Journal of Human Studies and Social . University Oran2. Vol: 14 .N : 01.
ISNN : 2253-0592 EISSN : 2588-199X / Prefix: 10.46315

The Impact of Using Small-Sided Games (2v2 and 3v3) on Developing Transitional Speed and Explosive Power of Lower Limbs in U-19 Female Football Players

أثر استخدام الألعاب المصغرة (2ضد2 و3ضد3) في تطوير السرعة الانتقالية والقوة الانفجارية للأطراف السفلى لدى لاعبات كرة القدم أقل من 19 سنة.

Walid Bouarti * وليد بوعرطي walid.bouarti@univ-dbkm.dz	Physical preparation	Sports, Health and performance laboratory, Djilali Bounaama University, Khemis, Miliana, Algeria.
Safia Ousmail صفية أوسماعيل s.ousmail@univ-dbkm.dz	Methodology of physical education and sports	Sports, Health and performance laboratory, Djilali Bounaama University, Khemis, Miliana, Algeria.
Mourad Chehat شهات مراد chehat.mourad@univ-alger3.dz	Elite sports training	Physical activity science laboratory, Sports, University of Algiers 3-Dali Brahim / Algeria

DOI : 10.46315/1714-014-001-033

Received: 29/ 02/ 2024 Accepted: 20/ 09/ 2024 Published : 16/ 01/ 2024

**

Abstract:

This study aimed to investigate the impact of utilizing small-sided games (2v2 and 3v3) on enhancing the transitional speed and explosive power of the lower limbs among U-19 female football players. Employing an experimental approach, a sample of 20 players was selected. The study utilized a 20-meter sprint from a high start and a standing long jump test as assessment tools. Statistically significant differences were observed between pre- and post-tests in both transitional speed and explosive power of the lower limbs, favoring the post-test results.

Keywords: Small-Sided Games; Transitional Speed; Explosive Power; Football.

ملخص

هدف البحث لمعرفة أثر استخدام الألعاب المصغرة (2ضد2) و(3ضد3) في تطوير السرعة الانتقالية والقوة الانفجارية للأطراف السفلى لدى لاعبات كرة القدم أقل من 19 سنة، حيث تم استخدام المنهج التجريبي على عينة متكونة من 20 لاعبة، وكأدوات للدراسة تم الاعتماد على اختبار الجري 20 متر من البدء العالي واختبار الوثب الطويل من الثبات، وقد تم التوصل لاكتشاف فروق دالة إحصائيا بين القياسين القبلي والبعدي في السرعة الانتقالية والقوة الانفجارية للأطراف السفلى لدى لاعبات كرة القدم أقل من 19 سنة ولصالح القياس البعدي.

كلمات مفتاحية: الألعاب المصغرة، السرعة الانتقالية، القوة الانفجارية، كرة القدم.

**

* - Corresponding author: walid.bouarti@univ-dbkm.dz

1. Introduction:

Football is recognized as the most popular sport worldwide and is among the activities that receive significant importance and research focus (Boutaoui & Khroubi, 2021). Modern football increasingly relies on rapid pace in movement execution under various playing conditions, with or without the ball (Nasser Bay, 2021). Despite the physicality of football, it has attracted considerable interest from women, who have started to follow and actively participate in the sport. The first recorded women's football match took place in 1895 in North London, marking the beginning of significant development and growth in women's football, leading to competitive events at both national and international levels. The inaugural FIFA Women's World Cup was organized in 1991, with subsequent tournaments held every four years by the International Federation of Association Football (FIFA) (Ibrahim & Khalifa, 2014, p. 12).

Although women's football is a relatively recent addition to the sports world, its historical roots have allowed it to gain significant importance among sports federations and clubs. This importance has necessitated the exploration of the latest methods and means to enhance the performance levels of female football players (Qasri & Bafa, 2013, p. 3). Achieving superior physical condition and performance in competitions requires players to possess various physical fitness elements, which can be improved through targeted development (Bafa, 2017). Asbagh and Mazari (2023) emphasized that achieving good results requires high physical fitness and its effective management during competitions, with football demanding high fitness levels to execute both offensive and defensive skills.

Strength and speed are fundamental physical fitness elements in football, considered crucial for optimal performance at high levels (Qasri & Bafa, 2013). Panariello (2016, p. 2) stated that explosive power and speed are among the physical attributes necessary for peak athletic performance. Additionally, Mihoubi & Boukthir (2021) highlighted that achieving the highest physical levels and sporting achievements involves focusing on fitness development.

The importance of transitional speed lies in its critical impact on rapidly building attacks or in contestations, as well as in interrupting and stopping counterattacks (Hashem & Khayat, 2000, p. 30). Explosive power is also vital in football, as it results from integrating speed and strength to enhance performance. Its significance for a football player manifests in controlling high balls, quick starts to regain the ball, defensive actions, shooting at the goal, among others (Alwarith, Wadih, & Khroubi, 2023).

To elevate the level of women's football, it was necessary to explore effective training programs, considering the selection of the best methods and understanding the characteristics of different age stages to improve physical and psychological attributes scientifically. Modern training now aims to prepare players in a balanced and comprehensive manner (Ben Quwa, Ben Qasid, & Ben

Bernou, 2011, p. 207). Among the most effective modern methods are small-sided games, which involve training players in small squares and confined spaces (Dellal, 2008, p. 154).

Small-sided games are an effective means to enhance players' levels and achieve optimal results, suitable for beginners and advanced players alike (Sharit, Qadri, & Mohammadi, 2021). These games are utilized in various forms and rules, such as the number of players, field size, and ball touches, depending on the desired objectives (Casamichana & Castellano, 2010). Their importance lies in developing physical and mental skills (Antonacci, 2007) and playing a crucial role in improving aerobic and anaerobic capacities (Tchiconti, 2011).

Observations and interactions during several matches in the women's football championship revealed inconsistencies in the performance levels of Algerian teams. Moreover, monitoring training sessions showed that coaches often employed very similar exercises, especially in small-sided games, without adhering to scientifically recognized spaces and without respecting the required time frame to advance players' performance levels.

Additionally, it was noted that the playing style was characterized by slowness and a lack of speed in players' movements and transitions across the field, their weakness in dual confrontations, and in securing high balls, especially in headshots. This indicates a deficiency in speed and explosive power, leading to an inability to build quick attacks. Given that small-sided games are among the training methods used to develop and enhance physical aspects of players, and that the majority of female football coaches in Algeria rely on these games without proper variation and progression in training load, this research problem emerged, prompting an exploration through the proposal of a training program using small-sided games (2v2 and 3v3). This leads to the main research question:

1.1 General Question:

- Do small-sided games (2v2 and 3v3) affect the development of transitional speed and explosive power in the lower limbs of U-19 female football players?

1.1 Sub-Questions:

- Are there statistically significant differences between the pre-test and post-test in transitional speed among U-19 female football players?
- Are there statistically significant differences between the pre-test and post-test in explosive power of the lower limbs among U-19 female football players?

1.2 Study Hypotheses:

1.2.1 General Hypothesis:

- Small-sided games (2v2 and 3v3) positively affect the development of transitional speed and explosive power in the lower limbs of U-19 female football players.

1.2.2 Sub-Hypotheses:

- There are statistically significant differences between the pre-test and post-test in transitional speed among U-19 female football players, favoring the post-test.
- There are statistically significant differences between the pre-test and post-test in explosive power of the lower limbs among U-19 female football players, favoring the post-test.

1.3 Study Objectives:

- To determine the impact of using small-sided games (2v2 and 3v3) on developing the transitional speed of U-19 female football players.
- To determine the impact of using small-sided games (2v2 and 3v3) on developing the explosive power of the lower limbs of U-19 female football players.

1.4 Definition of Concepts:

- **Small-Sided Games:** Defined as training methods that simulate actual match performance situations within confined areas of the pitch, conducted in a specific time frame, and involving a small number of players (e.g., 2v2, 3v3, 4v4, etc.) (Saudi & Eider, 2018, p. 67).
- **Transitional Speed:** Defined as the ability to perform repeated and similar movements to cover a distance in the shortest possible time (Al-Rabadi, 2004, p. 59).
- **Explosive Power:** Defined as the body's ability to generate the greatest acceleration possible through the capability to push with maximum force or to accelerate something in the shortest time possible (Brévost, 2013, p. 333).
- **Football:** A game where two teams of eleven players with different positions and tasks compete on a rectangular field, aiming to score many goals against the opponent. The team that scores more goals wins (Groumi & Wadih, 2021, p. 403).

1.5 Previous and Related Studies:

- **Study by Khalif Abdelkader & Mazari Fateh (2019):**

Titled "***The impact of a proposed training program using specific strength exercises and small-sided games on developing explosive power and the ability to recover between speed repetitions in U-19 football players***."

This study aimed to explore the effect of a training program utilizing strength and small-sided games on developing explosive power and recovery ability between speed repetitions among football players. The experimental method was applied to a sample of 24 players (12 in the control group and 12 in the experimental group), utilizing the "Sargent" test and the "Rapid Fatigue Detection" test. The results indicated that small-sided games and strength training

positively affected the development of explosive power and recovery ability between speed repetitions.

- **Study by Dehbazi Mohamed Saghir & Jabali Redouan (2020):**

Titled "***The effect of using small-sided games in physical preparation programs on maximum oxygen consumption and explosive power of the lower limbs in football players."*** The goal of this study was to assess the effectiveness of the proposed training program in improving maximum oxygen consumption and explosive power among football players. The experimental method with a single group was used on a purposively selected sample of 12 players, employing the "Navette" test for measuring maximum oxygen consumption and the "Sargent" test for explosive power. The findings demonstrated that the proposed training program using small-sided games had an impact on both VO2 max and explosive power in football players.

- **Study by Ben Rouissi Abdelrahim & Sdouki Bilal (2023):**

Titled "***The effect of intermittent training using plyometric exercises and small-sided games on developing explosive power and transitional speed in U-17 football players."***

This study aimed to explore the effect of intermittent training using plyometric exercises and small-sided games on enhancing explosive power and transitional speed among football players. The experimental method was applied to a sample of 18 players, divided into two groups (10 players underwent short-short intermittent training with plyometric exercises, and 8 players were subjected to small-sided games training). The study relied on the 30-meter sprint test and the "Sargent" test. The results indicated that short-short intermittent training developed explosive power and transitional speed, unlike small-sided games, which did not improve these physical attributes.

2. Method:

2.1 Pilot Study:

A pilot study was conducted to test the validity and reliability of the research tools. This study involved 5 female football players from the Champions of the Coast team of Souk El Tenine in Bejaia province, participating in the second national division (middle group), under 19 years category. These players were later excluded from the main study. The "test and re-test" method was applied to them, with the initial test conducted on May 8, 2023, and the re-test on May 15, 2023.

2.2 Study Domains:

2.2.1 Human Domain: The study targeted female players of the Champions of the Coast team of Souk El Tenine (CCS Souk El Tenine) in Bejaia province, under 19 years category, active in the second national division (middle group).

2.2.2 Spatial Domain: The municipal stadium "Souk El Tenine" in the municipality of Souk El Tenine, Bejaia province.

2.2.3 Temporal Domain: Divided into two parts:

- Pilot study conducted on May 8, 2023, and re-conducted seven days later on May 15, 2023.
- The main study involved conducting pre-tests on May 17, 2023, followed by the application of the program and post-tests on July 19, 2023.

2.3 Study Methodology:

The nature of the research dictates the methodology used, as the value of the results is tied to the methodologies adopted (Angers, 2004). This research utilized the experimental method with a single-group design.

2.4 Study Population and Sample:

- The population consisted of female football players under 19 years old, active in the second national division (middle group 02), comprising 4 teams.
- The research sample included 20 players from the Champions of the Coast team of Souk El Tenine (CCS Souk El Tenine), under 19 years category, selected intentionally.

2.5 Data Collection Tools:

To solve the posed problem and validate the hypotheses, the following tools were adopted:

2.5.1 Sources and References:

Consisting of books, theses, journals, etc., both Arabic and foreign, related to the study's topic.

2.5.2 Tests:

- **First Test: 20-meter Sprint from a High Start**
  - **Objective**: To examine transitional speed.
  - **Test Protocol:** Three parallel lines are marked, with 10 meters between the first and second lines and 20 meters between the second and third lines. The player starts behind the first line in a high start position. Upon signal, the player sprints, reaching maximum speed at the second line and finishing at the third line.
  - **Execution Conditions:** Each player is given two attempts, with full rest in between, and the best attempt is recorded.

- **Information Recording**: The time taken from the start of the second line to crossing the third line is measured in seconds and fractions thereof.

➢ **Second Test: Standing Long Jump**

- **Objective**: To assess the explosive power of the lower limbs.
- **Test Protocol:** The player stands behind the starting line with a small gap between the feet, arms raised forward, and knees slightly bent. From this position, the arms swing forward and back, then push forward as the legs extend and push off the ground to jump forward as far as possible.
- **Execution Conditions:** The jump is measured from the starting line to the point where the player lands nearest to the starting line or where the heels touch the ground. If the player loses balance and touches the ground with any other body part, the jump is invalidated and must be repeated.
- **Recording**: Each player is given two attempts, with the best attempt recorded.

2.6 Scientific Basis for the Study Tool:

2.6.1 Test Reliability:

To calculate the reliability of the tests used, we applied the "test and re-test" method on a sample of 5 players, excluded from the main sample, with the test conducted on May 8, 2023, and the re-test on May 15, 2023. Pearson's correlation coefficient was used to calculate the correlation between them.

2.6.2 Validity:

To determine the validity of the test, we used face validity, defined by (Radwan, 2006, p. 216) as representing scores from error-free measurements. It can be calculated by taking the square root of the reliability coefficient.

$$\text{Face Validity} = \sqrt{\text{Reliability Coefficient}}$$

According to the above, we present:

Table 01: Representing the reliability and validity coefficients for the preliminary sample tests:

Test	Application of the Test			Re-test			Reliability Coefficient	Pearson's Probability	Self-Validity Coefficient
	Mean	Standard Deviation	Shapiro Probability	Mean	Standard Deviation	Shapiro Probability			

20m Sprint	6.55	0.46	0.07	6.65	0.54	0.17	0.98	0.003	0.99
Standing Long Jump	98.2	4.60	0.18	102.80	4.76	0.06	0.97	0.006	0.98

Source: Compiled by the authors using SPSS program

From Table No. 01, it is observed that the Shapiro-Wilk probability for both the application and re-application of the 20-meter sprint and standing long jump tests is greater than the error rate of 0.05, indicating that their results are normally distributed.

It is also noted that the Pearson test probability between the application and re-application of the 20-meter sprint and standing long jump tests, 0.003 and 0.006 respectively, is less than the error threshold of 0.05, indicating a significant correlation between the two applications.

Furthermore, the self-validity coefficients for both tests reached 0.99 and 0.98, respectively, indicating high values, meaning the reliability and validity of the 20-meter sprint and standing long jump tests are confirmed.

2.7 Building the Training Program:

After reviewing numerous scientific studies that proposed training programs for developing and enhancing various physical attributes, we designed a program and subjected it to evaluation by specialized coaches and professors. This program spanned 8 weeks, with two sessions per week, taking into account the specific needs of the sample in terms of effort and rest.

The program was implemented during the competition phase and included small-sided games (2v2, 3v3) with different spaces and specific rules. The duration of the training units ranged between 60-70 minutes, with the intensity varying between 50-100% of the maximum effort the player could withstand. Intensity in training was determined by the duration of the exercise, its difficulty level, the number of participating players, the designated space for the exercise, and whether a goalkeeper was included or not.

Table No. 02: The protocol of the program:

Field Procedures	**Small-Sided Games (2v2)**	**Small-Sided Games (3v3)**
Duration of Exercise	From 45 sec to 2 min	2 min to 4 min
Number of Series	2 to 6 series	2 to 5 series
Rest Between Series	From 45 sec to 3 min 30 sec	1 min to 3 min 30 sec

Type of Rest	Passive/Active	Passive/Active
Field Dimensions (m)	10×10, 10×20	10×15, 10×25
Form of Training	Intermittent	Intermittent

Source: Compiled by the authors using SPSS program

2.8 Statistical Methods:

The SPSS program was utilized for statistical analysis, employing the following tools:

- Mean.
- Standard Deviation.
- Shapiro-Wilk Normality Test.
- Pearson's Correlation Coefficient.
- Wilcoxon Test.

3 . Results:

3.6 Presentation and Analysis of the First Hypothesis Results:

Claiming there are statistically significant differences between the pre-test and post-test in transitional speed among U-19 female football players, favoring the post-test.

Table No. 03: Pre-test and post-test results for the experimental group in the transitional speed test:

Test	Pre-test			Post-test			Wilcoxon Value	Wilcoxon Probability	Statistical Significance
	Mean	Standard Deviation	Shapiro Probability	Mean	Standard Deviation	Shapiro Probability			
20m Sprint	7.13	0.71	0.04	5.80	0.73	0.11	3.86	0.000	Significant Difference

Source: Compiled by the authors using SPSS program

The average post-test score for transitional speed was 5.80 with a standard deviation of 0.73, lower than the pre-test average of 7.13 with a standard deviation of 0.71. The Shapiro-Wilk probability for the pre-test was 0.04, indicating non-normal distribution, whereas for the post-test, it was 0.11, indicating normal distribution. The significant Wilcoxon probability of 0.000, below the acceptable error level of 0.05, indicates statistically significant improvements in transitional speed in the experimental group, attributed to the positive impact of the proposed program.

7-2 Presentation and Analysis of the Second Hypothesis Results: Claiming there are statistically significant differences between the pre-test and post-test in explosive power of the lower limbs among U-19 female football players, favoring the post-test.

- **Table No. 04: Pre-test and post-test results for the experimental group in the explosive power of the lower limbs test:**

Test	Pre-test			Post-test			Wilcoxon Value	Wilcoxon Probability	Statistical Significance
	Mean	Standard Deviation	Shapiro Probability	Mean	Standard	Shapiro Probability			
Standing Broad Jump	93.35	10.56	0.02	103.50	9.78	0.22	3.89	0.000	Significant Difference

Source: Compiled by the authors using SPSS program

The average post-test score for explosive power of the lower limbs was 103.50 with a standard deviation of 9.78, higher than the pre-test average of 93.35 with a standard deviation of 10.56. The Shapiro-Wilk probability for the pre-test was 0.02, indicating non-normal distribution, whereas for the post-test, it was 0.22, indicating normal distribution. The significant Wilcoxon probability of 0.000, below the acceptable error level of 0.05, indicates statistically significant improvements in explosive power of the lower limbs in the experimental group, attributed to the effectiveness of the proposed program.

4 Discussion:

4.6 Discussion of the First Hypothesis Results:

The analysis of data presented in Table No. 03 reveals statistically significant differences between the initial and final tests in the training program, including small-sided games (2v2 and 3v3), contributing to improved transitional speed in U-19 female football players, with the final test proving more effective. This improvement is attributed to the training program based on these small-sided games. Furthermore, studies by Abdel Hafeez Qadri (2015) and Mufti Abdel Moneim (2018) corroborate these results, indicating statistically significant improvements in transitional speed and agility among experimental groups before and after training. Based on these findings, we can affirm the validity and reliability of our study's first sub-hypothesis.

4.7 Discussion of the Second Hypothesis Results:

Data extracted from Table No. 04 and its statistical analysis show a notable and statistically significant improvement in the explosive power of the lower limbs in U-19 female football players, resulting from training with small-sided games (2v2 and 3v3). This improvement is clearly due to the effectiveness of the training program based on these games. This finding is supported by several other studies. Dehbazi and Jabali's study (2020) found that a training program based on small-sided games positively influenced explosive power development.

Similarly, Ben Rabeh et al. (2018) noted that small-sided games significantly enhance explosive power. Khalif and Mazari's study (2019) found that small-sided games and strength training were effective in improving explosive power and recovery capacity between speed repetitions. Ashoush and Ghanam's study (2018) also supports these findings, indicating that combined training had a positive impact on vertical jump test outcomes, demonstrating an improvement in the explosive power of the lower limbs in football players. These studies and data confidently support the validity of our study's second sub-hypothesis.

5 Conclusion:

Based on the results analysis, we conclude the following:

- ✓ There are statistically significant differences between the pre-test and post-test in transitional speed in U-19 female football players, favoring the post-test.
- ✓ There are statistically significant differences between the pre-test and post-test in the explosive power of the lower limbs in U-19 female football players, favoring the post-test.
- ✓ Small-sided games (2v2 and 3v3) positively affect the development of both transitional speed and explosive power of the lower limbs in U-19 female football players.

Based on these conclusions, we propose and recommend the following:

- ✓ Rely on training programs based on small-sided games (2v2 and 3v3) to improve and develop transitional speed and explosive power of the lower limbs in female football players.
- ✓ Apply this training program to other teams and age categories to assess its overall effects on physical fitness components, especially on transitional speed and explosive power of the lower limbs.
- ✓ Design training programs using small-sided games based on scientific principles and tailored to each age group, considering avoiding excessive pressure on players and respecting their natural development.
- ✓ Utilize the results of this study in the future to prepare effective training programs that contribute to the development of transitional speed and explosive power of the lower limbs.

**

6. References:

Abdelrahim Ben Rouissi, and Bilal Sdouki. (2023). The effect of intermittent training using plyometric exercises and small-sided games on developing explosive power and transitional speed in U-17 football players. Scientific Journal of Physical Education, Sports, and Psychological Sciences, 22(1), pp. 434-452.

Abdullah Bafa. (2017). Improving coordination abilities to enhance skill performance following a proposed periodized training program in female football players. Professional Journal, 4(3), pp. 286-297.

Al-Hussein Qaroumi, and Mohammed Amin Wadih. (2021). The impact of training interruption on maximum aerobic speed and speed repeatability in U-19 football players. Sports System, 8(3), pp. 299-315.

Ali Ben Quwa, Ali Hajj Mohammed Ben Qasid, and Osman Ben Bernou. (2011). The impact of a proposed training program for the preparatory period on developing the physical and skill side in female football players of the Oran team (Algeria). Journal of Physical Activities, Sports and Technology Sciences, 8(8), pp. 207-215.

Amal Mohammed Ibrahim, and Ahlam Al-Feki Mohammed Khalifa. (2014). A proposed program for training level one female football coaches. Journal of Sports Creativity, 05(02), pp. 12-22.

Ayoub Saudi, and Hassan Idir. (2018). Using small-sided games to develop maximum aerobic speed in football players. Challenge Journal, 10(1), pp. 64-78.

Chamseddine Asbagh, and Fateh Mazari. (2023). The impact of a circuit training program on developing transitional speed and speed-strength in U-17 football players. Challenge Journal, 15(01), pp. 259-275.

Hossam Sharit, Abdelhafid Qadri, and Mehdi Mohammadi. (2021). Proposing training units based on small-sided games to improve response speed and motor performance speed in U-13 female basketball players. Journal of Physical Activities and Sports Sciences Practices, 10(1), pp. 12-26.

Issa Mihoubi, and Nour Islam Boukthir. (2021). The effect of proposed training units on improving transitional speed and explosive power in U19 football players. Professional Journal, 8(3), pp. 508-523.

Kamal Jamil Al-Rabadi. (2004). Sports Training for the Twenty-First Century (2nd ed.). Amman, Jordan: Dar Wael for Publishing & Distribution.

Karima Nasser Bay. (2021). The impact of a proposed training program using continuous repetitive training method on developing endurance (aerobic endurance, speed endurance) in U17 female football players. Journal of Physical Activities, Sports, and Artistic Practices, 10(1), pp. 50-64.

Maurice Angers. (2004). Scientific Research Methodology in Human Sciences - Scientific Training - (Bouzid Sahraoui et al., Trans.). Algeria: Al Qasba for Publishing.

Mohamed Nasr El-Din Radwan. (2006). Introduction to Measurement in Physical Education and Sport. Cairo: Book Center for Publishing.

Mondher Hashem, and Ali Khayyat. (2000). Rules of Physical Fitness in Football. Amman, Jordan: Dar Al-Manahij for Publishing & Distribution.

Nasr El-Din Qasri, and Abdullah Bafa. (2013). The impact of a proposed plyometric training program on developing some basic skills and physical abilities in female football players - First National Division - An experimental study of the Union of Talents of Djelfa -UMD. Journal of Physical Activities, Sports, and Artistic Practices, 2(4), pp. 1-12.

Salim Boutaoui, and Mohammed Faisal Khroubi. (2021). A comparative study between two programs using small-sided games (6v6) and (3v3) in developing maximum aerobic speed in football players. Scientific Journal of Physical Activity, Sports and Technology, 18(2), pp. 394-406.

Samer Mohammed Abdel Warith, Mohammed Amin Wadih, and Faisal Khroubi. (2023). A comparative study of plyometric training methods, small-sided games, and mixed training on the explosive power of the lower limbs in U-19 football players. Challenge, 15(1), pp. 1-15.