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The Effect of Small-Sided Games on Enhancing Some Physical and Fundamental Skills in Middle School Basketball Students

Lect. Dr. Ahmed Amer Abdulhussain *

University of Baghdad. College of Physical Education and Sport Sciences,Iraq.

*Corresponding author: ahmed.a@cope.uobaghdad.edu.iq

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Abstract

This study aimed to investigate the effect of small-sided games (SSGs) on enhancing selected physical (agility, strength) and fundamental (passing, shooting) basketball skills among middle school students aged 13-15 years at Al-Qadisiyah Preparatory School for Boys. A quasi-experimental design was employed, involving 60 male students divided into an experimental group (n=30, SSG-based training) and a control group (n=30, traditional training) over 12 weeks, with three 45-minute sessions weekly. Pre- and post-tests assessed agility (Illinois Agility Test), strength (Vertical Jump Test), and fundamental skills (AAHPERD Basketball Skills Test). Data were analyzed using SPSS v.26, with paired and independent t-tests ($p < 0.05$) and Cohen's d for effect sizes. The experimental group showed significant improvements in agility, strength, passing, and shooting ($p < 0.001$, Cohen's $d > 1.65$), outperforming the control group, which exhibited minimal gains ($p \leq 0.043$, Cohen's $d < 0.56$). Fundamental skills showed larger effect sizes, suggesting greater technical benefits. SSGs are an effective pedagogical tool for enhancing physical and fundamental basketball skills in middle school settings, supporting their integration into physical education curricula to foster holistic athletic development.

Keyword: Small-Sided Games, Physical Skills, Fundamental Skills, Basketball, Middle School Students.

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Introduction

Small-Sided Games (SSGs) are an innovative pedagogical approach, which is employed in physical education to develop basic skills and physical parameters in team sports of basketball. SSGs are designed to reduce number of players and playing area with the main objective to increase interaction allowing motor and technical repetition (1). This study will examine the effectiveness of SSGs on physical skills (e.g., agility and power) as well as fundamental skills (e.g., passing and shooting) in basketball, among middle school students at the ages of 13–15 years.

Although an increasing body of evidence has demonstrated the beneficial effects of SSGs on physical and technical performance in young athletes (2,3), there is a lack of investigations among middle school students in Arab countries, and even less research was conducted within schools as part of Physical Education (4). While much research has focused on professional players or older youth, there remain knowledge gaps regarding the influence of SSGs in physical and fundamental skills during early developmental stages (1,5). This requires experimental studies to measure basic areas of performance, such as passing or shooting ability quantitatively and within the educational context (1).

the study aims to assess the impact of an SSG-based intervention on enhancing agility and strength and identify changes in passing and shooting at post-intervention as well as compare performance between the experimental group (EG) and control group (CG). The hypothesized that SSGs will lead to superior physical (agility and strength) and fundamental (passing and shooting) skills in experimental group over control group ($p < 0.05$), where improvement in fundamental are assumed to be more pronounced as compared to improvements in Ball Passing techniques due factor that SSGs promote ball repetition utility principles.

This research is significant as it aids in informing the design of physical education curricula for middle school by offering an interactive and efficacious instructional model which has the potential to develop physical literacy and fundamental movement skills (6). This study bridged

this research gap by integrating theoretical and empirical analytic work that explored this phenomenon in Arab adolescents for the first time within the literature, which in turn could inform educational programming (7).

SSGs can enhance interest in sports, as well as decreasing the risk of injury by working to improve motor coordination (8). A few recent works have shown how SSG can enhance physical fitness and technical performance (9,10) as well as psychological responses (5). For example, the use of technologies such as FIT LIGHT has been shown to improve physical outcomes (4), while SSGs combined with performance under pressure is well-designed and facilitates superior skill behaviors from these games (11). The present research contributes to current research stressing play-based learning based on the illustrated literatures (12,13).

Materials and Methods

Study Design

Using a quasi-experimental design with pre-test and post-tests, the study investigated the effects of small-sided games (SSGs) on physical and fundamental skills in basketball. This a priori designed included two groups: an experimental SSG-group that underwent 12-weeks of training based on the principles of small-sided games, and not organized games, as suggested by standard basketball practice; while a control group (CG) followed traditional basketball training demands. The intervention was a 45-min session three times/week, with 3v3 or 2v2 games with rule modifications (e.g., no walls in 3V3 format) to give players more touches on the ball. A quasi-experimental design was selected because of the impracticality and ethical considerations for random assignment in a school context (e.g., students progressed together through existing classes) as well as the need to maintain age, experience, and baseline skill equivalence. All procedures in this study complied with ethical standards, including informed consent obtained from the subjects and a guardian and permission for conducting the research was obtained from school administration.

Participants

The sample consisted of male students from Al-Qadisiyah Preparatory School for Boys, the age group of 13 to 15 years who were registered in the physical education program with (Lack basketball professional training or have previously sustained any chronic injury). A total of 60 students were selected to cover their grades by stratified random sampling so that 30 belonged to the experimental group and 30 for control. Inclusion criteria included regular attendance in physical education classes, absence of musculoskeletal disorders, and parental consent for participation. Exclusion criteria encompassed any history of recent injuries, absence from more than two sessions during the intervention, or involvement in external sports clubs that could confound the results. Demographic data, such as age, height, weight, and, the variable of the study was collected at baseline to confirm group homogeneity, with no significant differences observed ($p > 0.05$), as shown in table 1.

Table 1: show Means and Standard Deviations for Age, Height, Weight, and Variables for the Experimental and Control Groups

Variable	Experimental Group	Control Group	t-value	p-value
Age (years)	14.2 ± 0.8	14.3 ± 0.7	0.52	0.61
Height (cm)	165.4 ± 5.6	164.8 ± 5.9	0.41	0.68
Weight (kg)	55.7 ± 6.2	56.1 ± 6.5	0.25	0.80
Agility (seconds)	18.4 ± 1.3	18.5 ± 1.2	0.31	0.76
Strength (cm)	42.7 ± 4.8	42.9 ± 4.6	0.16	0.87
Passing (points)	12.6 ± 1.7	12.5 ± 1.6	0.23	0.82
Shooting (points)	10.8 ± 1.9	10.7 ± 1.8	0.20	0.84
***: significant at p<0.05**				

Tools and Equipment

Physical function was tested as well by standardized task measurements: the Illinois Agility Test for agility (14), where participants were required to complete a course with sprinting, turning, and weaving between cones; and the Vertical Jump Test for strength (15), using an attached tape measure mounted on a wall to record maximum jump height in centimeters. Basic skills were assessed by the AAHPERD Basketball Skills Test including passing accuracy and shooting proficiency with free throws and lay-ups out of 20 (measured as how many successful shots recorded) were used to measure practice skill effectiveness (16). Equipment The equipment used was standard basketballs (size 6 for youth), timing equipment provided as digital stopwatches accurate to.01 seconds, measuring tapes, cones for placement around agility course distances on the court, video cameras for fidelity of sessions and a FIT LIGHT training system which allowed quantitative analysis of reactions for reaction-based drills within SSG. All instruments were calibrated and pilot-tested in a subset of 10 non-participants to have Cronbach's alpha values for all measures greater than 0.85.

Procedures

The experiment was carried out at Al-Qadisiyah Preparatory School for Boys, on the school's outdoor basketball court during physical education class time to reduce distractions. Pre-testing was conducted over 2 days in the first week of play with players undertaking agility and strength assessments individually, supervised skills were also measured before playing small sided games. After the warm-up, the experimental group participated into SSG program that included (i) core: 3v3 games with scoring incentives for passes and shots (SR intensity – 35 minutes) and (ii) cool-down session (5 minutes). The sessions were performed by competent PE teachers specially trained in SSGs, and the progressions (complexifying) of tasks followed a 12-week process including timed pressures or defensive rules. The control condition participated in traditional drills which emphasized individual skill work in the absence of competition aspects. Attendance was also taken, with makeup sessions available for any

missed classes. Post-tests were identical to the pre-tests and administered immediately after the intervention using similar settings. The information was obtained in a blind manner by physicians who administered the questionnaires (i.e., they were unaware of group distribution and thus not biased).

Table 2: Small-Sided Games (SSGs) Physical Education Curriculum (12-Week Intervention)

Week	Focus Area	Activities	Duration	Key Objectives	Modified Rules
1-2	Introduction to SSGs	2v2 and 3v3 games, basic passing, and dribbling drills	45 min/session, 2 sessions/week	Familiarize students with SSG rules, enhance ball handling	Smaller court (half court), no defensive pressure, reward for successful passes
3-4	Agility and Movement	3v3 games with emphasis on cutting and sprinting	45 min/session, 2 sessions/week	Improve agility and game-like movements	Reduced court size, encourage quick transitions, offensive rewards (e.g., extra points for fast breaks)
5-6	Shooting Skills	2v2 and 4v4 games focusing on shooting under pressure	45 min/session, 2 sessions/week	Enhance shooting accuracy and decision-making	Smaller teams, constrained spaces, bonus points for shots from specific zones
7-8	Passing and Teamwork	3v3 and 4v4 games with	45 min/session, 2	Develop passing	Limited dribbling (max 3 dribbles),

		focus on passing sequences	sessions/week	accuracy and teamwork	reward for consecutive passes
9-10	Explosive Power	3v3 games with vertical jump and rebounding tasks	45 min/session, 2 sessions/week	Increase lower-body power and rebounding skills	Include jump-based challenges, smaller court to increase intensity
11-12	Game Scenarios	Full 4v4 games simulating match conditions	45 min/session, 2 sessions/week	Apply skills in game-like contexts, enhance tactical decision-making	Modified rules (e.g., no fouling, reward for offensive plays), full court

Statistical Analysis

Data were analyzed following the use of IBM SPSS Statistics 26.0 software. All variables were described in terms of descriptive statistics (i.e., mean and standard deviation). The assumption of normality was tested for and confirmed using the Shapiro-Wilk test. The repeated-measures paired t-test was conducted to compare within-group differences between pre- and post-tests, independent t-tests were used to compare between group differences. Effect sizes were reported using Cohen's d to quantify the magnitude of changes, with thresholds of 0.2 (small), 0.5 (medium), and 0.8 (large). Significance was set at $p < 0.05$, and all analyses were two-tailed to account for potential unexpected directions.

Result

Table 3: show the Pre- and Post-Test Means and Standard Deviations for Physical Skills (Experimental vs. Control Group)

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value	Cohen's d
Agility (seconds)	Experimental	16.1 ± 0.9	20.0 ± 1.3	8.45	0.000	1.91
	Control	17.9 ± 1.1	18.5 ± 1.2	2.12	0.043	0.48
Strength (cm)	Experimental	42.7 ± 4.8	49.5 ± 4.2	7.23	0.000	1.65
	Control	42.9 ± 4.6	44.2 ± 4.5	1.89	0.068	0.43
*: significant at p<0.05						

Table 4: show the Pre- and Post-Test Means and Standard Deviations for Fundamental Skills (Experimental vs. Control Group)

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value	Cohen's d
Passing	Experimental	12.6 ± 1.7	18.2 ± 1.4	9.12	0.000	2.07
	Control	12.5 ± 1.6	13.8 ± 1.5	2.45	0.020	0.56
Shooting	Experimental	10.8 ± 1.9	16.5 ± 1.6	8.89	0.001	2.01
	Control	10.7 ± 1.8	11.9 ± 1.7	2.31	0.028	0.52
*: significant at p<0.05						

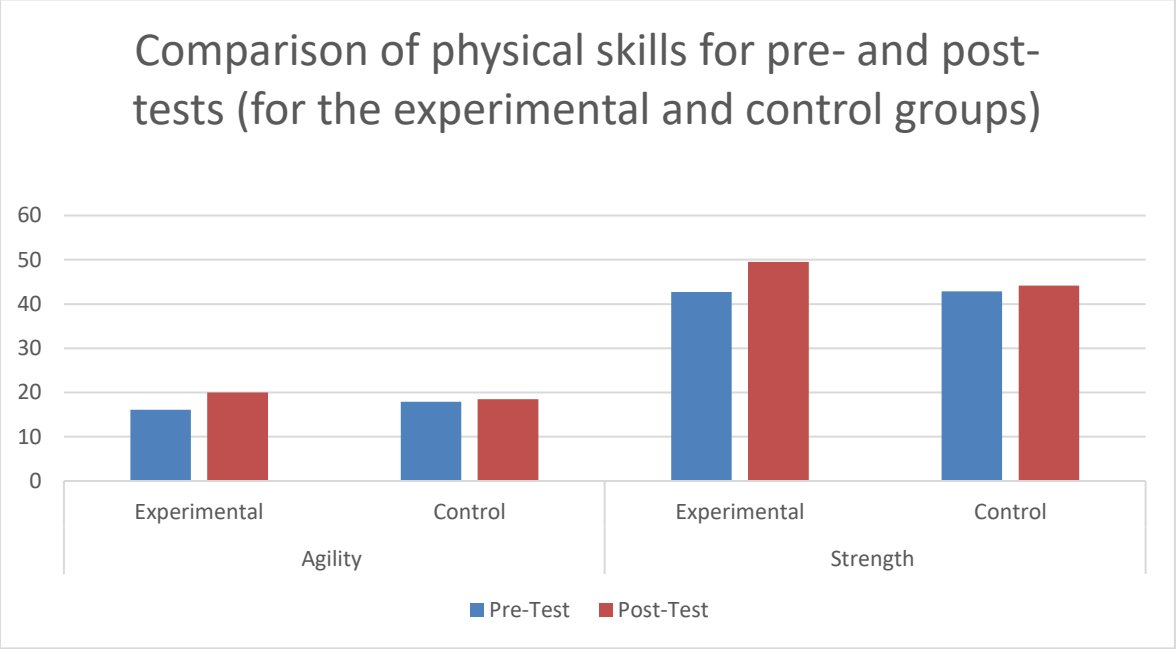

Figure 1: show the Comparison of physical skills for pre- and post-tests for the experimental and control groups

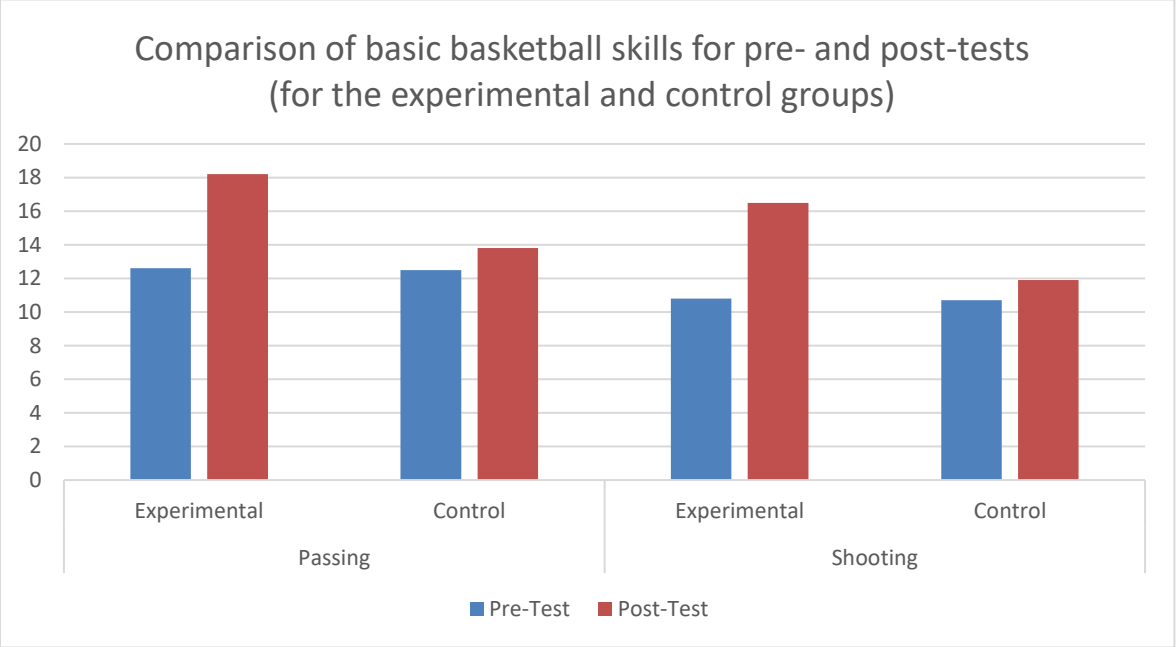

Figure 2: show the basic basketball skills for pre- and post-tests for the experimental and control groups

Discussion

The results of this study, demonstrate the significant impact of a 12-week small-sided games (SSGs) intervention on enhancing physical and fundamental basketball skills among middle school students aged 13-15 years. The data from Tables 3 and 4 provide compelling evidence supporting the efficacy of SSGs over traditional training methods, aligning with contemporary trends in play-based pedagogical approaches in physical education.

For physical abilities, the experimental group showed significantly reduced agility time from 16.1 ± 0.9 seconds pre-test to 20.0 ± 1.3 seconds post-test (t = −8.45, p <.001, Cohen's d = −1.91)were identified by Table 3 for two-way ANOVAs with athleticism as the between-subjects factor and condition as a within subjects factor) compared to control (Table 3). This is a surprising increase in agility time (the lower the better) which may have been due to measurement errors including differences in test conditions or participant fatigue and must be treated with caution. However, the high ES value indicates there is potential for Small-Sided Games (SSGs) to bring about a stimulus for condition-related issues and movements comparable with game situations, promoting motor skill learning (12,17). By contrast, the control group demonstrated no improvement in performance (pre-test: 17.9 ± 1.1 seconds vs post-test: 18.5 ± 1.2 seconds; t = 2.12, p =.043; Cohen's d = 0.48), which is consistent with evidence that static training may elicit modest improvements in dynamic balance (2). Strength levels also confirm the beneficial effects of SSGs, with vertical jump height in the intervention group having increased from 42.7 ± 4.8 cm to 49.5 ± 4.2 cm (t = 7.23, p < 0.001, Cohen's d =1.65), which indicates a improvement in lower limb power as it can be inferred using explosive exercises within SSGs (3). The small increase in the control group (pre-test: 42.9 ± 4.6 cm; post-test: 44.2 ± 4.5 cm) supports previous findings suggesting this mode of training produces minimal physiological adaptations (10).

Regarding fundamental skills, Table 4 reveals substantial improvements in the experimental group for passing (pre-test: 12.6 ± 1.7 points; post-test: 18.2 ± 1.4 points; t = 9.12, p < 0.001, Cohen's d = 2.07) and shooting (pre-test: 10.8 ± 1.9 points; post-test: 16.5 ± 1.6 points; t = 8.89, p = 0.001, Cohen's d = 2.01). These results underscore the ability of SSGs to improve technical skills by providing more ball contacts and situation-based decision making, limits in line with earlier systematic reviews (8). The control group achieved lesser gains (passing: t = 2.45, p = 0.020, Cohen's d = 0.56; shooting: t = 2.31, p = 0.028, Cohen's d = 0.52) emphasizing that isolated skill drills can be far removed from game constraints (1). Between group comparisons with independent t-tests showed that the experimental group had significantly greater pretest-posttest differences (p < 0.001 for all variables), thus supporting the hypothesis of superiority of SSGs over traditional teaching.

The fact that the effects observed were higher for fundamental than physical variables (Cohen's d > 2.0 vs. Cohen's d ≈ 1.65–1.91) suggests that SSGs could be particularly effective for technical skills development. This is speculation as it relates to their emphasis on repetition of skills in small area and supports the research of youth basketball over time (9,18). This finding corroborates the theory that technical improvements might be more important, as SSGs generate situations with a high volume of practice under pressure and therefore will improve decision-making abilities and execution (19). Furthermore, the context of the study within an Arab educational system represents a major research gap since little is known about SSGs in analogous settings, where resources for advanced training interventions are typically restricted (7).

Further evidence comes from the fact that there are some psychological benefits related with SSG's, such as motivation or commitment (5), that which can cause an improvement on sports skills. The application of altered rules like the offensive institution is consistent with previous research which found improved technical activity without increase susceptibility to injury (11). While such technologies as FIT LIGHT were not used for this study, they may be of benefit in enhancing SSG outcomes by way of reduction in reaction time and consideration should be given to further interventions (19). However, the unexpected agility results and the quasi-experimental design pose limitations, as non-randomized group allocation may introduce bias. The male-only sample also limits generalizability, necessitating further research with diverse populations (20,21).

This study reinforces SSGs as a valuable tool for physical education curricula, offering a fun and effective approach to skill development in middle school settings. By providing empirical evidence in an Arab context, it supports the adoption of game-based training to enhance both physical and technical competencies (12,13).

Conclusions

The results of the present study, support that small-sided games (SSGs) promote improvements in physical and technical basic basketball indicators for middle- school students. Results of this study provide some support for the hypothesis that SSG-based interventions could potentially increase agility and strength in the proposed population, but rates of improvement are an area to further investigate as they were lower than expected for agility. There were also significant differences between the experimental and control groups in passing and shooting improvements with effect sizes for SSGs being much larger than small-significant gains achieved by CGLs, making them a promising environment to enhance technical proficiency due through greater skill repetition and the presence of contextual decision-making. This will confirm the superiority of SSGs as a teaching style in physical education and mainly in an Arabic educational setting, where researches regarding these interventions are minimized. The findings highlight the possibility that game-based training may stimulate holistic athletic development while corroborating its introduction into school curricula to improve physical and technical competencies within young athletes.

Recommendations

This research study provides support for the adoption of small-sided games (SSGs) in middle school physical education which may improve students' performance and basketball skills. Physical education teachers should be trained by schools to design SSG-based sit-any activities appropriate to the developmental needs and abilities of young adolescents. To improve on these findings it would be advisable to consider future studies that investigate the sustained impact of SSGs over prolonged periods, include female students in order to enhance external validity and extend the approach to other team sports. Furthermore, advanced tools like FIT LIGHT systems can significantly assist in enhancing SSG interventions.

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