analysis of its Characteristics and Effect on Scoring. *International Journal of Performance Analysis in Sport*, *22*(2), 261–276. https://doi.org/10.1080/24748668.2022.2039090

Susmita, D., Jufrianis, & Sari, V. I. P. (2023). Kontribusi Koordinasi Mata-Tangan Terhadap Hasil Belajar Passing Bawah Bolavoli. *Skrinter : Jurnal Ilmu Olahraga*, *4*(3), 357–365. https://doi.org/10.46838/spr.v4i3.414

Syahruddin, S., Badaru, B., Saleh, M. S., Saleh, M. S., & Jufri, M. C. (2023). Keefektifan Bentuk Latihan dan Koordinasi Terhadap Keterampilan Chest Pass. *Multilateral : Jurnal Pendidikan Jasmani dan Olahraga*, *22*(2), 155. https://doi.org/10.20527/multilateral.v22i2.16192

Sylvayoga, A. P. N., & Prayoga, A. S. (2021). Pembelajaran Teknik Dasar Shooting Bola Basket dengan Modifikasi Alat Ring Gantung dan Bola Karet untuk Meningkatkan Hasil Belajar Siswa SDN Sonorejo I Tahun Ajaran 2020/2021. *JAS: Journal Active of Sport*, *1*(2), 19-27.

Tarigan, S. T. A., & Wahjoedi, W. (2025). Hubungan Koordinasi Mata dan Tangan dengan Kemampuan Dribbling dan Shooting pada Peserta Ekstrakulikuler Bola Basket di SMP Negeri 2 Singaraja. *Ranah Research: Journal of Multidisciplinary Research and Development*, *7*(3), 1550-1558. https://doi:10.38035/rrj.v7i3.1471

Yoga, I. K. I. A. A., Hita, I. P. A. D., & Mahotama, I. B. G. J. (2025). Efektivitas Strategi Pembelajaran Kooperatif Terhadap Penguasaan Teknik Pivot Pada Permainan Bola Basket. *Jurnal Ilmiah Multidisipin*, *3*(8), 596–605. https://doi.org/10.60126/jim.v3i8.1049

Zanada, J. F. (2024). *Pengaruh Metode Circuit dan Interval Training Terhadap Kelincahan dan VO2Max Atlet Basket Ditinjau dari Daya Tahan Otot Tungkai*. Thesis. Universitas Negeri Yogyakarta.

Zeng, J., Xu, J., Xu, Y., Zhou, W., & Xu, F. (2022). Effects of 4-Week Small-Sided Games vs. High-Intensity Interval Training with Changes of Direction in Female Collegiate Basketball Players. *International Journal of Sports Science and Coaching*, *17*(2), 366–375. https://doi.org/10.1177/17479541211032739